Effects of osmo-dehydration, blanching and semi-ripening on flour of plantain

Plantains and bananas (*Musa* sp.) are important starchy staples in Ghana. Processing of plantains into flour is limited as most plantain foods are eaten as boiled, fried or roasted. However, after the introduction on local and foreign markets of instant plantain *fufu* (popular West African food) flour consisting of plantain flour and cassava starch, interest in plantain flours as a commercial commodity has increased. Thus, researchers at CSIR-Food Research Institute, Accra, Ghana studied the viscoelastic properties, water activity and colorimetry properties of plantain flour produced employing osmo-dehydration, hot-water blanching, semi-ripening and fresh unripe process treatments from three plantain (*Musa* AAB) cultivars namely ‘False Horn’, ‘French Horn’ and ‘True Horn local’. Treatments given to the plantains before the hot-air dehydration were osmo-dehydration, hot-water blanching and semi-ripening and fresh unripe. The best pasting characteristics occurred for ‘True Horn local’ and ‘False Horn’ osmo-dehydrated flours. Water activity and moisture content were 0.27-0.39 $a_w$ and 5.08-7.25%, respectively with the lowest recorded for ‘False Horn’ osmo-dehydrated flour. Colour parameters were in the range of 87.34-79.56 and 15.71-26.74 for $L^*$ and $b^*$, respectively. The least browning colour ($a^*$) was exhibited by ‘True Horn local’ and ‘False Horn’ osmo-dehydrated flours. Statistical significances ($P<0.05$) were recorded for water activity, moisture content and $a^*$ colour parameter between process treatments for fresh unripe, semi-ripe, osmo-dehydration and blanching whereas no statistically significances occurred for varietal differences for ‘False Horn’, ‘True Horn local’ and ‘French Horn’ plantains. However, the viscoelastic properties were significant for $F$-ratios at $P>0.05$. Process treatments of osmo-dehydration, blanching and semi-ripening contribute significantly to the differences for water activity, moisture content, browning effect and viscoelastic properties compared to plantain varieties, with osmo-dehydration emerging as the best treatment method. Important results were obtained for the flour industries for decisions on selecting osmo-dehydration among the process treatments for plantain (*Musa AAB*) flour in order to take advantage of the consumer demand for plantain flour [Tortoe Charles, Johnson Paa-Nii T and Nyarko Apollonius I, Effects of osmo-dehydration, blanching and semi-ripening on the viscoelastic, water activity and colorimetry properties of flour from three cultivars of plantain (*Musa AAB*), *Innov Food Sci Emerg Technol*, 2009, 10 (1), 82-86].

Shelf-life modelling of osmotically treated chilled gilthead seabream fillets

Fresh fish is an extremely perishable food as compared to other food commodities. Thus, shelf-life extension of osmotically treated chilled gilthead seabream (*Sparus aurata*) fillets was studied by researchers at Laboratory of Food Chemistry and Technology, School of Chemical Engineering, National Technical University of Athens, Greece. Water-loss, solid-gain, salt content and water activity were measured. Osmotic pretreatment with 40, 50 and 60% maltodextrin (DE 47) plus 5% NaCl solutions caused substantial water loss (12.3-77.0%) and solid enrichment (2.5-34.1%) with higher solution concentrations showing the highest values of mass flow. Quality indices (colour, microbial growth, TVB-N and sensory scoring) were estimated during refrigerated storage and kinetically modelled. Temperature dependence of quality loss rates was modelled by the Arrhenius equation. Shelf-life at 5°C was 4 days for untreated fillets and 9, 11 and 13 days for fillets treated with 40, 50 and 60% maltodextrin, respectively. The results of the study show the potential of using osmotic treatment to extend the shelf-life of fresh chilled fish products [Tsironi Theofania, Salapa Ioanna and Taoukis Petros, Shelf life modelling of osmotically treated chilled gilthead seabream fillets, *Innov Food Sci Emerg Technol*, 2009, 10 (1), 23-31].
Pre-treatment effect on properties of cassava-based composite flours

The low protein and lack of gluten in cassava (*Manihot esculenta Crantz*) are disadvantageous for its use for product development and is overcome through the use of composite flours incorporating cereal and/or legume flours. The functionality and nutritional attributes of cassava flour were altered by pre-treatment with termamyl and green gram amylase, pre-gelatinization and subsequent blending with cereals, legumes, bran sources, etc. in a study done by researchers at Division of Crop Utilization, Central Tuber Crops Research Institute, Thiruvananthapuram, Kerala, India.

