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Abstracts

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Silva Norman Azucena et al., J Food Nutr Popul Health 2018, Volume 2
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EFFECT OF SOLAR DEHYDRATION ON THE ANTIOXIDANT CAPACITY AND THE CONTENT OF PHENOLIC COMPOUNDS OF BLACKBERRY, *RUBUS FRUTICOSUS* SPP.

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The blackberry is a fruit of interest due to its high content of anthocyanins and ellagitannins, as well as other phenolic compounds that contribute to its high antioxidant capacity (AC). The state of Michoacán (Mexico) is currently the world's leading producer and exporter of blackberry, with about 239 thousand tons produced by 2016. However, there is a high problem of waste of fruit that implies a loss of product between 30% and 50% due to causes associated with the sensitivity of fruits and lack of conservation methods. Therefore, dehydration is an option for their preservation. The objective of this study was to evaluate two technologies of solar drying (SD): direct (DSD) and indirect (ISD) and its effect on AC and the content of phenolic compounds (phenols, anthocyanins, flavonoids) of blackberry (*Rubus fruticosus* spp.,) dehydrated. The DSD and ISD results were compared with those of the dehydrated samples in stove (SS) at 60°C with forced convection at 1 ms-1. The fresh and dried fruits were evaluated, the samples were liquefied and the seed was separated from the pulp. The analysis of the results shows that in all cases the dehydrated blackberry pulp contains lower concentrations of phenolic compounds and AC than the fresh sample. However, that total phenol concentrations of ISD and DSD are higher than SS (41.8±2.9, 41.2 ± 4.9 and 35.9±11.9 mg of gallic acid equivalent /g dry solid, respectively). The AC remained constant in all three drying methods (5.5±0.6, 5.8±0.5 and 5.9±0.5 mg ascorbic acid/g dry solids for SC, ISD and DSD, respectively). Flavonoids were higher in ISD than DSD and SC (10.2±1.3, 9.6±0.8 and 9.1±0.4 mg of quercentin/g dry solid, respectively). These findings support the potential properties of dehydrated blackberry as a beneficial food for health.

Biography

Silva Norman Azucena completed her undergraduate studies in Chemical Engineering in 2012, doing research at the Institute of Engineering, UNAM in the Division of Environmental Engineering. She worked as a Process Engineer in projects for the petroleum sector, performing basic and detailed engineering. Currently, she is pursuing her Master's Degree in Sustainability Science at UNAM, with the thesis entitled, "Implementation of solar dehydrators to reduce agricultural loss".

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SPROUTS, MICRO GREENS AND BABY LEAF: IMPROVING THE NUTRITIONAL QUALITY IN VEGETABLES

Maria Dolores Lopez Belchi, Zapata E, Fierro P, Toro T, Jara P, Fischer S, Wilckens R and **Schoebitz M**
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Consumers are seeking better quality products, which differ from the products found in the traditional market, presenting clear advantages to our health. Sprouts are germinated seeds, usually in dark or low light conditions, high humidity and temperature until their cotyledons appear; whereas, micro greens are also seeds germinated having two fully developed cotyledons with or without the appearance of a rudimentary pair of true leaves. In the last few years, it has been discovered that these sprouts and micro greens are highly healthy with immense potential, being considered even as functional foods or super foods, but there is still limited scientific information. The objective therefore, of this work was to compare different conditions in the crop of sprouts, micro greens and baby vegetables of lettuce, carrots and zucchini grown in hydroponic systems and evaluate nutritional aspects. To carry out this work, three vegetables, lettuce, carrot and zucchini were evaluated as sprout, micro green, baby vegetable and commercial vegetable produced in hydroponics, with floating root and solid substrate, under two photo periods (long-day and short-day). Each species was affected differently by these conditions and its development was different. To evaluate nutritional aspects, a proximate analysis (moisture, ash, crude protein, ether extract, crude fiber and nitrogen free extract) was performed. In addition, total carotenoids and total polyphenols were analyzed, always resulting in higher values in sprouts and micro greens than baby and commercial vegetables. These preliminary results show a promising source of nutrients beneficial to our health in sprouts and micro greens and consider these immature stages of vegetables to be incorporated and consumed more frequently in our diet.

Biography

Maria Dolores Lopez Belchi developed her PhD in IMIDA in Murcia, Spain working with natural products extracted from plants and she has completed her PhD in Agricultural Chemistry from the University of Murcia (Spain) and Postdoctoral studies of functional ingredients from Nantes Atlantic College of Veterinary Medicine, Food Science and Engineering, France. She worked as a Professor of Chemistry at the University of Concepción. She published more than 30 papers in reputed journals and has been serving as a Director of Laboratory of Chemical Analysis in the Department of Crop Production. In recent years, she has worked on the study of active compounds extracted from berries or other vegetables and fruits with high impact on human health.

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CALAFATE (*BERBERIS MICROPHYLLA* G. FORST), THE CHILEAN BERRY: UNVEILING ITS POTENTIAL

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Berries are fruits characterized by being coloured and flavoured with high anthocyanins contents which provide benefical properties to human health. Chile produces several berries and one of this is calafate (*Berberis microphylla*). There are few reports about this native species that grows as a wild crop from Aysen and Magallanes (in the Patagonia), although it is possible to find it under a wide range of ecological conditions. Its fruits are an intense purple berry with high polyphenol contents. It has been determined that calafate possesses 18 anthocyanins derived from glycosylated delphinidin, petunidin, malvidin, peonidin and cyanidine. Many of them are associated with health beneficial effects. The uptake of sources of polyphenols ensures the scavenge of free radicals and also increases cognitive properties and prevents or reduce the risk of neurodegenerative diseases. In recent years, it has been proven that fruits rich in antioxidants such as calafate, could prevent and counteract neurodegenerative deterioration, considering functional against these diseases. The inhibition of acetylcholinesterase enzymes (AChE) is an indicator of neurotransmitter function in diseases such as Parkinson's and Alzheimer's disease. The polyphenolic profile of calafate analyzed through HPLC-DAD and the antioxidant capacity by different assays was studied. Delphinidin-3-O-hexoside, petunidin-3-O-hexoside and malvidin-3-O-hexoside were found in calafate as major compounds. The antioxidant capacity tests revealed high values for this berry. The main compounds and characteristic composition of calafate provide biological activity and potential antioxidant capacity. *In vitro* tests, Ellman esterase assay have been carried out to confirm the reaction capacity of calafate extracts in the action of cholinesterase. Knowing that calafate has a high profile of polyphenols, this work is aimed to present the characteristics, description of metabolites and the potential of calafate for nutrition and health purposes, especially to neurodegenerative diseases.

Biography

Maria Eugenia Romero Roman is a PhD student of Agronomic Science from the University of Concepción, Chile. She completed her Master's Degree in Molecular Biotechnology from the University of Guayaquil, Ecuador. She worked as Deputy Head of Department of Biotechonology in Litoral Sur Experimental Station at National Institute of Agricultural Research of Ecuador and as Research Assistant at the University of Babahoyo, Ecuador. Currently, she is working with calafate, analyzing it a source of functional ingredients by determining bioactive compounds, testing isolated or mixed metabolites to assay some formulations *in vitro* and *in vivo*, in order to propose those metabolites extracted from calafate as food supplement.

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COMPARISON OF PHENOLIC COMPOSITION AND ANTIOXIDANT CAPACITY IN FRUITS OF THE WHITE STRAWBERRY *FRAGARIA CHILOENSIS* SPP., *CHILOENSIS FORM CHILOENSIS* OF TWO CHILEAN LOCALITIES

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At present, there has been a great interest in producing foods that provide beneficial effects on human health. As a result, many native fruits have been studied for being a great source of antioxidants and functional foods. Agriculture has the purpose of producing high quality foods with beneficial potential for health, such as antioxidant compounds that can avoid the free radicals involved in oxidative stress. Chilean strawberry (*Fragaria chiloensis* ssp., *chiloensis f. chiloensis*) is an endemic wild species, native to southern Chile. The *Fragaria chiloensis* is distributed in the center and south of Chile and has a low consumption within Chile and a low impact on the external market. However, the antioxidant activity and part of the phenolic composition of extracts of this species have been analyzed by some authors resulting to be a fruit with high capacity. This work focuses on the content of ellagic acid and ellagitannins found in white strawberry fruits (*Fragaria chiloensis* spp., *chiloensis form chiloensis*) of two Chilean localities. The identification and quantification of phenolic compounds (anthocyanins, ellagic acid and ellagitannins) of white strawberry was made from a water/methanol/formic acid extract and through HPLC-DAD. The results show that the major compounds in Chilean strawberry were the derivatives of ellagic acid and ellagitannins, besides it is observed that the two localities do not have differences in the contents of these compounds. Also, anthocyanins, specifically cyanidin-3-O-glucoside, pelargodinin-3-O-glucoside and cyanidin-malonyl-glucoside were also detected. From these preliminary results, we can assure that the *Fragaria chiloensis* turns out to be a promising fruit that offers benefits to the human health.

Biography

Felipe Noriega is a Biochemist who graduated from the University of Concepción and is pursuing his Master's Degree in Agricultural Sciences with a mention in Plant Production and Protection at the same university. He worked as a Research Assistant at the Biotechnology Center of the University of Concepción. He has published an article in a reputed journal.

