FOOD (incl. Dairy, Fishery, Poultry and other Plant and Animal products)

NPARR 3(2), 2012-0148, Extrusion-enzyme liquefaction as a method for producing sorghum protein concentrates

A novel method was developed for concentrating proteins from sorghum flour utilizing a combination of extrusion and α-amylase treatment for starch liquefaction. A central composite design was used to optimize in-barrel moisture content (MC), enzyme concentration during extrusion (E1) and post-extrusion enzyme concentration (E2) in order to produce sorghum protein concentrates with high protein content (PC) and in vitro protein digestibility (D). Extrusion-enzyme liquefaction yielded concentrates with higher protein yield (82 db%) and digestibility (66%) than batch liquefaction alone because extrusion promoted starch and protein degradation. The optimum conditions for developing a sorghum protein concentrate with both high yield and digestibility were 32% MC, no E1, and 2.5% E2. The sorghum protein concentrate developed in this study can augment the nutritional value of gluten-free foods for individuals suffering from celiac disease and other forms of gluten and wheat intolerance [Normell Jhoe de Mesa-Stonestreet, Sajid Alavi and Jeff Gwirtz (Department of Grain Science and Industry, Kansas State University, Manhattan, KS 66506, United States), Journal of Food Engineering, 2012, 108(2), 365-375]

NPARR 3(2), 2012-0149, Quality changes in sea urchin (Strongylocentrotus nudus) during storage in artificial seawater saturated with oxygen, nitrogen and air

Sea urchin gonads are highly valued seafood that degenerates rapidly during the storage period. To study the influence of dissolved oxygen concentration on quality changes of sea urchin (Strongylocentrotus nudus) gonads, they were stored in artificial seawater saturated with oxygen, nitrogen or air at 5 ± 1°C for 12 days. The sensory acceptability limit was 11–12, 6–7 and 7–8 days for gonads with oxygen, nitrogen or air packaging, respectively. Total volatile basic nitrogen (TVB-N) values reached 22.60 ± 1.32, 32.37 ± 1.37 and 24.91 ± 1.54 mg 100 g⁻¹ for gonads with oxygen, nitrogen or air packaging at the points of near to, exceeding and reaching the limit of sensory acceptability, indicating that TVB-N values of about 25 mg 100 g⁻¹ should be regarded as the limit of acceptability for sea urchin gonads. Relative ATP content values were 56.55%, 17.36% and 18.75% for gonads with oxygen, nitrogen or air packaging, respectively, on day 2. K-values were 19.37%, 25.05% and 29.02% for gonads with oxygen, nitrogen or air packaging, respectively, on day 2. Both pH and aerobic plate count values showed no significant difference (P > 0.05) for gonads with the three treatments. Gonads with oxygen packaging had lower sensory demerit point (P < 0.05) and TVB-N values (P < 0.05), and higher relative ATP content (P < 0.01) and K-values (P < 0.05), than that with nitrogen or air packaging, with an extended shelf life of 4-5 days during storage in artificial seawater at 5 ± 1°C [Chao Wang, Changhu Xue, Yong Xue*, Zhaojie Li, Yingchun Lv and Hao Zhang (College of Food Science and Engineering, Ocean University of China, No. 5 Yu Shan Road, Qingdao, Shandong Province, 266003, China.), Journal of the Science of Food and Agriculture, 2012, 92(1), 191-196].

NPARR 3(2), 2012-0150, Optimisation of chocolate formulation using dehydrated peanut–cowpea milk to replace dairy milk

The rheological properties of chocolate, based upon its acceptability by consumers, are determined largely by the ingredients and their proportions used in the formulations. Milk chocolates are very popular because milk provides flavour and smooth texture to the product. This study aimed to determine the optimal ingredient formulation for vegetable milk
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chocolate using peanut–cowpea milk as a substitute for dairy milk. The study followed a four-component constrained mixture design, with cocoa liquor, vegetable milk, cocoa butter and sugar as the components. Lecithin and vanillin were added at a constant amount to all formulations. Critical attributes of the chocolates were evaluated using descriptive sensory tests and instrumental techniques. Regression models were fitted to the data, and the optimum ingredient formulation for acceptable vegetable milk chocolate was determined. The vegetable milk had significant ($P = 0.05$) influence on flavour, mouth feel, hardness and after taste of chocolates. The optimum ingredient formulation for acceptable vegetable milk chocolates was determined to be cocoa liquor (18.00%), sugar (30.75%), peanut–cowpea milk (28.93%), and cocoa butter (22.32%). The results demonstrate that it is feasible to use vegetable source milk for chocolate. The findings also provide clues for scale-up criteria for large-scale production of vegetable milk chocolate [Herta Aidoo, Esther Sakyi-Dawson, Lawrence Abbey, Kwaku Tano-Debrah and Firibu Kwesi Saalia* (Department of Nutrition and Food Science, University of Ghana, Legon, Accra, Ghana), Journal of the Science of Food and Agriculture, 2012, 92 (2), 224-231].