Malting of cassava flour with termamyl followed by pre-gelatinization reduced the starch and increased the sugar content of the mixes. Pre-gelatinization had little effect on the crude protein of the mixes; nevertheless, the fat content was higher by 0.15-1.0 units. Energy content was around 1176 and 1217 KJ/100g for the rice bran added mixes from malted cassava, which slightly increased in the respective pre-gelatinized cassava mixes. The peak viscosity of termamyl treated cassava-based flour mixes was much lower than the respective gram amylase based mixes, indicating that the latter had much less amylolytic activity than termamyl and pre-gelatinization further reduced the viscosity. The very low viscosity for the enzyme treated cassava-based mixes was due to the inability for retrogradation of the hydrolyzed starch.

Significant improvement in *in vitro* starch digestibility (IVSD) (enhancement by 5.0-16.0 units in termamyl treatment vs 5.0-9.0 units in gram amylase treatment) was observed for the pre-gelatinized mixes. Lowest IVSD (25-29 units) was for the two bran based mixes, suggesting its use in the nutrition therapy for controlling obesity linked diseases. The study led to the development of cassava based composite flours with low starch digestibility, high protein content and low energy content which could be effectively utilized for developing designer foods for obese and diabetic people. Enhanced digestibility of pre-gelatinized malted flours from cassava finds potential application for the development of foods for geriatric and convalescent people (Jisha S, Padmaja G, Moorthy SN and Rajeshkumar K, Pre-treatment effect on the nutritional and functional properties of selected cassava-based composite flours, *Innov Food Sci Emerg Technol*, 2008, 9(4), 587-592).

Extruded products with Fenugreek (*Trigonella foenum-graecum* Linn.), chickpea and rice

The researchers at Australia and New Zealand jointly investigated the effects of fenugreek flour (*Trigonella foenum-graecum* Linn.) and debittered fenugreek polysaccharide (FenuLife®) inclusion on the physical and sensory quality characteristics and glycaemic index (GI) of chickpea-rice based extruded products. Based on preliminary evaluation with different proportions of chick pea and rice, a blend of 70:30 chickpea and rice was chosen as the control for further studies. The control blend, replaced with fenugreek flour at 2, 5 and 10%, or fenugreek polysaccharide at 5, 10, 15 and 20%, was extruded at the optimum processing conditions as specified in the detailed study. The extruded products were evaluated for their physical (moisture retention, expansion, hardness, water solubility index (WSI) and water absorption index (WAI)), sensory
The use of germinated seeds as food originated in far east countries and has recently spread to the western world, where they are considered fashionable and healthy ingredients. A great variety of sprouts are easily available on the European markets, but the most popular are those from alfalfa, mung bean and radish. They are consumed often raw or slightly cooked in salads and sandwiches or as decorative appetizers. The effect of combined treatments of pressure, temperature and two disinfectant agents (hypochlorite and carvacrol) applied on alfalfa (*Medicago sativa* Linn.) seeds, on their germination capability as well as on the reduction of the native microbial load of sprouts developed from treated seeds was evaluated by scientists of Spain using response surface methodology (RSM). The germination percentage decreased as pressure and carvacrol concentration increased, while calcium hypochlorite concentration had no significant impact on seed viability. The counts of total aerobic mesophilic bacteria, total and faecal coliforms and moulds and yeast were reduced with increasing pressure and hypochlorite and carvacrol concentrations. The optimal conditions for improving the microbiological quality of alfalfa seeds (reductions between 4.5 and 5logCFU/g) for sprouts production were 200MPa and hypochlorite concentration of 18,000ppm. On the contrary, the process parameters of the combined treatment HP/carvacrol that ensure the microbial safety of sprouts (250MPa and 1500ppm of carvacrol) reduced the germination percentage to unacceptable levels. The results indicated that calcium hypochlorite in combination with high pressure may be a feasible seed pretreatment for use in the commercial production of alfalfa sprouts. Moreover, it has the advantage that it is easy to implement by the industry [Peñas Elena, Gómez Rosario, Frías Juana and Vidal-Valverde Concepción, Efficacy of combinations of high pressure treatment, temperature and antimicrobial compounds to improve the microbiological quality of alfalfa seeds for sprout production, *Food Control*, 2009, 20 (1), 31-39].