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RESPONSE OF QUINOA PLANTS TO PROCESSES OF SOIL RECLAMATION IN SALINE-SODIC, USING COMBINED AMENDMENTS

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Soil degradation resulting from salinity and sodicity is a major environmental constraint with severe negative effects on soil fertility and agricultural productivity in arid and semiarid regions of the world. Saline sodic soil are degraded due to their simultaneous effect of salinity and sodicity, which deteriorates soil physical structure by clay swelling and dispersion due to high concentrations of Na+ in the soil solution or at the exchange phase, forming dispersed. In addition to physicochemical effects, biological properties such as the microbial respiration and biomass are deteriorated. In our experiment, we evaluated the effects of individual and synergic of biochar, humic substances and gypsum application on chemical and biological properties of saline sodic soil and growth of two quinoa genotypes. Treatments included biochar (B) 22 t ha-1, humic substances (HS) 5 kg ha^{-1}, gypsum (G) 47.7 t ha^{-1}. Eight treatments T0 = control, T1 = B, T2 = G, T3 = HS, T4 = B+G, T5 = B+HS, T6 = HS+ G, T7 = B+HS+G were established. The combined treatment B+HS+G increased root biomass in AZ - 51 and AZ - 103 quinoa genotypes 206 and 176% respectively, while plants grown on amendment soils increase significant stomata conductance, chlorophyll index and seeds yield. Furthermore, electrical conductivity (EC_e), sodium adsorption ratio (SAR) and exchangeable sodium percentage (ESP) decreased significantly in all treated soils, the ESP in gypsum treatment (decreased 11 folds) and B+G, B+HS, B+HS+G (decreased 9–15 folds) respect to control. Likewise, soil microbial biomass increased 112-322% on B+HS+G treatment. Combined amendment improved chemical and biological properties of soil, reducing the negative effects of saline sodic soil on the performance of quinoa plants.

Biography

Mauricio Schoebitz Cid completed his PhD from Nantes University, France and Postdoctoral studies from Consejo Superior de Investigaciones Científicas, Murcia, España–(CEBAS–CSIC). He worked as a Professor of Soil Science and Natural Resources at Concepción University. He has published more than 15 papers, book chapters and patents.

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EVALUATION OF EXTRUSION EFFECTS ON ANTIOXIDANT ACTIVITY AND TOTAL PHENOLICS COMPOUNDS IN THE SHELL WALNUT

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The compounds oxidation found in food, as in the case of lipids, decreases the nutritional value and affects the products organoleptic characteristics. Phenolic compounds are a good option to prevent this negative effect. High temperatures usually causes loss of phenolics compounds, while the mechanical effect of extrusion is helpful for releasing bound phenolics from the food matrix and induced antioxidant activities. On the other hand, the high content of fiber in the shell of walnuts can be useful as prebiotic or as a filter compound in the industry. Different extrusion temperatures (33.25, 40, 70, 100 and 106.75ºC) and different screw speeds (88.75, 100, 150, 200 and 211 rpm) were analyzed using response surface methodology (RSM) to investigate changes in dietary fiber (soluble and insoluble) contents, oil and water absorption, water solubility, phytochemical contents and antioxidant activity of extrusion products of walnut shell. The results showed that the total dietary fiber extraction was increased, in the best conditions, around 6%. The extrusion process no affected the insoluble and soluble fraction. With 70ºC and 150 rpm, the total phenolic content (TPC) reached their peak and increased when compared with the control test. Antioxidant activity occurred at higher levels in the range from 70ºC to 100ºC and 150 to 200 rpm. In colour, the three parameters measured, L* (lightness), a* (greenness-redness), and b* (blueness-yellowness); these were significantly affected ($p<0.05$) by the process temperature and screw speed. Water and oil absorption capacity increased with the extrusion process. These results demonstrated the potential that the shell walnut extrusion has for the creation of new functional products for animals and preservative in the food industry.

Biography

María Pilar Almajano has completed her PhD in Organic Chemistry in the CSIC and postdoctoral studies in Reading University (UK). She has been working on the topic of natural antioxidants for more than 15 years. She has around 60 scientific publications in international journals. Since 2007 she is working at the School of Engineering in the UPC, teaching Chemistry and Food Technology. Juliana Villasante is a PhD student in natural antioxidants. She has completed his degree in Engineering in Food Indsutry by "Instituto Tecnológico y de Estudios Superiores de Monterrey" and master in Food Research, Development and Innovation by Universidad de Barcelona. She has worked in the departments of Development and Innovation in different food industries.

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INFLUENCE OF FOLIAR APPLIED MICRONUTRIENTS ON THE ESSENTIAL OIL AND FATTY ACID COMPOSITION OF CARAWAY (*CARUM CARVI* L.)

Clara Lizarazo, Anna-Maija Lampi and **Pirjo Mäkelä**
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Caraway (*Carum carvi* L.) is one of the most important spice crops worldwide. In Finland, it has become a hit agricultural product cultivated in over 1.500 farms and 20.000 hectares. Finnish caraway production fluctuated between 4.9-8.2 million kg during the period 2012-2016, while it reached a record 10.4 million kg in 2011. Most of the production is for export, where Finland holds a 1.4% share of the world's spice crop market. Caraway seeds contain between 1 to 7% oil, depending on whether the crop is annual or biennial, the latter usually accumulating more oil. The essential oil is mainly made of carvone, limonene and polyphenols, which have antioxidant activity and health promoting properties. Caraway, cv. 'Record', plant stand was established in 2016 at the Viikki Experimental Farm, Helsinki, Finland. In the second year, 2017, a field experiment was designed on the caraway plant stand using a randomized complete block design with four replicates and five treatments: a control and a foliar applied micronutrient of copper, magnesium, manganese or zinc. After milling seed oil was extracted using accelerated solvent extraction method. Essential oils and fatty acids were measured using solid phase microextraction (SPME) and gas chromatography – flame ionization detector (GC-FID) as described in da Silva and Câmera and Zi-Tao *et al.* respectively. To our knowledge, no previous studies have assessed the role of micronutrients on caraway oil composition. Our results indicate that while the micronutrient treatments have a significant effect on essential oil composition i.e., Zinc treatment giving the highest limonene content, not such effect was found on fatty acid composition.

Recent Publications

1. Da Silva C L and Câmara J S (2013) Profiling of volatiles in the leaves of Lamiaceae species based on headspace solid phase micro extraction and mass spectrometry. Food research international 51:378-387.
2. Vallverdú - Queralt A, Regueiro J, Alvarenga J F R, Martinez – Huelamo M, Leal L N and Lamuela-Raventos R M (2015) Characterization of the phenolic and antioxidant profiles of selected culinary herbs and spices: caraway, turmeric, dill, marjoram and nutmeg. Food science and technology 35(1):189-195.
3. Zi-Tao Jiang, Mo-Lei Sun, Rong Li and Ying Wang (2011) Essential oil composition of Chinese Caraway (*Carum carvi* L.) Journal of Essential Oil Bearing Plants 14(3):379-382.

Biography

Clara Lizarazo currently works at the Department of Agricultural Sciences, University of Helsinki. Clara does research in Food Science, Agronomy and Agricultural Plant Science. Has worked for two EU funded projects 'Climate CAFE: Climate change adaptability of cropping and farming systems' and 'Legume Futures'.

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THE POTENTIAL RISK OF HEAVY METALS ON FOOD CHAIN IN AN ALBANIAN SERPENTINE SITE

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Soils with either peridotite or serpentinite parent materials are strongly influenced by the specific geochemistry and mineralogy of the parent material. So called serpentine soils share a number of chemical particulars including low Ca: Mg ratio, elevated levels of heavy metals (Fe, Ni, Cr, Co) and low concentrations of macronutrients e.g., K and P. Flora and vegetation of serpentine areas often differ from that of normal soils. Nickel availability in soil depends on environmental and pedological factors. Nickel uptake by plants depends on its bioavailability in soils. The objective of this study was to identify the serpentine problem in agricultural soil of Pojska and Pogradec and the impact of the serpentine problem on the structure and quality of agricultural products. In this study, soils and agricultural products in this region were collected and analyzed for heavy metal and macronutrient content. This study informs us about the potential risk of serpentine soils on food chain.

Biography

Aida Bani has graduated from Agriculture University of Tirana (AUT) in Agronomic Sciences, 1989. She enrolled at AUT and INPL, Nancy, France for her PhD studies and received the title Doctor of Sciences in year 2009. She has several articles published in high impact factor scientific journals. She has participated in 68 international scientific conferences. She is a passionate Lecturer of several courses such as: Landscape Architecture, Landscape Management, Soil Remediation Methodologies etc. Her scientific interest particularly relies on topics connecting with agriculture, environment and landscape. She has also been leading several national and international scientific projects in the field of agriculture and environment.