NPARR 3(2), 2012-0152, Relating raw rice colour and composition to cooked rice colour

The whiter the rice, the more it is preferred by consumers and the more value it has in the market place. The first objective of this study was to determine the interrelationships of raw colour, cooked colour, amylose content and protein content in rice. The second objective was to assess whether or not the colour of cooked rice can be predicted from raw rice colour in conjunction with amylose and protein contents. Protein and amylose contents were not significantly correlated with the colour measurements for raw rice. Protein and amylose showed moderate, significant associations with $L^*$ and $a^*$ and $a^*$, $b^*$ and $C^*$ respectively for cooked rice. Only the colour variable $a^*$ of cooked rice could be predicted using protein, amylose and raw rice colour with high enough precision to be useful, and this was only for modelling using samples cooked in the same manner (rice cooker). Cooking method (rice cooker versus excess water) affected the colour of cooked rice. Being able to predict $a^*$ in cooked rice is likely of limited value. Only the model that used samples where postharvest handling conditions were controlled (US-grown rice) was able to predict $C^*$, a more useful measure, and then with only moderate ability. $L^*$, a measure of brightness/whiteness, was not predicted well by any of the models [Karen L Bett-Garber*, Elaine T Champagne, Jessica L Thomson and Jeanne Lea (USDA ARS Southern Regional Research Center, PO Box 19687, New Orleans, LA 70179, USA), Journal of the Science of Food and Agriculture, 2012, 92 (2), 283-291].

NPARR 3(2), 2012-0151, Egg yolk fatty acid profile in relation to dietary fatty acid concentrations

The health benefits of n-3 fatty acids have led to much research on manipulating the fatty acid composition of animal-derived foods. In this study, two experiments were conducted to investigate the interaction of dietary fatty acids on egg yolk fatty acid concentrations. In experiment I, 32 dietary treatments with three replicates of three birds each were fed for 35 days. Diets were prepared by mixing one type of fish oil with four vegetable oils in different proportions. In experiment II, three different types and two levels of fish oil in combination with two vegetable oils were tested under the same conditions as in experiment I. In experiment I the results showed that the egg yolk saturated (SFA) and monounsaturated (MUFA) fatty acid concentration was determined by the dietary SFA, MUFA and 18:2n-6 content. The egg 18:2n-6 concentration was mainly explained by the dietary inclusion of 18:2n-6 and negatively by the dietary MUFA content. The egg C18:3n-3,
C20:5n-3 and C22:6n-3 concentration is almost exclusively determined by their direct supply from the diet. The egg 20:4n-6 concentration was inversely proportional to the long-chain n-3 polyunsaturated fatty acid content of the diet. The results of experiment II showed that the egg yolk C20:5n-3 and C22:6n-3 concentration was determined by both the level of dietary fish oil (1 or 2%) and the C20:5n-3/C22:6n-3 ratio in the fish oil. The results of this study demonstrated that the direct dietary supply of fatty acids is the most important factor determining the egg yolk fatty acid composition, in particular for the n-3 fatty acids. The interaction effect from other dietary fatty acids was in general small [Reza Poureslami*, Katleen Raes, Gerard Huyghebaert Amy B Batal and Stefaan De Smet (Department of Poultry Science, University of Georgia, Athens, GA 30602, USA), Journal of the Science of Food and Agriculture, 2012, 92, (2), 366-372].