Due to the distinct bitter taste, inclusion of fenugreek flour was not acceptable at levels more than 2% in extruded chickpea based products. Addition of fenugreek polysaccharide resulted in slight reduction in radial expansion (*P*<0.05), while longitudinal expansion increased. WAI increased while WSI decreased compared to the control (*P*<0.05). The mean scores of sensory evaluation indicated that all products containing fenugreek polysaccharide up to 15% were within the acceptable range. There were no significant differences (*P*<0.05) between products containing 5-15% fenugreek polysaccharide in their colour, flavour, texture and overall quality. Fenugreek, in the form of debittered polysaccharide (FenuLife®) could be incorporated up to a level of 15% in a chickpea-rice blend to develop snack products of acceptable physical and sensory properties with low GI Index [Shirani Gamliath and Ganesharane Ravindran, Extruded products with Fenugreek (*Trigonella foenum-graecum*) chickpea and rice: Physical properties, sensory acceptability and glycaemic index, *J Food Eng*, 2009, 90(1), 44-52].

### Efficacy of combinations of high pressure treatment, temperature and antimicrobial compounds on quality of alfalfa seeds

The use of germinated seeds as food originated in far east countries and has recently spread to the western world, where they are considered fashionable and healthy ingredients. A great variety of sprouts are easily available on the European markets, but the most popular are those from alfalfa, mung bean and radish. They are consumed often raw or slightly cooked in salads and sandwiches or as decorative appetizers. The effect of combined treatments of pressure, temperature and two disinfectant agents (hypochlorite and carvacrol) applied on alfalfa (*Medicago sativa* Linn.) seeds, on their germination capability as well as on the reduction of the native microbial load of sprouts developed from treated seeds was evaluated by scientists of Spain using response surface methodology (RSM). The germination percentage decreased as pressure and carvacrol concentration increased, while calcium hypochlorite concentration had no significant impact on seed viability. The counts of total aerobic mesophilic bacteria, total and faecal coliforms and moulds and yeast were reduced with increasing pressure and hypochlorite and carvacrol concentrations. The optimal conditions for improving the microbiological quality of alfalfa seeds (reductions between 4.5 and 5logCFU/g) for sprouts production were 200MPa and hypochlorite concentration of 18,000ppm. On the contrary, the process parameters of the combined treatment HP/carvacrol that ensure the microbial safety of sprouts (250MPa and 1500ppm of carvacrol) reduced the germination percentage to unacceptable levels. The results indicated that calcium hypochlorite in combination with high pressure may be a feasible seed pretreatment for use in the commercial production of alfalfa sprouts. Moreover, it has the advantage that it is easy to implement by the industry [Peñas Elena, Gómez Rosario, Frías Juana and Vidal-Valverde Concepción, Efficacy of combinations of high pressure treatment, temperature and antimicrobial compounds to improve the microbiological quality of alfalfa seeds for sprout production, *Food Control*, 2009, 20 (1), 31-39].
Physico-chemical properties of commercial fibres from different sources

The lower intake of fibre and fibre-containing foods has refocused the food industry on the benefits of incorporating different fibres in the foodstuff. Now-a-days, a whole range of fibres are available in the market, but sometimes a good choice becomes complicated due to their varied physico-chemical properties. In order to give some light when selecting fibres, a comparative account regarding some physical properties of commercial fibres from different sources is presented in a study by researchers at Spain, with a view to increasing their use in food products, namely bakery products. Commercial fibres included in the study were hydroxypropylmethylcellulose (HPMC), cellulose, locust bean gum, guar gum, inulin, galactooligosaccharides, oat and wheat fibres and fibres extracted from apple and bamboo. Particle size distribution (PSD) of the dry commercial fibres ranged from around 10 to 334 µm; moreover PSD in wet (water and ethanol) form was also determined to have precise information about their behaviour when processing. Cereal fibres (oat 600 and wheat) exhibited the highest values for hydration properties (swelling, water holding and water binding capacity). Only the hydrocolloids (HPMC, locust bean gum and guar gum), with the exception of cellulose, yielded highly viscous solutions during the heating-cooling cycle; moreover oat 600 and apple fibre developed viscous solutions after cooling. HPMC, locust bean gum and guar gum significantly augmented the four solvent retention capacity (SRC) values, thus those hydrocolloids affected the relative contributions to water absorption of proteins, carbohydrates, damaged starch and pentosans. Fibre sources and degree of replacement significantly affected the SRC values for the four solvents in all the fibre groups, with the exception of lactic acid SRC in the case of cereal fibres. Differences in fibres effect on wheat flour quality can be easily detected by assessing solvent retention capacity, which can give information on the end use functionality of the wheat flour [Rosell CM, Santos E and Collar C, Physico-chemical properties of commercial fibres from different sources: A comparative approach, Food Res Int, 2009, 42 (1), 176-184].