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ANALYSIS OF BEE BREAD QUALITY FROM SERPENTINE AREAS IN ALBANIA AND BULGARIA

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The quality of bee bread samples collected from south eastern serpentine areas in Albania and Bulgaria was evaluated and compared on the basis of their pollen content by qualitative melissopalynological analysis, chemical composition and morphological characteristic of bee bread. The pollen morphological data after standard acetolysis method were used to determine the botanical origin of the collected samples. Macro elements K, Ca, Mg, P and microelements Cd, Co, Cr, Cu, Fe, Mn, Na, Ni, Pb and Zn were determined after inductively coupled plasma atomic emission spectroscopy (ICP-AES) method. Most of the analyzed Albanian samples were mono floral while Bulgarian samples were poly floral. The percentages of pollen between samples varied considerably. Predominantly *Vicia* type pollen grains were found in the Albanian bee bread samples. *Brassicaceae* pollen was also determined in all samples but in different concentrations mostly in Albanian samples. Pollen from Ni hyper accumulator *Alyssum murale* was difficult to be separated from other *Brassicaceae* pollen grains. Studied elements have different concentrations in bee bread samples even if they originated from the same geographical region and locality depending on the environmental characteristics of the locality. The concentrations of Ni, Cr, Co and Fe elements that normally are elevated in serpentine areas were in Albanian samples about 8, 4, 2 and 3 times higher compared to the data from Bulgaria. The concentrations of Cu, Zn and Ca were higher in the Bulgarian samples. As a product of high commercial value, the quality of bee bread should be controlled and standardization of metal content for more metals has to be accepted. The bee keepers should be informed about possible negative effect of naturally metalliferous soils on the quality of bee bread and should pay attention to the environmental characteristics of the locality where they place bee hives. A strict control on the metal concentrations has to be paid on bee bread pollen used as a medication, as a food and as a nutraceutical supplement.

Biography

Aida Bani has graduated from Agriculture University of Tirana (AUT) in Agronomic Sciences, 1989. She enrolled at AUT and INPL, Nancy, France for her PhD studies and received the title Doctor of Sciences in year 2009. She has several articles published in high impact factor scientific journals. She has participated in 68 international scientific conferences. She is a passionate Lecturer of several courses such as: Landscape Architecture, Landscape Management, Soil Remediation Methodologies etc. Her scientific interest particularly relies on topics connecting with agriculture, environment and landscape. She has also been leading several national and international scientific projects in the field of agriculture and environment.

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NI AVAILABILITY IN AGRICULTURAL SOILS IN ALBANIAN SERPENTINE AREA

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In Albania, ultramafic outcrops cover 11% of the surface and the Mg-rich arable vertisols have been estimated to cover about 14,889 ha of the about 700,000 ha of total agricultural land available in the country. Albanian ultramafic landscapes have the potential to provide multiple ecosystem services, but are currently being used for low-productivity agriculture. The purpose of this paper was to characterize Ni availability in one of most Mg-rich arable vertisols of Albania, Field of Domosdova, Prrenjas. We sampled 16 soils from a Domosdova field, which was cultivated with plants that serve as food for animals and humans. Collection of both plant samples (analysis of element concentrations in aerial parts) and soil samples (analysis of total elements), DTPA-extractable Ni, Fe, helped us to evaluate the potential risk of soil elements and the tolerant and accumulator plant species in this serpentine area. Obtained results have revealed high concentration of nickel in soil of the serpentine pastures that are used for animals grazing. Ni availability (DTPA extractable Ni) in Domosdova soil varied from 55 mg kg^{-1} to 56 mg kg^{-1}. The highest Ni concentrations in were found in nickel hyper accumulator plant *Alyssum murale* (from 3504 to 3516 mg kg^{-1}). In conclusion, serpentine soil of Domosdova, Prrenjas is a potentially toxic contaminated source to surrounding environment due to the high content of total and available nickel.

Biography

Besmira Xhaferri has a Bachelor's Degree in Biochemistry and Master's Degree in Environmental Science from the University of Elbasan. She is currently a PhD candidate in the Agriculture Faculty at the University of Tirana. She is in progress of her thesis entitled, "Phenology and the absorption dynamics of macro elements and heavy metals in hyper accumulator plants of nickel in Albania". She works as a Professor of Biology at Aleksander Xhuvani University, Elbasan and as a Teacher of Biology and Chemistry at Arianiti High School in Elbasan.

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THE WATER BINDING CAPACITY OF FROZEN MANDARIN FISH WITH ITS BY-PRODUCT, HYDROLYSATES

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The enzymatic hydrolysates from the mandarin fish swim bladder, skin and bones were used for water retention on frozen mandarin fish. The degree of moisture loss slowed by the by-products hydrolysates on frozen mandarin fish was analyzed through soaking weight gain, defrosting loss rate and cooking loss rate. Using low field nuclear magnetic resonance spectrometer, texture analyzer, scanning electron microscopy (SEM), the water binding status, texture characteristics and microstructure were measured respectively, to clarify the effect of by product hydrolysates with salt on water binding capacity. The results showed that the hydrolysates of swim bladder with 2.5% salt solution was effective in alleviating the defrosting loss rate of frozen mandarin fish and the decrease of cooking loss rate. The protective effect on frozen mandarin fish texture was remarkable. The integral area of movable water (T22) in mandarin fish was significantly larger than that in the blank group (P <0.05). The amount of intercept water in the muscle fiber was more than before treatment also, which meant the overall fluidity weakened. The micro structure validated that the combined treatment of swim bladder hydrolysates with salt on frozen mandarin fish has a complete structure with strong muscle fibers and small gaps. Therefore, the quality of frozen mandarin fish could be maintained by the treatment of swim bladder hydrolysates with 2.5% salt solution, which provides a theoretical basis for the development of a new type of phosphorus free water retaining agent.

Biography

Ying Li completed her PhD in Food Science from Nanjing Agricultural University and Postdoctoral studies from North Carolina A&T State University. She worked as an Associate Professor of Agroindustry at Jiangsu Academy of Agricultural Sciences. She published more than 25 papers as the first or communication author in Chinese and international journals, such as *Food Chemistry, Journal of Agricultural and Food Chemistry* and *Journal of Medicinal Food*. She has been granted three invention patents as the First Inventor.

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MECHANISM OF REPELLENT ACTION AND CONTACT TOXICITY OF THE ESSENTIAL OIL EXTRACTED FROM CHINESE CHIVE AGAINST *PLUTELLA XYLOSTELLA* LARVAE

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Botanical pesticides are playing an increasingly important role in the control of agricultural pests. In this study, the insecticidal effects of the essential oil extracted from Chinese chive (EOC) against *Plutella xylostella* larvae were confirmed in terms of their repellent action and contact toxicity. The repellent actions of four pyrazines isolated from EOC were studied based on electroantennograms (EAG). The effects on glutathione S-transferase, carboxylesterase and acetyl cholinesterase were assayed after treatment with EOC. EOC had an obvious effect on the EAG and inhibited the activities of glutathione S-transferase and carboxylesterase in treated *P. xylostella* larvae, which could explain their repellent action and contact toxicity. In addition, two principal sulfide compounds in EOC, diallyl disulfide and methyl disulfide, were tested. Both showed the repellent action and contact toxicity against *P. xylostella* larvae, although weaker than the effects of EOC. The four pyrazines isolated from essential oil of Chinese chive showed better repellent activities than that of EOC.

Biography

Feng Tang completed his PhD in Tea Science at Anhui Agricultural University and Postdoctoral studies from Chinese Academy of Forestry. He worked as Professor of Pesticide Science at Anhui Agricultural University. He has published more than 200 papers in reputed journals and has been serving as Professor of Phytochemistry at the International Center for Bamboo and Rattan..

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SIMULATION OF CARBON FLUXES AND EVAPOTRANSPIRATION IN RICE FIELDS

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Quantification of the canopy photosynthesis and evapotranspiration (ET) of crops is essential to determine the effects of environmental changes on CO_2 fluxes and ET in agricultural ecosystems and crop productivity. This study was conducted to simulate the CO_2 fluxes and ET of paddy rice (*Oryza sativa*) based on the development of photosynthesis and ET models. We also projected spatiotemporal variations in CO_2 assimilation and ET using a crop model based on remotely sensed information to identify a link of CO_2 and water balances with the accumulation of plant biomass. The photosynthesis and ET models that were developed simulated CO_2 assimilation and ET that had statistically acceptable agreements with the corresponding experimental measurements. Also, projections of spatiotemporal variations in absorption of CO_2 and ET were established using the GRAMI- rice model using remote sensing data. These results indicate that CO_2 and water fluxes in paddy rice could be well quantified based on simulation projecting spatiotemporal assimilation of CO_2 and ET. Our results would highlight the need to partition water and carbon fluxes to improve our mechanistic understanding of primary productivity and water use efficiency of rice and environmental impact of agricultural practices. Further efforts should be made to seek ecological implications through a fusion between at-ground measurements and remote sensing observations via model improvement.

Biography

Jonghan Ko is an Associate Professor position at Chonnam National University, Gwangju, South Korea. He is a crop modeler and agricultural remote sensing researcher. His research fields include agronomic applications of crop modeling techniques, quantitative agricultural remote sensing and environmental crop ecology. He was awarded a PhD degree in Agronomy at Texas Tech University, Lubbock, Texas, The USA, with a dissertation topic of "Development of a cotton crop model that uses remote sensing data" in 2004. He received both Bachelor's and Master's degrees in agronomy at Kangwon National University, Chuncheon, South Korea in 1995 and 1998 respectively.

