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

NPARR 2(1), 2011-166, Wheat porridge with soy protein isolate and skimmed milk powder: Rheological, pasting and sensory characteristics

Porridges made from raw and roasted wheat grits (dalia) with added soy protein isolate (SPI) and skimmed milk powder (SMP) were investigated by employing rheological, pasting and sensory tests in order to develop nutritious products. All porridge samples, irrespective of the presence of SPI/SMP and the application of roasting process, exhibited shear-thinning behaviour, fitted well with Cross equation ($r = 0.972$, $p < 0.01$) compared to power law and Casson models. The power indices for porridges prepared from raw grits were higher (0.643–0.764) compared to roasted samples (0.582–0.659). Pasting characteristics like peak viscosity, hot paste viscosity, cold paste viscosity, break down viscosity and total set back viscosity decreased due to incorporation of SPI/SMP. Roasted wheat grits exhibited increased pasting temperature but decreased other pasting characteristics. Pasting temperature increased from 64.4 to a maximum of 74.2 °C due to incorporation of SPI/SMP up to 10%. Porridges made from raw grits along with SPI/SMP had excellent sensory characteristics although roasted grit samples were thinner in consistency and had a better flavour [R. Sai Manohar*, G.R. Urmila Devi, Suvendu Bhattacharya and G. Venkateswara Rao, (Flour Milling, Baking and Confectionery Technology Department, Central Food Technological Research Institute (Council of Scientific and Industrial Research), Mysore 570 020, India), *Journal of Food Engineering*, 2011, 103(1), 1-8].

NPARR 2(1), 2011-167, Levels of nutritional constituents and antinutritional factors in black gram (*Vigna mungo* L. Hepper)

A study was conducted on nutritional constituents (total sugars, total proteins, total lipids and starch content) and antinutritional factors such as phenolic compounds, tannins, saponins, phytic acid, trypsin inhibitors and enzymes related to them such as acid- and alkaline phosphatases, $\alpha$-galactosidase in eleven recommended cultivars and twenty one advance breeding lines of black gram (*Vigna mungo* L. Hepper) with an aim to identify genotypes containing high nutritional quality and low antinutritional content. The average content of starch, total soluble sugars, proteins and lipids was around 43.5, 4.84, 22.0 and 1.1%, respectively. Seven genotypes had higher levels of bound fructose contributed by sucrose and raffinose series oligosaccharides. A significant positive correlation was observed among total phenols, $\alpha$-dihydroxy phenols and flavonols; and among trypsin inhibitors and saponins. The content of phytic acid and activity of trypsin inhibitors showed significant variation among these genotypes. However, not much variation was observed in the content of tannins and saponins. Activities of $\alpha$-galactosidase, acid- and alkaline phosphatase were found to be related to the content of bound fructose of raffinose series oligosaccharides and phytic acid respectively. Genotypes having higher activity of these enzymes showed lower content of these antinutritional factors. The results showed that the observed diversity in developed cultivars and advance breeding lines could be further used by plant breeders [Yadhu Suneja, Satvir Kaur, Anil K Gupta and Narinder Kaur* (Department of Biochemistry, Punjab Agricultural University, Ludhiana-141004, India), *Food Research International*, 2011, 44(2), 621-628].

NPARR 2(1), 2011-168, A salt substitute with low sodium content from plant aqueous extracts

The perception of the salty taste, obtained in humans by using sodium chloride (NaCl), is one of the most important attributes of the human sensory system. However, extra intake of sodium present in salt might lead to conditions such as hypertension. To develop a salt substitute with low sodium content, 13 plants were extracted with water, and their sensory perception was analyzed. After the sensory evaluation, 3 plant aqueous extracts (PAEs), representing salty and umami tastes, were selected using principal component analysis (PCA). They were powdered using a spray dryer, mixed, and subsequently referred to as plant salt substitute (PSS). The relative saltiness of PSS to NaCl was shown to be 0.65. When the degree of saltiness between PSS and NaCl is the same, PSS contains 43% less sodium than NaCl. Therefore, PSS can be used in food to reduce an individual's sodium intake while retaining the salty
The development of an egg-shell like structure in skim milk powder has been investigated in a stirred fluidized-bed dryer at various temperatures and humidities. The developed particles have crystalline surfaces and amorphous cores. The SEM analysis shows a thin layer of lactose crystals (at the nano-scale) that is formed on the surface of the powder while the XRD analysis shows that the particle cores are still amorphous (egg-shell form), so the surface properties have improved while the bulk desirable properties (of good solubility) have been retained. The resulting powders show better flowability and stability and less cake formation during storage by retaining good rehydration and dissolution times. The nano-coating of milk powders by crystalline lactose from the powder itself and the improvement in stability and flowability could be a worthwhile solution for dairy industries [Nima Yazdanpanah* and Tim A.G. Langrish (Drying and Process Technology Group, School of Chemical & Biomolecular Engineering, The University of Sydney, NSW 2006, Australia), Food Research International, 2011, 44(1), 39-45].