Total phenolic compounds and antioxidant capacity of wheat graded flours by polishing method

Wheat (Triticum aestivum Linn.) is one of the major cereals in the world because of the universal use of wheat for a wide range of products such as bread, noodles, cakes, biscuits, cookies, etc. The graded flour fractions, which were milled from whole wheat grain from outer to inner parts without removal of germ and bran, are rich in dietary fibres and minerals, the sources of nutrition for human beings. The whole waxy wheat was milled into five fractions using the gradual milling method and the phenolic contents and antioxidant capacity of these flours were investigated by researchers at Vietnam and Japan. The total phenolic and flavonoid contents of free and bound phenolic extracts gradually increased in the order from the inner to the outer fractions. The flours milled from the outer parts of grain contained significantly higher amount of phenolics and exhibited significantly higher antioxidant capacity than did the whole grain. Likewise, the inner flour fractions milled from mostly endosperm part had significantly higher amount of phenolics and exhibited significantly higher antioxidant capacity than did the white flour, which was milled by a conventional milling method. Thus, the graded flours from whole waxy wheat should be encouraged to be used for processing whole-grain foods to improve both qualities of end-use products and health benefits [Hung Pham Van, Maeda Tomoko, Miyatake Kazutaka and Morita Naofumi, Total phenolic compounds and antioxidant capacity of wheat graded flours by polishing method, Food Res Int, 2009, 42 (1), 185-190].
Role of sugar and fat in sugar-snap cookies

The impact of sugar (17.6-31.2%) and fat (8.7-15.8%) levels on cookie structure was studied by the scientists at Belgium. Cookie diameter increased and its height decreased with increasing sugar or fat levels. X-ray microfocus computed tomography porosities and cell sizes increased with fat level, but cell size distribution, cell wall thickness and distribution were not affected by fat level, indicating that fat primarily incorporates air. In contrast, the sugar level influenced porosity, cell size, cell wall thickness and their relative distributions. Thus, the sucrose level, probably by affecting dough viscosity during baking, largely influences the baked cookie structure. Cell and cell wall anisotropy measurements indicated that the inner orientation of cells and cell walls probably depends on the horizontal spread behaviour, rather than on the maximum cookie height and collapse. Finally, the surface cracking pattern was determined by sugar level, rather than by structural collapse at the end of baking [Pareyt Bram, Talhaoui Faisal, Kerckhofs Greet, Brijs Kristof, Goesaert Hans, Wevers Martine and Delcour Jan A, The role of sugar and fat in sugar-snap cookies: Structural and textural properties, J Food Eng, 2009, 90(3), 400-408].

Influence of hydrothermal processes on selected physical properties of oat grain

The scientists at Department of Food Engineering and Machinery, Agricultural University of Lublin. Poland have proved the existence of a strong correlation between the range of parameters of hydrothermal treatment of oat grain (temperature of moistening, steam pressure, time of moistening) and the moisture content of the grain. The study is based on a multidirectional scheme and allows for conducting analysis of the influence of hydrothermal treatment on the physical properties of oat grain, mainly on its moisture content. The results obtained facilitated the elaboration of a scheme for calculating changes in the geometrical center of grain after it is subjected to steam moistening. It explains a complicated mechanism of changes in the geometrical properties of moistened grain and their effect on the bulky array, which is very important in the proper processing and preparation of grain. The obtained results and their analysis demonstrated practical directions and possibilities of hydrothermal treatment of oat grain before processing [Panasiewicz Marian, Grochowicz Józef and Sobczak Pawel, Influence of hydrothermal processes on selected physical properties of oat grain, J Food Eng, 2009, 90(1), 81-89].