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BIOGENIC AMINES IN *PA* KIMCHI, A KOREAN KIMCHI MADE OF GREEN ONION

Jae Hyung Mah, Jun-Hee Lee, Jae Hoan Lee and **Young Hun Jin**
Korea University, South Korea

Kimchi is a group of Korean traditional fermented vegetables, which includes Pa (green onion) kimchi made of green onion. The green onion that is known as one of the main ingredients used for the preparation of various types of kimchi and contains anti-bacterial sulfur-compounds resulting in delay of the growth of harmful bacteria, serves as the main material of *Pa* kimchi. Lactic acid bacteria (LAB), other important components of kimchi fermentation, contribute to the bio preservation of kimchi but may produce biogenic amines (BA) during the fermentation, posing potential safety risks. This study was conducted to evaluate BA related risks by measuring BA content in *Pa* kimchi samples and assessing bacterial contribution to the BA content. Total BA content of the samples did not reach the recommended safety limit 1,000 mg/kg for food. On the contrary, relatively high levels of vasoactive (histamine and tyramine) and putrefactive (putrescine and cadaverine) amines were detected in less ripened *Pa* kimchi samples, reaching the toxic thresholds of respective BA. Meanwhile, of the 99 LAB strains isolated from *Pa* kimchi samples, 16 strains significantly produced BA in independent *in vitro* assays, 14 and two strains were identified as *L. brevis* and *L. sakei*, respectively, through 16s rRNA sequencing. Therefore, it was assumed that L. brevis could be responsible for BA formation in *Pa* kimchi. In addition, there appeared to be negative correlations between BA content (viz., vasoactive and putrefactive amines) and acidity (an indicator of kimchi ripening) of *Pa* kimchi samples. The results suggest that BA-related risks decrease as Pa kimchi ripening progresses. The relationship between the successive change of microbial communities and BA in kimchi needs to be further investigated to reduce BA formation.

Biography

Jae-Hyung Mah completed his PhD from Korea University, South Korea and Postdoctoral studies from University of Wisconsin-Madison and Washington State University, USA. He is a Professor of Food and Biotechnology at Korea University, South Korea. He published about 50 papers in reputed journals and has been serving as an Editor-In-Chief, Editorial Board Member and Referee for several peer-reviewed journals in Food Science and Technology. His researches focus on the analyses of hazardous chemicals and microorganisms in fermented foods, development of novel protective and preservative strategies such as application of genetically designed starter culture to food fermentation and mathematical model studies on inactivation kinetics of food borne pathogenic and spoilage microorganisms exposed to chemical, physical and biological intervention treatments.

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ANALYSES OF BIOGENIC AMINES IN *CHONGGAK* KIMCHI AND *KKAKDUGI*, KOREAN KIMCHI PRODUCTS MADE OF RADISH

Jae Hyung Mah, Young Hun Jin, Jae Hoan Lee and **Jun-Hee Lee**
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Kimchi is the name representing various types of Korean traditional fermented vegetables and largely consumed as a side dish and excellent source of beneficial lactic acid bacteria (LAB) in Korea. There are hundreds of different kinds of kimchi depending on raw materials, but in general cabbage or radish have been used as a major ingredient. Hence, *Chonggak* (pony-tail radish) kimchi and *Kkakdugi* (diced radish kimchi) are as popular as Baechu (Chinese cabbage) kimchi, commonly called kimchi, in Korea. Although many researchers have studied health benefits of LAB, there have been several reports in which some LAB species have strong capabilities of producing biogenic amines (BA), resulting in the formation of excessive BA in lactic fermented foods. However, there have been insufficient studies on the BA content and BA-producing LAB in kimchi, particularly radish kimchi. In this study, BA content in two types of radish kimchi were determined to estimate BA-related risks. While most radish kimchi samples contained relatively low levels of BA, some samples had excessive levels of histamine and total BA higher than toxicity limits of respective categories. It is noteworthy that, except for one *Kkakdugi* sample, putrescine content in each type of radish kimchi increased alongside acidity. To understand bacterial contribution to BA content in radish kimchi, BA production by LAB isolated from respective samples was measured. BA production by most LAB was below detection limits; however, some LAB significantly produced vasoactive amines (tyramine and β-phenylethylamine). Moreover, these amines were produced in greater quantities by LAB from over-ripened kimchi than those from either less ripened or optimally ripened kimchi. Based on 16s rRNA sequences, BA-producing LAB were all identified as *Lactobacillus brevis*. This study suggests that most kimchi products are safe for consumption; however, the use of starter culture is required to further reduce BA content in kimchi.

Biography

Jae-Hyung Mah completed his PhD from Korea University, South Korea and Postdoctoral studies from University of Wisconsin-Madison and Washington State University, USA. He is a Professor of Food and Biotechnology at Korea University, South Korea. He published about 50 papers in reputed journals and has been serving as an Editor-In-Chief, Editorial Board Member and Referee for several peer-reviewed journals in Food Science and Technology. His researches focus on the analyses of hazardous chemicals and microorganisms in fermented foods, development of novel protective and preservative strategies such as application of genetically designed starter culture to food fermentation and mathematical model studies on inactivation kinetics of food borne pathogenic and spoilage microorganisms exposed to chemical, physical and biological intervention treatments.

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FORMATION AND INHIBITION OF HETEROCYCLIC AMINES IN FRIED PORK FIBER

Tsai Hua Kao and **Han-Yin Hsiao**
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Heterocyclic amines (HAs) are a class of compounds containing unsaturated double bonds with their ring structure composed of carbon, hydrogen and nitrogen. The HAs are usually formed during high temperature processing of protein rich foods. The objective of this study is to evaluate different processing methods for reduction of HAs in fried pork fiber. A quick and simultaneous analysis method which coupled with QuEChERs and LC-MS-MS also be developed for determining 20 types of HAs in fried pork fiber. Results showed that HAs contents in fried pork fiber increased along with increasing cooking time and temperature. Moreover, fried pork fiber show high levels of harman with the amount of total HAs ranging from 103.19-661.38 ng/g and their levels decreasing in the following order: nor Harman >8-MeIQx>IQx>PhIP>Trp-P-2>Phe-P-1>IFP>MeAαC>MeIQ. However, DMIP, Glu-P-2, Iso-IQ, IQ, Glu-P-1, IQ [4, 5-b], 7, 8-DiMeIQx, 4,8-DiMeIQx, Trp-P-1 and AαC were not detected. Half proportion of soy sauce in fried pork fiber effectively reduced the amount of HAs, while reducing sugar to half and increased the formation of HAs, with reducing of both sugar and soy sauce proportion to half showing no significant effects.

Biography

Tsai-Hua Kao received her PhD in Food Science and Nutrition from Fu Jen University, Taipei, Taiwan and is now an Associate Professor in the Department of Food Science at Fu Jen University, with formal responsibilities in research and teaching. Her research efforts are in the area of Food Analysis, Food Toxicity and Functional Food Development. She teaches instrumental analysis, food processing and management and utilization of food processing by-products courses. She has published more than 35 journal articles, five book chapters and has also been an Expert Reviewer for several peer-reviewed journals.

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CHARACTERISTICS OF RED WINE FERMENTED BY *SACCHAROMYCES CEREVISIAE* MUTANT WITH ABILITY OF OVER-EXPRESSION MANNOPROTEINS

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Mannoproteins in the cell wall of *Saccharomyces cerevisiae* are composed of 5–20% protein and 80–90% mannose, and are responsible for most cell surface properties of the yeast. The objective of this study was to improve the quality of red wine using the yeast with over-expression of mannoproteins. *S. cerevisiae* mutants were generated by treating either UV radiation or ethyl methane sulfonate (EMS). Mannoproteins over expressed strains, which are resistant to killer-9 toxin produced by *Hansenula mrakii* IFO 0897, were selected. Among the mutants, an EMS mutant, *S. cerevisiae* CM8, was used to produce red wine because it showed the highest mannose/glucose ratio (3.6:1.0) in the carbohydrate composition of the cell wall. The mannoprotein content in the cell wall of *S. cerevisiae* CM8 was 386.8±0.25 mg/g, while the content in the wild type strain was 340.1±0.58 mg/g. The ethanol content of *S. cerevisiae* CM8 fermented red wine (CM-wine) was comparable to that of wild strain fermented red wine (SC-wine). CM-wine made from the Kyoho grapes (*Vitis vinifera* L. × *Vitis labracana* Bailey) harvested in summer or winter obtained higher tannins and total anthocyanins contents, but lower tartaric acid content than SC-wine. The results of sensory evaluation showed that CM-wine had higher consumer preference than SC-wine. Moreover, the astringency level of CM-wine was lower than that of SC-wine. The above mentioned results demonstrated that *S. cerevisiae* CM8 with the ability of mannoproteins over expression was a capable starter for wine brewing.

Biography

Yun-Chin Chung completed her PhD in Food Science and Technology from Oregon State University, USA and Postdoctoral studies from the University of Taiwan National Ocean University, Taiwan. She works as a distinguished Professor of Food and Nutrition Department at Providence University, Taiwan, China. She published more than 66 papers in reputed journals and has been serving as a Department Head.