Effects of electron beam irradiation at doses of 10, 15, 20, 25 and 30 kGy on chemical composition, phyttate and tannin contents, and in vivo digestibility of sorghum grain were investigated. Irradiation had no effect (p > 0.05) on chemical compositions. Tannin content was reduced (p < 0.05) by 28%, 30%, 42%, 83% and 86% and phyttate content reduced (p < 0.05) by 39%, 49%, 66%, 79% and 90% in electron beam irradiated compared to control, respectively. Irradiation improved (p < 0.05) in vivo digestibilities of dry matter, crude protein, true protein and gross energy. Based upon these results, electron beam irradiation was judged to be a useful processing method for reducing the anti-nutritional compounds and therefore, improving nutritive value of sorghum grain [P. Shawrang*, A.A. Sadeghi, M. Behgar, H. Zareshahi and G. Shahhoseini (Agricultural, Medical and Industrial Research School, Nuclear Science and Technology Research Institute, Atomic Energy Organisation of Iran, P.O. Box 31485-498, Karaj, Iran), Food Chemistry, 2011, 125(2), 376-379].

Effects of packaging materials, storage temperatures and time on physicochemical properties of organic hulled red fragrant rice cv. Hom Daeng were investigated. The samples were vacuum-packed in oriented polypropylene/aluminium/linear low-density polyethylene or nylon/linear low-density polyethylene pouches and stored at ambient temperature or 15 °C for up to 12 months. Results from differential scanning calorimetry indicated that onset and peak temperature of gelatinisation of the aged rice samples increased after the 6th month while enthalpy of gelatinisation initially increased and then decreased after the 8th month. Measurements from the Rapid Visco Analyzer revealed that peak viscosity and breakdown of the rice pastes increased within the first 2 months, then decreased after the 6th month, whereas setback gradually increased during storage. Swelling power, at 70 and 90 °C, of the aged samples, tended to decrease after the 4th month. Lower storage temperature retarded those changes while packaging materials did not influence the changes. Changes in thermal and pasting properties of the aged samples were reversed after adding 2-mercaptoethanol. Hence, an increase in disulphide linkages of oryzenin during storage could play a crucial role in altering those properties. Sensory evaluation indicated a significant increase in hardness of the cooked rice prepared from the longer-aged samples (p < 0.05). However, the cooked rice samples, deriving from the samples stored at ambient temperature for up to 12 months, were still acceptable for Thai consumers [Kanitha Tananuwong* and Yuwares Malila (Department of Food Technology, Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand), Food Chemistry, 2011, 125(1), 179-185].
Feasibility of use of buckwheat flour as an ingredient in ginger nut biscuit formulation

Ginger nut biscuits are popular traditional biscuits which contain honey. In order to improve their nutritive profile and functionality, standard formulation based on wheat flour was substituted with buckwheat flour at three levels (30%, 40%, 50%). The quality attributes (chemical composition, microelements, bioactive compounds (total polyphenols, rutin, quercetin), antioxidative potential, textural and sensory properties) were compared to control biscuit (based on wheat flour) and biscuits substituted with rye at the same levels, since rye is used as an ingredient which improves the quality of ginger nut biscuits. Substitution with buckwheat flour resulted in a significant increase \((p < 0.05)\) in protein, \(Zn\), total polyphenols, antioxidative and chelating activity. Total dietary fibre, \(Cu\), \(Mn\) and \(Fe\) contents also increased but did not exceed those in rye substituted biscuits. Consumption of 100 g of enriched biscuits could contribute to reaching \(18–22\%\) (buckwheat) and \(16-17\%\) (rye) of the estimated daily average total polyphenols intake, respectively. With the contents of rutin and quercetin at 3.96–6.57 mg/100 g d.b. and 0.087-0.214 mg/100 g d.b., respectively, buckwheat substituted biscuits may significantly contribute to total dietary flavonoid intake and meet the demands of preventive nutrition. Buckwheat enriched biscuits were rated higher regarding sensory attributes, softness and fracturability as compared to control but lower compared to rye supplemented biscuits. [Bojana Filipčev*, Olivera Šimurina, Marijana Sakač, Ivana Sedej, Pavle Jovanov, Mladenka Pestorić and Marija Bodroža-Solarov (Institute for Food Technology, University of Novi Sad, Bul. cara Lazara 1, 21000 Novi Sad, Serbia), Food Chemistry, 2011, 125(1), 164-170].