Ultrasonic internal defect detection in cheese

The scientists at Belgium used and compared different ultrasonic signals and detection techniques to detect internal foreign bodies present in semi-soft cheeses. The signals were a pulse or a chirp and the detection was carried out by using either correlation with reference signal or wavelet decomposition. The principle of the detection consisted in measuring the time of flight of the transmitted signals and of the echoes, the latter in the absence of foreign body should be the double of the former. The presence of a foreign object affected this pattern in several ways. In order to assess the method, a small plastic cylindrical object of 3mm in diam. was introduced in one half of the cheese and was tested for detection, the second half being used as reference for the control cheese. The results showed that the two signals and the two detection methods were able to localise the transmitted signals and the echo from the opposite face of the cheese under all circumstances. For the foreign body detection, the correlation method gave superior results, in term of signal to noise ratio as well as in term of error rate, while the two signals gave similar results. The analysis of the mean and standard deviation of the signal
to noise ratio of the object echo showed that some samples presented peak values close to those due to the noise. Nevertheless, the object was detected in 90% of the tests. There was no significant effect of temperature on the detection technique [Leemans Vincent and Destain Marie-France, Ultrasonic internal defect detection in cheese, *J Food Eng*, 2009, 90(3), 333-340].

**Protein profile and malt activity during sorghum germination**

The scientists at Portugal evaluated effect of germination time on major sorghum macromolecules by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy. Sorghum flour was also incubated with sorghum malt to evaluate amylase and protease activities. The SDS-PAGE results showed that levels of high-molecular-weight aggregates, $\beta$ monomer and $\gamma$ and $\alpha$ monomers increased by 120.5, 20.3 and 12.7%, respectively during the first few days of germination. This behaviour shows the enhancement of prolamin extractability and concentration in sorghum as a result of starch degradation. After the third day, proteins suffered degradation by intrinsic proteases. FTIR spectroscopy showed a gradual decrease in lipid and protein levels and starch structural changes during the germination period. These modifications are due to intrinsic lipases, proteases and amylases. Sorghum flour was incubated with different malt samples resulting from 0-7 days of germination. It was found that 5 days malt led to a six fold increase in carbohydrate digestibility and a four fold increase in free amino acid content. Thus a 5 days sorghum malt is the best inoculum for porridge preparation, representing an inexpensive, effortless and culturally acceptable way to prepare weaning foods at domestic and industrial levels [Correia Isabel, Correia Alexandra Nunes, António S Barros and Delgado Ionne, Protein profile and malt activity during sorghum germination, *J Sci Food Agric*, 2008, 88(15), 2598-2605].

**Milling and physicochemical properties of chickpea varieties**

Physical characteristics of chickpea (*Cicer arietinum* Linn.) seeds such as grain size, weight and hull content are important from a milling and marketing point of view. Chemical characteristics provide the information on nutritional status of grains. Chickpea of Desi (cv. A1) and Kabuli (cv. L550) cultivars were analyzed for their physicochemical, milling and milled flour quality characteristics. The scientists at Department of Food Science and Human Nutrition, Michigan State University, USA obtained higher yield of *dal* from wet milling which was found to be true in both cultivars. An extra yield of 2-4% was obtained in wet milling. Between the cultivars, Desi was found to be the higher dhal-yielding cultivar in both dry and wet milling methods. Fat, ash and protein contents were found to be higher in Kabuli than in Desi and the values were respectively 5.3, 3.5 and 24.9% for Kabuli and 4.3, 2.2 and 22.6% for Desi. Thus the chickpea cultivars Desi and Kabuli vary significantly in their physical properties such as seeds colour, size, 100-seeds weight and 100-seeds volume. Between the dry and wet milling, a higher yield (2-4%) of *dal* was obtained from wet milling. Between the cultivars, electronic nose analysis of chickpea flour indicated the possibility of differentiating the variations associated with varietal difference and milling. The gel electrophoresis pattern of chickpea showed as many as 15 protein bands in flours from both the cultivars, either in phosphate or SDS buffer. The Rapid Visco Analyzer profile did not show a significant difference between the two cultivars [Ravi Ramasamy and Harte Janice B, Milling and physicochemical properties of chickpea (*Cicer arietinum* L) varieties, *J Sci Food Agric*, 2009, 89(2), 258-266].
Influence of natural antioxidants and their carry-through property in biscuit processing