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QUALITY CHARACTERIZATION OF TRADITIONAL, ITALIAN AND CONICAL PEPPER CULTIVARS

María del Carmen García García[1], Felipe Hermoso Almudena[1], Pascual Asso Fernando[1] and **Del Río Celestino Mercedes[2]**

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The province of Almeria, southeast of Spain, has more than 30,000 hectares of greenhouse dedicated to the cultivation of vegetables and one third of them are pepper crops. There are different types of pepper, being the Italian and conical elongated peppers, 9% of recent interest in the market is for its high taste quality and different ripening colors. A segment of the market is interested in this same type as traditional non-hybrid cultivars called "*cuerno de toro*". The objective of the present study was to characterize the physicochemical and nutritional profile in three cultivars of Italian pepper, three conical cultivars with three colors, red, orange and yellow and one traditional red elongated pepper cultivar. These analyses were performed from three randomly selected fruits for each of the three replications per cultivar. Plants were grown in a Mediterranean greenhouse of the IFAPA "*La Mojonera*" Research Center, Almeria using integrative production management techniques. Methodologies used are supported in the scientific literature and the results were analyzed statistically. Cultivars showed a wide variability for most of the characters studied. The yellow fruits had the highest average weight of 109.61–122.21 g. In relation to the color, different chroma is obtained, the yellow cultivars showed the highest tone value of hue >58. The pH ranged between 5.08–5.54 and the acidity is 0.18–0.26 g of citric acid/100 g of fresh weight. With significant differences between types and cultivars, all cultivars showed high sweetness standing out significantly with 8.81 ºBrix, the red conical type. Total phenolic content was similar between 10.26–12.97 mg eq. gallic acid/g f.w. The orange and conical red and orange Italian fruits showed significantly higher vitamin C content of 84.7–101.17 mg/100 g. The traditional cultivar showed the highest carotenoid content with 4.32 mg/g f.w.

Biography

María del Carmen García García is an Agricultural Technical Engineer from the University of Barcelona, Graduate in Agricultural Engineering and Master in Protected Horticulture from the University of Almería. Current lines of work are organic agriculture and diversification of horticultural crops in the Mediterranean greenhouse.

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ANALYSIS OF THE ECONOMIC IMPACT OF GOVERNMENT'S ENDOGENOUS MEASURES FOR PROMOTING LOW-FAT PORK CONSUMPTION: A KOREAN CASE STUDY

Hyun No Kim
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The implementation of government policy can have an influence on changing consumers' preference for meat consumption. This paper examines the impact of the government policy which aims to promote the consumption of low fat pork cuts because of the concerns regarding asymmetric consumption of pork cuts in South Korea. Using hedonic price methods combined with quasi experimental approaches, we estimate the subsequent impact of food policy on the price of low fat pork cuts using a time series of sales data. This study utilized an effective approach which has been widely employed for policy evaluation to produce plausible estimates of the economic values generated by the government policy. We find existence of market segmentation and different impacts of the policy between markets. While the market price for high fat pork cuts has remained stable, the price for low fat pork cuts has slightly increased since the policy has been implemented. This paper illustrates that the government's endogenous measures such as advertising, marketing campaigns and public relations associated with managing food consumption patterns can be a good strategy to maintain sustainability of the food industry.

Biography

Hyun No Kim completed his PhD in Agricultural and Resource Economics from the Department of Resource Economics and Environmental Sociology at the University of Alberta, Canada. His research areas involve environmental valuation, integrating the environment into economic analysis, economic assessment of agricultural and environmental policy, consumer choice/behavior and applied econometrics. He has published more than 20 papers in reputed journals associated with agricultural and resource economics. He is currently working as a Research Fellow in Environmental Policy Research Group at Korea Environment Institute.

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SUNFLOWER AND PALM OILS RETAIN BETA CAROTENE EXTRACTED FROM INDIGENOUS VEGETABLES

Nawiri Mildred, Muturi Samuel and **Nyambaka Hudson**
Kenyatta University, Kenya

Hidden hunger, caused by lack of micronutrients in the diet afflicts billions of people especially in developing nations with the WHO, estimating 1.4% of all deaths occuring worldwide, attributed to vitamin A deficiency (VAD). In Kenya, indigenous vegetables such as *Solanum nigrum* and *Asystasia mysorensis* are rich in beta carotene, but face challenges of being seasonal, ignored or under utilized. While oils increase bioavailability and bio accessibility of beta carotene, the retention of the carotenoid extracted from *S. nigrum* and *A. mysorensis* preserved separately in sunflower and palm oils for a period of 180 days were investigated. The peroxide and acid values of the oils were determined and the mean levels of beta carotene extracted from *A.mysorensis* are preserved in sunflower and palm oils reduced by 73.14% and 69.95%, respectively and in *S. nigrum* preserved in sunflower and palm oils reduced by 81.56% and 65.56%, respectively. In terms of retinol activity equivalent, the oils retained enough beta carotene to provide recommended daily allowance for infants and adults projecting a solution in curbing VAD. Peroxide values in sunflower and palm oils increased while acid values increased. These values indicate that oxidation of the oil matrices occurs with time but not to critical levels of 10 mEq/kg oil and 0.6 mg KOH/g, respectively. The findings indicate a significant reduction in levels of beta carotene ($p \leq 0.001$) though amounts remaining are able to meet daily requirements and thus can be promoted with a particular focus on addressing vitamin A deficiency.

Biography

Nawiri Mildred is a Analytical Chemist, Senior Lecturer, Mentor and Director of the University Industry Partnerships, Kenyatta University, Kenya. She is an Expert in Food Analysis with a passion to improve health of children and general public in developing countries facing challenges from non communicable diseases and malnutrition. She has 10 years' research experience, more than 20 publications and has attended numerous local and international conferences. She embraces networking, collaborations and is focused to seek long term solutions through shelf products of vital carotenoids from available indigenous species of fruits and vegetables. She aspires to be a Visionary Leader that embraces Entrepreneurship.

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BIOLOGICALLY ACTIVE COMPOUNDS IN POLISH CRAFT BEER

Joanna Kawa Rygielska[1], Mirosław Anioł[1], Mateusz Gulej[2], Kinga Adamenko[1] and Grzegorz Ziemian[2]

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Beer is one of the oldest and mostly consumed alcoholic beverages around the world. It is produced by means of alcoholic fermentation through yeasts that convert sugars contained in malt wort mainly into ethyl alcohol and carbon dioxide. The beer also contains hops and, optionally, some additives. It is rich in carbohydrates, amino acids, minerals, vitamins and phenolic compounds, which derive mainly from malt and hops. The basic flavonoid present in hops is xanthohumol which inhibits the growth of human cancer cells, has a high bioavailability and low toxicity. In malt, however, there are large quantities of microelements and macroelements, that perform a number of important functions in the human body. In this study the level of: xanthohumol, isoxanthohumol, 8-prenylnaringenin and micro- and macroelements in Polish craft beer, brewed in Polish craft brewery located in Lower Silesia, was tasted. The content of flavonoids was determined using liquid chromatography (HPLC), whereas the determination of Na, Ca and K content was performed by atomic emission spectrometry and Mg, Fe and Zn by atomic absorption spectrometry. The highest amount of all controlled flavonoids was determined in Black IPA beer, summary 4,26 mg/L, whereas in beers Pale Ale and AIPA the content of these compounds was on the average level of 2,4 mg/L. Several times lower number of discussed compounds was marked in Oatmeal Hoptart beer. Among the tested beers, the highest content of potassium (436,23 mg/kg), magnesium (92,30 mg/kg) and sodium (84,26 mg/kg) ions was found in AIPA beer. That beer was also rich in zinc (0,135 mg/kg), however a similar amount of this element was tested in the Oatmeal Hoptart type beer (0,133 mg/kg). The largest amount of calcium (42,46 mg/kg) and iron (0,202 mg/kg) ions was characterized by Black IPA beer.

Biography

Prof. Joanna Kawa Rygielska in the head of Department of Fermentation and Cereals Technology in Wroclaw University of Environmental and Life Sciences. She has many years of experience in research on fermentation processes and yeast cells.

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EDIBLE BIOMASS PRODUCTION BY CO-CULTURE OF *ASPERGILLUS ORYZAE* AND *CANDIDA UTILIS* USING CORN-BASED THIN STILLAGE

Witold Pietrzak, Joanna Kawa Rygielska
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Industrial bioethanol production generates huge amounts of wastewater from distillation process called stillage which is fractionated into liquid (thin stillage) and solid (condensed distillers grains) fractions. Thin stillage contains all of the non-volatile components of the grain not utilized by the yeast (oligosaccharides, lipids, protein) as well as their metabolism by-products (i.e. glycerol, organic acids) and is, in part, recycled in the process (called backset). Those could be utilized by edible filamentous fungi to produce food/feed biomass, moreover application of edible yeast strain capable of fast utilization of inhibitory compounds (lactate, glycerol) may improve removal of some compounds which may accumulate and inhibit the fermentation. In this study, industrial grade corn-based thin stillage (9% w/v dry solids) was used as medium for production of edible *Aspergillus oryzae* in co-culture with fodder yeast *Candida utilis* inoculated after initial 24 h of fungal growth. The 72-h co-culture resulted in obtaining up to 18.6 g L-1 biomass with crude protein and lipid content of 0.31 and 0.41 g g-1 respectively also containing all of the essential amino acids. Therefore, the biomass could be used as a high protein and energy, vegan foodstuff or animal feed additive. Additionally, the cultivation resulted in reduction of 33.9% of thin stillage solids, 33.4% glycerol and 12.5% lactic acid. Moreover, additional 4.5 g L-1 ethanol was produced together with high amount of amylolytic enzymes (1.67 U mL-1) which could be sent back to the process and positively contribute to its course and final production economics.