Lipid, fatty acid and carotenoid content of edible egg yolks from avian species: A comparative study

A comparative study has been conducted of the major lipid classes composition, as well as the fatty acid and carotenoid content in the yolk of conventional eggs from five avian species (ostrich, turkey, quail, duck and goose); the nutritional indices were calculated. The neutral lipids were the major yolk fractions but their proportions varied among species. All yolks and especially ostrich’s yolk were found to be an excellent source of dietary lecithin. Quail yolk displayed the lowest fat and cholesterol content and the lowest values for the cholesterol index (CI) and cholesterol-saturated fat index (CSI). It is therefore more appropriate for a healthier diet. Turkey and goose yolks contained significantly \((P < 0.05)\) higher \(\omega-3\) fatty acid proportion and \(\omega-6/\omega-3\) ratio. The turkey yolk was characterised by the lowest \(AI\) and \(TI\) values, which are recommended for a healthy diet. Quail yolk lipids contained a favourable PUFA/SFA ratio. All the examined yolks contained highly bioavailable functional nutrients, such as lutein and zeaxanthin [Vassilia J. Sinanoglou*, Irini F. Strati and Sofia Miniadis-Meimaroglou (Food Analysis Laboratory, Department of Food Technology, Technological Educational Institution of Athens, Ag. Spyridonos, 12210 Egaleo, Greece), Food Chemistry, 2011, 124(3), 971-977].

Yield and fruit quality of four sweet corn hybrids (Zea mays) under conventional and integrated fertilization with vermicompost

Vermicompost has been proposed as a valuable fertilizer for sustainable agriculture. The effects of vermicompost on yield and quality of sweet corn were evaluated in this study. In two field trials, sweet corn plants were grown under (i) a conventional fertilization regime with inorganic fertilizer, and integrated fertilization regimes in which 75% of the nutrients were supplied by the inorganic fertilizer and 25% of the nutrients were supplied by either (ii) rabbit manure, or (iii) vermicompost. All three types of fertilization regime were supplied at two doses. Two pairs of nearly isogenic sweet corn hybrids homozygous for \(sugary1\) and \(shrunken2\) mutants were included in the trials to explore fertilizer × genotype interactions. Growth, yield and ear quality of the plants were evaluated in relation to the three fertilization regimes.

In general, the integrated regimes yielded the same productivity levels as the conventional treatment. Moreover, both vermicompost and manure produced significant increases in plant growth and marketable yield, and also affected the chemical
composition and quality of the marketable ear. Nevertheless, most of the observed effects of the organic fertilizers were genotype-dependent.

The results confirm that the use of organic fertilizers such as vermicompost has a positive effect on crop yield and quality. Nevertheless, these effects were not general, indicating the complexity of the organic amendment–plant interactions and the importance of controlling genetic variation when studying the effects of vermicompost on plant growth.

**NPARR 2(1), 2011-175, Physicochemical, thermal and functional characterisation of protein isolates from Kabuli and Desi chickpea (Cicer arietinum L.): a comparative study with soy (Glycine max) and pea (Pisum sativum L.)**

Chickpea (Cicer arietinum L.) seeds are a good source of protein that has potential applications in new product formulation and fortification. The main objectives of this study were to analyse the physicochemical, thermal and functional properties of chickpea protein isolates (CPIs) and compare them with those of soy (SPI) and pea (PPI) protein isolates.