The scientists at Central Food Technological Research Institute, Mysore, India have explored the use of natural antioxidants from plant sources such as hexane (G-1) and chloroform (G-2) extracts of Garcinia, *Peltophorum ferrugineum* Benth. flower extract (FE), turmeric powder (C-1) and curcumin (C-2), in biscuit preparation in the place of synthetic ones and their carry-through properties were evaluated during processing and storage. Microstructure and electrophoretic characterization of biscuit dough were carried out to understand the influence of these natural antioxidants in the processing of biscuits. Biscuits prepared with C-1, C-2, G-1 and G-2 was well acceptable and FE biscuits were least acceptable. Among the antioxidants used, C-2 was found to retain only 11.23% activity whereas G-2 had retained 51% activity after baking, which was comparable to synthetic antioxidant butylated hydroxyanisole (BHA) and better than tert-butylhydroquinone (TBHQ). Microstructure studies of biscuit dough indicated that in the case of G-1, G-2, C-1 and BHA the gluten network formation was intact when compared to FE and TBHQ. Supportive electrophoresis studies indicated that there was no change in the wheat protein subunits of different samples except for FE biscuit dough.

Thus based on the result of retention of antioxidant activity during baking and storage, hexane and chloroform extracts of Garcinia (G-1, G-2) and turmeric powder (C-1) were found to be suitable for use in biscuits as natural antioxidants and results were comparable with BHA. The present study also indicated that protein subunits of biscuit dough were not affected by antioxidants. However, antioxidants influenced the protein-starch-lipid network during biscuit dough formation [Nanditha Bheema Rao, Sankar Jena Bhabani and Pichan Prabhasankar, Influence of natural antioxidants and their carry-through property in biscuit processing, *J Sci Food Agric*, 2009, 89(2), 288-298].

**Characteristics and oil absorption of deep-fat fried dough prepared from ball-milled wheat flour**

High levels of oil in fried products have been recognized as causing health problems. The formation of microstructure during frying is one factor that influences oil absorption. Above the glass transition temperature ($T_g$), the physical properties of a polymer influences the formation of structure. The ball-milling process changes the physico-chemical properties of wheat flour constituents. The scientists at School of Bionics, Tokyo University of Technology, Hachioji, Tokyo, Japan and Department of Food Science and Technology, Tokyo University of Marine Science and Technology, Minato-ku, Tokyo, Japan investigated the effects of physico-chemical changes in wheat flour by the ball-milling process on structure formation and oil absorption in wheat flour dough model.

During experiment dough samples were made from wheat flour that had been ball-milled for 0 to 10h and then fried in frying oil at 150°C for 1-7min. Thermal properties of wheat flour, structure alteration and textural properties of fried samples were evaluated. As compared with samples made of non-milled flour, samples made from milled flour had smaller pores and higher oil absorption. The fracture force of a fried sample prepared from non-milled flour was lower than that of a sample prepared from milled flour. The results revealed that ball-milling affected the microstructure formation in fried wheat flour dough and subsequently oil absorption. The crispness of a sample prepared from non-milled wheat flour is higher than that of a sample prepared from ball-milled wheat flour. This may be due not only to a plasticization effect, but may also be dependent on microstructure [Thanatulsorn Pariya, Kajiwara Kazuhito and Suzuki Toru, Characteristics and oil absorption of deep-fat fried dough prepared from ball-milled wheat flour, *J Sci Food Agric*, 2009, 89(3), 363-371].
Oxidative damage is implicated in the etiology of cancer, cardiovascular disease and other degenerative disorders. Recent nutritional research has focused on the antioxidant potential of foods, while current dietary recommendations are to increase the intake of antioxidant-rich foods rather than supplement specific nutrients. Many alternatives to refined sugar are available, including raw cane sugar, plant saps/syrups (e.g., maple syrup, agave nectar), molasses, honey, and fruit sugars (e.g., date sugar). Unrefined sweeteners were hypothesized to contain higher levels of antioxidants, similar to the contrast between whole and refined grain products. Therefore, the scientists at Food Analysis Laboratory Control Center, Biochemistry Department, Virginia Tech, Blacksburg, Virginia, US compared the total antioxidant content of natural sweeteners as alternatives to refined sugar. The ferric-reducing ability of plasma (FRAP) assay was used to estimate total antioxidant capacity. Major brands of 12 types of sweeteners as well as refined white sugar and corn syrup were sampled from retail outlets in the United States. Substantial differences in total antioxidant content of different sweeteners were found. Refined sugar, corn syrup, and agave nectar contained minimal antioxidant activity (<0.01 mmol FRAP/100 g); raw cane sugar had a higher FRAP (0.1 mmol/100 g). Dark and blackstrap molasses had the highest FRAP (4.6 to 4.9 mmol/100 g), while maple syrup, brown sugar, and honey showed intermediate antioxidant capacity (0.2 to 0.7 mmol FRAP/100 g). Based on an average intake of 130g/day refined sugars and the antioxidant activity measured in typical diets, substituting alternative sweeteners could increase antioxidant intake an average of 2.6 mmol/day, similar to the amount found in a serving of berries or nuts. Many readily available alternatives to refined sugar offer the potential benefit of antioxidant activity [Phillips Katherine M, Carlsen Monica H and Blomhoff Rune, Total antioxidant content of alternatives to refined sugar, J Amer Diet Assoc, 2009, 109(1), 64-71].