Biography

Dr. Witold Pietrzak has completed his MSc and PhD in Food Technology by Wroclaw University of Environmental and Life Sciences. He works as assistant at Department of Fermentation and Cereals Technology. He has published 12 papers in reputed journals.

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DISCOVERY OF POTENT ANTIMICROBIAL PEPTIDES AS ALTERNATIVE NATURAL FOOD PRESERVATIVES: *IN SILICO* AND *IN VITRO* APPROACHES

Ahmed E Yousef
The Ohio State University, USA

Novel and potent antimicrobial agents are urgently needed to replace currently-used food preservatives such as nitrite, benzoates and sorbates. Although existing preservatives have protected processed food against spoilage and pathogenic microorganisms for decades, presence of these chemicals on products label is perceived negatively by new generation of consumers. Additionally, researchers are increasingly detecting microbial strains that are resistant to these conventional preservatives. Many researchers have screened beneficial bacteria for natural alternatives preservatives, and several promising antimicrobial peptides have been discovered. These include paenibacillin, paenibacterin and brevibacillin which were discovered in our laboratory since 2007. Considering how tedious current screening protocols are, and that many antimicrobial producers are missed by traditional screening, there is a need to develop rapid high-throughput protocols to accomplish these tasks efficiently. Few bacterial strains are known to carry DNA codes for antimicrobial peptides, but several others have not been discovered yet. Although the capability of strains to produce antimicrobials is not widely-spread, this capability can be revealed *in silico* by searching (using appropriate software) for a number of DNA sequence patterns in whole genomes deposited in gene banks. Experienced analysts can screen further the selection resulting from these *in silico* searches. However, presence of candidate sequences needs to be complimented with *in vitro* detection of potential antimicrobials. This involves collecting potential producers from commercial culture collections (e.g., ATCC and NCTC) and research laboratories and testing these cultures for the presence of the antimicrobials predicted *in silico*. We also used a metagenomics approach successfully, in lieu of the *in silico* search just described. The technique involves designing degenerate primers, targeting DNA sequence patterns associated with different categories of antimicrobial peptides, and running PCR on metagenomics DNA extracted from food or environmental samples. The presentation will include how these approaches were used recently to detect several promising antimicrobial peptides.

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THE ASSOCIATION OF HOT RED CHILI PEPPER CONSUMPTION AND MORTALITY: A LARGE POPULATION-BASED COHORT STUDY

Mustafa Chopan
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The evidence base for the health effects of spice consumption is insufficient, with only one large population-based study and no reports from Europe or North America. Our objective was to analyze the association between consumption of hot red chili peppers and mortality, using a population-based prospective cohort from the National Health and Nutritional Examination Survey (NHANES) III, a representative sample of US noninstitutionalized adults, in which participants were surveyed from 1988 to 1994. The frequency of hot red chili pepper consumption was measured in 16,179 participants at least 18 years of age. Total and cause-specific mortality were the main outcome measures. During 273,877 person-years of follow-up (median 18.9 years), a total of 4,946 deaths were observed. Total mortality for participants who consumed hot red chili peppers was 21.6% compared to 33.6% for those who did not (absolute risk reduction of 12%; relative risk of 0.64). Adjusted for demographic, lifestyle, and clinical characteristics, the hazard ratio was 0.87 (P=0.01; 95% Confidence Interval 0.77, 0.97). Consumption of hot red chili peppers was associated with a 13% reduction in the instantaneous hazard of death. Similar, but statistically nonsignificant trends were seen for deaths from vascular disease, but not from other causes. In this large population based prospective study, the consumption of hot red chili pepper was associated with reduced mortality. Hot red chili peppers may be a beneficial component of the diet.

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DIETARY SUPPLEMENTATION WITH RICE BRAN AND NAVY BEANS FOR GUT HEALTH AND DISEASE PREVENTION ACROSS THE LIFESPAN

Elizabeth P Ryan
Colorado State University, USA

Rice bran, an agricultural byproduct of whole grain rice processing, and cooked dry beans are globally accessible, complementary, nutrient-dense functional foods that have evidence for prevention of chronic and enteric infectious diseases. Based on data from animal studies, we implemented and completed human dietary intervention trials with these foods in infants, children, healthy adults and colon cancer survivors using randomized controlled trials. The feasibility and tolerability was shown for increasing intake of rice bran and navy beans to levels that show beneficial effects on blood lipid regulation, the gut microbiome and stool metabolome. Additionally, the integration of food and nutritional metabolomics identified a number of prebiotics and phytochemicals that undergo gut microbial biotransformation to influence gut immunity. Microbiome was analyzed using 16S Illumina sequencing and the blood, urine, and stool metabolome was analyzed using UPLC-MS-MS. The effects of these foods on altered gastrointestinal functions such as nutrient malabsorption and impaired immunity that can affect normal growth and development will be shown. The metabolite profiles depict changes in gut function across different chemical classes in response to the foods, such as fatty acids, primary and secondary bile acids and branched chain amino acids. Maturity of the gut microbiota during infancy and weaning periods are influenced by dietary patterns in a different manner than what we see in children and adults. This presentation will share outcomes related to diarrheal disease and anthropometric measurements in infant cohorts as well as modulation of the microbiome and metabolome in children and adults after consuming rice bran and/or navy beans. Funding support from the Bill and Melinda Gates Foundation Grand Challenges Explorations in Global Health, the US National Institutes of Health and US National Institutes of Food and Agriculture was provided for these studies.

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DISSEMINATION AND THE FATE OF FOODBORNE PATHOGENS AND INDICATORS ON PRODUCE POST IRRIGATION WITH SURFACE WATER: AN INTERVENTION TRIAL

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Irrigation water has been recognized by the US FDA Food Safety Modernization Act (FSMA) as a major route of produce contamination at pre-harvest. There is a critical need for new and improved control strategies and to evaluate their effectiveness in reducing microbial hazards in irrigation water, as affected by irrigation method, produce commodity and weather conditions. We have conducted controlled intervention trials in cantaloupes and spinach to determine effectiveness of FSMA mitigation options based on the microbial die-off post irrigation, and to test the effectiveness of two strategies for treatment of surface water to keep generic *Escherichia coli* levels under the regulatory thresholds. The two treatments are ultra-violet (UV) radiation and a novel treatment, which takes advantage of the widespread use of sulfuric acid based fertilizers (SA-fertilizer) in produce growing. The preliminary results indicated that, compared to the no-treatment control (NO), both UV and SA treatments were effective in reducing contamination of water with (i) generic *E. coli* that naturally occurred in water used for irrigation and (ii) inoculated Rifampicin-Resistant (RifR) *E. coli*, and the microbial reduction was evident both in the tank water, just before irrigation, and in the irrigation water in the produce field, and both in cantaloupe and spinach trials.

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NIR SPECTROSCOPY AND COLOR MEASUREMENTS CAN BE USED TO DETERMINE DIFFERENT CHARACTERISTICS OF FERMENTED COCOA BEANS

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Colombia produces fine and flavor cocoa, so there is a need to identify the compounds that generated these characteristics. However, the chemical analysis in the laboratory it is expensive and time-consuming. The control and quality guarantee of the cocoa requires the rapid analysis of cocoa beans. In this study, NIRS it is used because it is a fast, simple, nondestructive analytical tool that does not involve the use of chemicals or the elaborate preparation of samples and to allows the identification of these compounds. This study shows the differences between the initial and the final spectra of fermentation, which are related to characteristic frequencies of fat, polysaccharides, proteins and aromatic compounds with bands that appear in 2338, 2314, 2078, 2056 and 1930 nm respectively. Additional to this, the degree of fermentation of cocoa bean is an important characteristic that defines your quality. Then the measurements of color are a good alternative for this determination. In this work, we obtained the red, green and blue values of bean surface measurements obtained from a digital camera. The brown color indicated a complete fermentation, a partial fermentation show brown and violet color. In this case, cocoa beans are brown with a small contribution of violet. These analytical techniques are useful to manufacturers and producers for onsite quality control and quantification of the fermentation degree of cocoa beans. The results of the present work demonstrate that these techniques can be adopted in-situ procedure to identify different characteristics of cocoa.

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IDENTIFICATION OF FERMENTATION FACTORS THAT DETERMINE THE QUALITY OF CACAO

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In Colombia, cocoa cultivation is a good alternative for the high and growing demand for cocoa in the world, especially for fine and flavor cocoa. Colombia's production zone has a privileged geographic position for cultivating this type of cocoa. However, many factors influence its quality. One of these factors is the fermentation process, as is the stage where the formation of flavor precursors takes place. Then the quality of fine and flavor cocoa could be lost if the fermentation is not carried out under certain conditions. This project looks at getting a better understanding of how the fermentation process is carried out in three different places in Colombia and how these practices could affect the cocoa quality. We controlled the fermentation process each 24 hours, analyzing the change in different variables such as pH, total acidity, sugar content, total polyphenols, theobromine, caffeine, reducing sugars, proteins and amino acids. Moreover, we analyzed the aromatic profile, and the sensorial analysis of the cocoa produced. Results showed significant differences in quality of the cocoa, but neither of them released distinctive aromatic notes that allow classifying such as fine and flavor cocoa. However, we have identified two factors that are mainly responsible for this behavior, the temperature, and the pH, which never reaches the value required according to literature, for the optimal activity of endogenous enzymes involved in the degradation of bean proteins and the generation of various flavor precursors.