Extracted CPIs had mean protein contents of 728–853 g kg\(^{-1}\) (dry weight basis). Analysis of their deconvoluted Fourier transform infrared spectra gave secondary structure estimates of 25.6–32.7% \(\alpha\)-helices, 32.5–40.4% \(\beta\)-sheets, 13.8–18.9% turns and 16.3–19.2% disordered structures. CPIs from CDC Xena, among Kabuli varieties, and Myles, among Desi varieties, as well as SPI had the highest water-holding and oil absorption capacities. The emulsifying properties of Kabuli CPIs were superior to those of PPI and Desi CPIs and as good as those of SPI. The heat-induced gelation properties of CPIs showed a minimum protein concentration required to form a gel structure ranging from 100 to 140 g L\(^{-1}\). Denaturation temperatures and enthalpies of CPIs ranged from 89.0 to 92.0 °C and from 2.4 to 4.0 J g\(^{-1}\) respectively.

The results suggest that most physicochemical, thermal and functional properties of CPIs compare favourably with those of SPI and are better than those of PPI. Hence CPI may be suitable as a high-quality substitute for SPI in food applications [Thushan S Withana-Gamage, Janitha PD Wanasundara, Zeb Pietrasik, and Phyllis J Shand* (Department of Food & Bioproduct Sciences, University of Saskatchewan, 51 Campus Drive, Saskatoon, Saskatchewan, S7N 5A8, Canada), *Journal of the Science of Food and Agriculture, 2011, 91(7), 1244–1253].

**NPARR 2(1), 2011-176, Antioxidant activity of hard wheat flour, dough and bread prepared using various processes with the addition of different phenolic acids**

The purpose of this study was to evaluate the effect of baking process on the antioxidant activity of different phenolic acids. Antioxidant potential was determined using the \(\beta\)-carotene-bleaching activity assay, and free phenolic acid levels were determined by high-performance liquid chromatography. Four phenolic acids, caffeic acid, ferulic acid, syringic acid and gallic acid, were mixed with wheat flour at a concentration of 4.44 \(\mu\)mol/g of flour.

Type of phenolic acid and processing affected antioxidant activity. Of the phenolic acids, caffeic acid had the most pronounced antioxidant effect. The ranking of phenolic acids in terms of their antioxidant activity in fermented dough and bread was similar to that before processing, i.e. syringic acid < gallic acid < ferulic acid < caffeic acid. The content of ferulic acid was greater than that of the other phenolic acids after baking. Antioxidant activity and free phenolic acid content were reduced by mixing but recovered after fermentation and baking. Phenolic acid recovery after baking was 74–80%.

Phenolic acids retain their antioxidant activity after the baking process, which has potential health benefits for consumers. Elucidation of interactions between the baking process and phenolic acids is important for the development of functional foods [Hye-Min Han and Bong-Kyung Koh* (Department of Food and Nutrition, Keimyung University, 1000 Sin-dang Dong, Dal-suh Gu, Dae-gu 704-701, Korea), *Journal of the Science of Food and Agriculture, 2011, 91(4), 604–608].
The present study investigated the effect of irradiation, active and modified atmosphere packaging, and storage conditions on quality retention of raw, whole, unpeeled almonds. Almond kernels were packaged in barrier and high-barrier pouches, under N\textsubscript{2} or with an O\textsubscript{2} absorber and stored either under fluorescent lighting or in the dark at 20 °C for 12 months. Quality parameters monitored were peroxide value, hexanal content, colour, fatty acid composition and volatile compounds. Of the sensory attributes colour, texture, odour and taste were evaluated.

Peroxide value and hexanal increased with dose of irradiation and storage time. Irradiation resulted in a decrease of polyunsaturated and monounsaturated fatty acids during storage with a parallel increase of saturated fatty acids. Volatile compounds were not affected by irradiation but increased with storage time indicating enhanced lipid oxidation. Colour parameters of samples remained unaffected immediately after irradiation. For samples packaged under a N\textsubscript{2} atmosphere $L^*$ and $b^*$ values decreased during storage with a parallel increase of value $a^*$ resulting to gradual product darkening especially in irradiated samples.

Non-irradiated almonds retained acceptable quality for ca. 12 months stored at 20 °C with the O\textsubscript{2} absorber irrespective of lighting conditions and packaging material oxygen barrier. The respective shelf life for samples irradiated at 1.0 kGy was 12 months packaged in PET-SiOx//LDPE irrespective of lighting conditions and 12 months for samples irradiated at 3 kGy packaged in PET-SiOx//LDPE stored in the dark [Stamatios F Mexis, Kyriakos A Riganakos and Michael G Kontominas* (Laboratory of Food Chemistry and Technology, Department of Chemistry, University of Ioannina, Ioannina 45110, Greece), Journal of the Science of Food and Agriculture, 2011, 91, 634–649].