NPARR 3(2), 2012-0153, The impact of germination on the characteristics of brown rice flour and starch

In recent years, germinated brown rice as a functional food has received great attention with its improved sensory and nutritional properties. Particularly of interest are the high levels of γ-amino butyric acid (GABA) which can be obtained during germination. However, more studies are needed to fully understand the effect of germination on the physicochemical properties of brown rice. Germination altered the chemical composition of brown rice, resulting in an increase in reducing sugar and ash content, and a reduction in amylose. Solubility, paste viscosity, transition temperatures (T<sub>o</sub>, T<sub>p</sub> and T<sub>c</sub>) and percentage of retrogradation (%Retrogradation) were decreased, while swelling power and turbidity were significantly increased. Scanning electron micrographs indicated that starch granules from germinated brown rice became smaller and less homogeneous. Moreover, germination shortened the chain length of amylpectin and amylose molecules. This investigation provides information on changes in the characteristics of rice flour and rice starch during germination, leading to a better understanding on the chemistry of brown rice germination [Jie Xu, Hui Zhang*, Xiaona Guo and Haifeng Qian (School of Food Science and Technology, Jiangnan University, 1800 Lihu Avenue Wuxi 214122, Jiangsu Province, P.R. China), Journal of the Science of Food and Agriculture, 2012, 92(2), 380-387].

NPARR 3(2), 2012-0154, Dark chocolate acceptability: influence of cocoa origin and processing conditions

Chocolate properties can vary depending on cocoa origin, composition and manufacturing procedure, which affect consumer acceptability. The aim of this work was to study the effect of two cocoa origins (Ghana and Ecuador) and two processing conditions (roasting time and conching time) on dark chocolate acceptability. Overall acceptability and acceptability for different attributes (colour, flavour, odour and texture) were evaluated by 95 consumers. Differences in acceptability among dark chocolates were mainly related to differences in flavour acceptability. The use of a long roasting time lowered chocolate acceptability in Ghanaian samples while it had no effect on acceptability of Ecuadorian chocolates. This response was observed for most consumers (two subgroups with different frequency consumption of dark chocolate). However, for a third group of consumers identified as distinguishers, the most acceptable dark chocolate samples were those produced with specific combinations of roasting time and conching time for each of the cocoa geographical origin considered. To produce dark chocolates from a single origin it is important to know the target market preferences and to select the appropriate roasting and conching conditions [Miriam Torres-Moreno*, Amparo Tarrega, Elvira Costell and Consol Blanch (Food Science Research Group, Universitat de Vic, 08500 Vic,
Cardiovascular disease has had an unquestioned status of the number one cause of death in the US since 1921. Omega-3 polyunsaturated fatty acids (ω-3 PUFAs) have cardio-protective benefits. However, egg is typically a poor source of ω-3 PUFAs and, in general, the American diet is low in these cardio-protective fatty acids. Novel, nutritionally enhanced egg products were developed by substituting yolk with ω-3 PUFA-rich flaxseed, menhaden, algae, or krill oil. Experimental egg products matched composition of hen egg (whole egg). The experimental egg products, mixed whole egg, and a liquid egg product (Egg Beaters™) were microwave-cooked and compared. Although fat, protein, and moisture contents of experimental egg products matched (P > 0.05) mixed whole egg, experimental egg products had more (P < 0.05) ω-3 PUFAs, lower (P < 0.05) ω-6/ω-3 ratio, and depending on oil added, a higher (P < 0.05) unsaturated/saturated fatty acids ratio compared to mixed whole egg. Triglycerides were the main lipid class in all experimental egg products except those developed with krill oil, which had even more phospholipids than mixed whole egg. Analysis of thiobarbituric acid reactive substances showed that lipid oxidation of experimental egg products was lower (P < 0.05) or similar (P > 0.05) to mixed whole egg, except for experimental egg products with krill oil. However, peroxide value showed that all egg samples had minimal oxidation. Experimental egg products developed with menhaden or flaxseed oil had the highest (P < 0.05) concentration of the antioxidant, ethyoxquin compared to all other egg samples. However, experimental egg products with krill oil likely contained a natural antioxidant, astaxanthin. This study demonstrated an alternative approach to developing novel, nutraceutical egg products. Instead of dietary modification of chicken feed, yolk substitution with ω-3 PUFAs oils resulted in enhancement of ω-3 PUFAs beyond levels possible to achieve by modifying chicken feed [Nissan M Kassis, Joseph C Gigliotti, Sarah K Beamer, Janet C Tou and Jacek Jaczynski*(West Virginia University, Division of Animal and Nutritional Sciences, P.O. Box 6108, Morgantown, WV 26506-6108, USA), Journal of the Science of Food and Agriculture, 2012, 92(1), 66-73].