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APPLICATION OF GREENHOUSES FOR SUSTAINABLE FOOD PRODUCTION

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A greenhouse is essentially an enclosed structure, which traps the short wavelength solar radiation and stores the long wavelength thermal radiation to create a favourable microclimate for higher productivity. The sun's radiation incident on the greenhouse has two parts: direct radiation and an associated diffuse sky radiation. The diffuse part is not focused by the lenses and goes right through Frensel lenses onto the surface of the absorbers. This energy is absorbed and transformed into heat, which is then transported via the liquid medium in copper pipes to the water (heat) storage tanks or, if used, open fish tanks. In this way, an optimal temperature for both plant cultivation and fish production can be maintained. Stable plant growth conditions are light, temperature and air humidity. Light for the photosynthesis of plants comes from the diffuse radiation, which is without substantial fluctuations and variation throughout most of the day. The air temperature inside the greenhouse is one of the factors that have an influence on the precocity of production. The selective collector acts in a more perceptible way on extreme air temperatures inside the greenhouse. Hence, the system makes it possible to avoid the excessive deviation of the temperature inside the greenhouse and provides a favourable microclimate for the precocity of the culture. Sediment and some associated water from the sediment traps are used as organic fertiliser for the plant cultivation. The present trend in greenhouse cultivation is to extend the crop production season in order to maximise use of the equipment and increase annual productivity and profitability. However, in many Mediterranean greenhouses, such practices are limited because the improper cooling methods (mainly natural or forced ventilation) used do not provide the desired micro-climatic condition during the summer of a composite climate. Also, some of these greenhouses have been built where the meteorological conditions require some heating during the winter, particularly at night. The worst scenario is during the winter months when relatively large difference in temperature between day and night occurs. However, overheating of the greenhouse during the day is common, even in winter, requiring ventilation of the structure. Hence, several techniques have been proposed for the storage of the solar energy received by the greenhouse during the day and its use to heat the structure at night.

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ANALYTICAL STRATEGIES TO STUDY THE MIGRATION OF SELECTED CHEMICAL CONTAMINANTS INTO DRY FOODSTUFFS

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Several alerts for food contamination caused by photo-initiators, which are added to UVcurable inks to cure the ink onto the substrate, occur in the past. In 2005, Italian authorities withdrew thirty million liters of infant milk from the market due to the presence of the photoinitiator 2-Isopropylthioxanthone. Since then, other photo-initiators have also been found in foodstuffs. Evaluation of the migration of photo-initiators in foodstuffs is challenging due to the complexity of the matrix and the wide variety of foodstuffs that need to be analysed. Therefore, migration studies can be carried out using food simulants. The official simulant for dry foodstuffs is poly(2,6-diphenylphenylene oxide), also known under its commercial name Tenax®. In this contribution, the performance of Tenax® as a simulant for dry foodstuffs for the migration of photoinitiators from cardboard packaging was evaluated. Therefore, the simulation according to EU Regulation 10/2011 was compared to the real migration conditions for dry foodstuffs. Important migration features such as migration temperature, migration time, Tenax® pore size were studied, supporting the suitability of Tenax® as a simulant for the migration of photo-initiators towards cardboard from a consumer safety point of view. Unfortunately, the use of the Tenax® powder as a simulant is inconvenient since the powder has to be entirely collected in a recipient prior to contaminant extraction. Therefore, Tenax® films were synthesized that can be easily applied to the cardboard surface. The performance of the films was compared to the performance of the Tenax® powder for a selection of model contaminants. It was concluded that the performance of Tenax® as a simulant for the migration of photoinitiators from cardboard towards dry foodstuffs was illustrated. However, the use of easy applicable Tenax® films can open new perspectives in the domain of testing food contact materials intended for contact with dry foodstuffs for compliance.

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A GLOBAL VIEW OF NATURAL ANTIOXIDANTS AND CHARACTERIZATION

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In recent years antioxidants of natural origin have experienced a boom, mainly due to the rejection experienced by synthetics and some experiments that question its safety. Polyphenols are the main group of these antioxidants. They have radical scavenging activity, which can be measured against various radicals (such as DPPH, AAPH, ABTS or hydroxyl, among others) as well as the power to reduce Fe (III), with simple methodologies that indicate the real possibility of delaying oxidation. However, this characterization is not enough. Therefore, we must work with food models that contain lipids (in general), as well as real foods (meat, fish ...) in which deterioration by oxidation may become the most important. In these model systems (or real) the measurements that must be made must work both primary and secondary oxidation, analysing the evolution over time at different temperatures. A detailed summary of mechanisms and methodologies will be presented.

On the other hand, it should be noted that a protection through active films, which incorporate natural antioxidants, can bring greater benefits to the food industry, since the release over time delays oxidation without the need to incorporate large quantities. These films can be edible or, at least, biodegradable, respectful with the environment. There are several ways to make active films (by organic synthesis, through biotechnology, by polymerization ...), as well as possibilities to characterize them (physical, thermal characterization, permeability, transparency, durability, biodegradability ...) and to measure both their diffusivity and their antioxidant effect. A summary of these methodologies will also be made.

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BIOTECHNOLOGY FOR INCREASED UTILIZATION OF MARINE REST RAW MATERIALS

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Significant amounts of rest raw materials are generated throughout the value chain of seafood processing. Although effort has been made on development of technology to utilize these raw materials, there are still huge amount that goes to waste. These include fractions with potential as e.g. food, feed and pharmaceuticals and are generally rich in functional proteins, lipids and carbohydrates. As an example; if whitefish fillet is the main product, as much as 50% of the biomass in the catch is regarded as rest raw materials or waste. Also filleting of fatty species such as pelagic fish and salmonoids generate valuable cut-offs and viscera. So, while the marine fatty acids are in short supply worldwide, significant lipid-rich fractions goes to waste throughout the value chain when producing seafood. Upgrading this biomass for the growing world population and aquaculture is a key area in the circular economy and optimal utilization of the global marine resources. Several factors play a role in the circular economy and gaining the total picture of reducing food waste. I will primarily focus my talk on the biotechnology aspects of utilization and demonstrate how these complex raw materials changes fast due to its high susceptibility to biochemical degradations. Biotechnological processes might trigger the potential of higher utilization of the biomass. I will visualize technology from raw materials into bioactive components such as protein and peptide component, lipid and lipid components and also carbohydrate rich components for example from utilization of macro algae. Furthermore, I will include the sensory aspects of the rest raw materials as marine ingredients, documented health effects and demonstrate analytical techniques to understand the value of the products.

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USE OF RHIZOSFERIC MICROORGANISMS TO IMPROVE PLANT RESPONSE TO DROUGHT STRESS AND PRODUCE QUALITY

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Intensive agriculture and climate change have induced worldwide a progressive soil depletion and biodiversity erosion, leading to rising crops needs for fertilization and plant protection, accompanied by a gradual loss of effectiveness of chemical fertilizers and phytosanitary products. The resilience of plant/soil systems to abiotic stresses can be strongly dependent from soil biologic fertility and biodiversity. Soil microorganisms can modify the physiological plant response to biotic and abiotic stresses, and several microbial strains have already been selected and made commercially available as biofertilizers. Plants can be supported by soil microorganisms to tolerate drought by several direct or indirect mechanisms. Drought stress drastically reduces plant growth and crop yield, mainly by reducing the plant photosynthetic activity due to stomatal closure or by structural and functional changes in the photosynthetic apparatus. The physiological behavior of plants in response to drought can be significantly different when they are inoculated with rhizospheric selected microbial strains or consortia; in particular, gas exchange parameters are affected, and an improved stomatal conductance allows to maintain a good photosynthetic activity even under low water availability. Produce yield and quality can be strongly affected, relying on microorganisms and plant species. Therefore, a proper soil management, respecting the micro biotic components and making use of selected microorganisms as inoculants, can both support agricultural activities in drought seasons and optimize the use of the water source.

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INFLUENCE OF MYCORRHIZAL FUNGI AND RHIZOBACTERIAL CONSORTIUM INOCULATION ON QUALITY OF WATER-STRESSED HOT PEPPER FRUITS

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The quality of hot pepper fruits as influenced both by water stress and endomycorrhizal microorganism's inoculation was investigated. To this aim, two different hot pepper genotypes (Cayenne Long Slim and Takanotsume) were grown in pots in two different kinds of green houses, a conditioned glass green house and an unconditioned plastic covered one. The control was represented by uncovered plants. In this trial, some of these were treated with a mixed inoculum, composed by arbuscular mycorrhizal fungi and rhizobacteria. Moreover, treated and untreated these were submitted to two different water supply levels, a normal supply and a limited one. The fruits from different theses were analyzed for their phytochemicals content, particularly for their capsacinoids, carotenoids, polyphenolic compounds and ascorbic acid contents and for their antioxidant capacity, measured by the DPPH *in vitro* test. An influence of genotype and inoculation on the water-stress response of the plants, in terms of phytochemicals biosynthesis, was noticed.

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EFFECTS OF SUPERFINE GRINDING ON PHYSICAL AND CHEMICAL PROPERTIES OF PACIFIC OYSTER (*CRASSOSTREA GIGAS*) PROTEIN

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The oyster protein was ball-milling treated in this work in order to provide a better solubility. The effects of ball-milling on the solubility of oyster protein were firstly investigated and the mechanism of the effects were preliminarily revealed by the changes of particle size, conformation structure and the protein surface hydrophobicity. It was observed that the solubility was increased firstly from 17.55%±0.68% to 28.17%±0.66% followed by a significant decrease resulting in a point of inflection at ball-milling treatment for 8 min. The increase of solubility of oyster protein ball-milled within 8 min mainly attributed to the decrease of the particle size of oyster protein. While the decrease of oyster protein ball-milled for more than 12 min was the result of combined effects of re-enlargement of the particle size, the changes in higher molecular structure and the increase of the protein surface hydrophobicity. With a better solubility of the oyster protein ball-milled within 8 min, the digestibility increased significantly up to 65.89% compared with the control group (54.58%). A further increase of the digestibility from 54.89% to 82.39% was observed when the oyster protein was ball-milled for more than 12 min, mainly attributed to the denaturation of the oyster protein. These results provided theoretical basis for the application of ball-milling treatment in the utilization of oyster protein in the food industry.

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ISOLATION AND CHARACTERIZATION OF LACTOFERRIN PEPTIDES WITH STIMULATORY EFFECT ON OSTEOBLAST PROLIFERATION

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Lactoferrin is reported to be a potential food protein with osteogenic activity. However, the activity of lactoferrin peptides is questionable. In the present study, we isolated and characterized peptides from lactoferrin with stimulatory effect on osteoblast proliferation. Peptides from the lactoferrin pepsin hydrolysate were purified using cation-exchange and gel-filtration chromatography. Effects of different hydrolysates and peptides on the proliferation of osteoblast MC3T3-E1 cells were compared by MTT assay. Results showed that fraction P5-a from Superdex Peptide 10/300 GL gel chromatography showed better activity. Tricine-sodium dodecyl sulfate polyacrylamide gel electrophoresis and high-performance liquid chromatography coupled to electrospray ionization tandem mass spectrometry confirmed that two peptides components of P5-a corresponded to fractions of 20–78 and 191–277 amino acids in Bos taurus lactoferrin molecule (GI: 221706349). These results will provide some theoretical and practical data for the preparation and application of osteogenic peptides in functional food industry.

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COMPARATIVE STUDY OF STARCHES FROM FIVE DIFFERENT SOURCES ON THE RHEOLOGICAL PROPERTIES OF GLUTEN AND GLUTEN-FREE MODEL DOUGH'S

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Starch, as a major component of dough's, can significant affect the rheological properties. Understanding effects of different botanical starches on the rheological properties of dough can help us to enhance the technological properties of dough's and the products' quality. In this study, starch-gluten and starch-hydroxy propyl methyl cellulose (HPMC) model dough's were prepared, and effects of wheat starch (WS), corn starch (CS), tapioca starch (TS), sweet potato starch (SS) and potato starch (PS) on the rheological properties and moisture distribution of dough's were investigated. For gluten doughy, WS showed greatest linear viscoelasticity region (0.190%), lowest frequency dependence (0.128) and greatest recovery capacity (67.39%), while PS showed smallest linear viscoelasticity region (0.126%), greatest frequency dependence (0.195) and lowest recovery capacity (54.97%). Furthermore, WS–gluten dough showed highest disulfide bonds content (3.47μmol/g), lowest intensity of extracted glutenin bands and highest bond water content (23.20%). This suggested that WS–gluten dough formed stronger starch–gluten interactions compared with the other four starch–gluten dough's. For gluten-free dough's, WS showed greatest linear viscoelasticity region (0.104%), frequency dependence (0.236) and recovery capacity (31.79%), while PS showed lowest viscoelasticity region (0.077%), frequency dependence (0.160) and recovery capacity (19.33%). Furthermore, PS-HPMC dough showed higher free water content (85.05%) than the other four starch-HPMC dough's. This suggested that more water distributed between hydration sites of HPMC and PS surface, leading to more hydrogen bonds and the formation of stable PS-HPMC network. In conclusion, the rheological properties of model dough's are largely due to the variation in structural and physicochemical properties of different starches, and the varying interactions between different starches and gluten/HPMC.

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INFLUENCE OF UNADSORBED EMULSIFIERS ON THE RHEOLOGICAL PROPERTIES AND STRUCTURE OF HETEROAGGREGATE OF WHEY PROTEIN ISOLATE (WPI) COATED DROPLETS AND FLAXSEED GUM (FG) COATED DROPLETS

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Recent studies have shown that controlled heteroaggregation of oppositely charged lipid droplets can be used to improve the rheological properties of emulsion and create desirable functional properties in foods. The effect of unadsorbed emulsifier on the microstructure and rheological properties of heteroaggregate of emulsion is not clear. Therefore, the influence of unadsorbed emulsifiers (whey protein isolate-WPI & Flaxseed gum-FG) on the microstructure and rheological properties of heteroaggregate of 40% WPI-coated droplets and 60% FG-coated droplets was studied. WPI-stabilized emulsions and FG-stabilized emulsions were centrifuged to separate the aqueous phase from the oil droplets to prepare the washed emulsions, separately. Emulsions containing mixtures of droplets with washed and unwashed WPI-emulsion and FG-emulsion were prepared, respectively. Droplet size, zeta-potential, Transmission-physical stability, rheological behavior, and Cryo-SEM microstructure of the heteroaggregates were measured as a function of unwashed and washed WPI & FG emulsion. It was found that the presence of unadsorbed WPI in the aqueous phase of mixed emulsion adsorbed onto the FG-coated droplets, meanwhile, the unadsorbed FG could bind WPI-droplet and FG-droplet-WPI together forming a special three-dimensional network. Rheological properties indicated that free WPI and FG played dominated roles in the heteroaggregation of mixed emulsions. The shearing viscosity of the heteroaggregates formed by washed WPI-droplets and FG-droplets was significantly decreased compared with the unwashed mixed emulsion. It indicated that unadsorbed WPI and FG dominated the physical property through a specific network structure. This study proved the effect of the continuous phase on the rheological properties of heteroaggregates and provided theoretical basis for the development of reduced-fat food.

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DISAGGREGATION AND RE-FORMATION OF FIBRILS FROM SOY PROTEIN ISOLATE: EFFECTS OF PH

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Soy protein isolate (SPI) is an important source for preparing fibrillar protein aggregates, which could be used in foods to modify viscosity, flow behavior, and so on. Food processing often involves pH adjustment and heat treatment, which would affect the structure of fibrils, thus damaging their functional properties. In this study, the structural changes of SPI fibrils with increasing pH were monitored, and the method to improve the stability of SPI fibrils was explored. In addition, the thermal aggregation behaviors of the disaggregated SPI fibrils at different pH were investigated. Thioflavin T fluorescence and circular dichroism spectrum were used to characterize the content of cross β-sheet in protein. The morphologies of SPI aggregates were observed by TEM. The results showed that as the pH increased from 2 to higher values, the flocculation appeared in SPI fibrils solution and clusters of fibrils were observed (pH 3-6). Then the fibrils started to disaggregate and finally disappeared (pH 7-10). The cross β-sheet content of SPI fibrils started to decrease at pH higher than 6, and showed huge losses at pH higher than 8. The addition of cationic polymer could help stabilize SPI fibrils under pH ranging from 3 to 7. When the disaggregated SPI fibrils were heated, the peptides from the original fibrils would generate small amorphous particles (pH 7-10), large irregular agglomerates (pH 6), short and curved worm-like aggregates (pH 3-5), and new fibrils (pH 2), respectively. Both the worm-like aggregates and new fibrils had a lot of cross β-sheet structure. This study would deepen our understanding of self-assembly mechanisms for SPI and facilitate scientific design of protein fibril-based food ingredients.

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ANALYSIS ON THE BITTERNESS AND ASTRINGENCY OF SOYMILK PROCESSED FROM DIFFERENT SOYBEAN CULTIVARS

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The soybean products especially soymilk is getting more and more popular globally nowadays. However, most consumers may not accept the undesirable taste of soymilk described as bitterness and astringency. The influences on the soymilk taste of soyasaponins and other soybean constituents in soybean were investigated in this research by analyzing the relationships between their contents and sensory evaluation. The soymilk samples processed from 24 soybean cultivars were clustered into three groups depending on the bitterness and astringency sensory evaluation scores of panelists, including 6 at high level (8.83 bitterness and 9.12 astringency on average), 13 at middle level(7.15, 9.03) and 5 at low level(7.11, 6.81). The correlations analysis indicated that the bitterness showed significant positive correlations with the content of soysaponin, protein, phosphorus and potassium, negatively correlated with the content of calcium. The astringency had perfect positive correlations with the content of saponin, protein, oil and negative correlations with calcium and sodium. The total variation of soybean compositions was explained 79.70% by first three components in the principal component analysis. Samples in the space map of components scores coordinating PC1 and PC2 assembled like the clusters in principle. The loading plot showed the most important variables were the content of saponin, protein, phosphorus, potassium and sodium. The multiple linear regression equations of bitterness and astringency depending on the constituents highly correlated presented the R respectively of 0.786 and 0.878. It would help to evaluate and select specific soybean cultivars for less bitter and astringent soymilk or to improve the taste of soymilk by adjusting the compositions of raw materials.

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