Recent developments in micro-scale testing methodology and in methods modelling the effects of native forms of constituents by in vitro methods have provided a new approach to study the impact of added foreign proteins on dough end-use quality. Amaranth (Amaranthus sp.) is a member of the pseudo-cereal family, whose storage proteins have superior nutritional quality due to their essential amino acid composition. Therefore, the scientists at Hungary and Australia jointly studied the effects of the incorporated amaranth albumin proteins on the rheological properties of the wheat dough. The mixing time requirements, dough strength and stability of the reconstructed dough increased proportionally with the amount (1, 3 and 5%) of amaranth albumin proteins incorporated. These results were supported by measurements on the non-extractable polymeric protein ratio of the dough indicating the change in polymer size distribution. It is observed that amaranth albumin proteins are capable of interacting with gluten proteins through disulfide bonds, showing similar effects to the individual glutenin subunits of wheat flour proteins. Improvements in dough strength and stability without a substantial increase in the mixing requirements are of great significance for developing energy saving technologies in the baking industry [Oszvald Mária, Tamás Cecilía, Ralszegi Mariann, Tömösközi Sándor, Békés Ferenc and László Tamás, Effects of incorporated amaranth albumins on the functional properties of wheat dough, J Sci Food Agric, 2009, 89(5), 882-889].
**Food**

**Effect of the milling process on quality characteristics of rye flour**

Most of rye flour is obtained by a gradual reduction system using roller flour mills, which generate different flour streams. The study of the different flour streams composition is necessary since it determines the flour quality and the flour uses. The scientists at Spain analysed four break streams and nine reduction streams for moisture, ash, starch, protein, damaged starch, falling number, amylose/amylopectin ratio, β-glucans and colour. Mixing and pasting properties were also determined with a doughLAB and a Rapid Visco Analyser, respectively. As the milling process advanced, moisture and starch content decreased but protein, ash, β-glucans and damaged starch increased. The differences in composition are probably related to the effect of the roller mills and the increase in the contamination with bran. The absorption, development time and pasting viscosity increased as the milling proceeded, in detriment of the peak time. The β-glucan content was positively correlated to absorption, mixing tolerance index and pasting viscosity and negatively correlated to peak time. Differences in composition, above all, in bran, showed different mixing and pasting properties in rye streams. The most different streams corresponded to the last streams in the break process, in the sizings and in the middlings [Gómez Manuel, Pardo Jose, Oliete Bonastre and Caballero Pedro A, Effect of the milling process on quality characteristics of rye flour, J Sci Food Agric, 2009, 89(3), 470-476].

**Fruit**

**Improving cranberry shelf-life using high voltage electric field treatment**

The scientists at McGill University, Canada treated Cranberries (Vaccinium macrocarpon Ait.) with high voltage electric fields (HVEF) of 2, 5 or 8kV/cm in strength for 30, 60 or 120min in a parallel plate electrode system. The treated berries were stored at ambient conditions (23°C and 65% RH) for three weeks to study the effect of treatments on their respiration rate, physiological loss of mass (PLM), colour, total soluble solids (TSS) and skin puncture strength. Resulting respiration rates were in the range of 11.69-14.56ml CO₂/kg/h after the first week of storage and increased to 13.95 and 21.33ml CO₂/kg/h by the end of third week. For both two and three weeks of storage, HVEF-treated cranberries showed significantly lower respiration rates than the control. This particular attribute indicates the potential of HVEF for improving shelf-life. The PLM of HVEF-treated cranberries were in the range of 23.2–30.4% after three weeks of storage. There was no significant difference between treated and untreated berries in terms of absolute L*, a* and b* colour values; however, the colour difference value ΔE*ab of treated berries was somewhat greater. The TSS content of various HVEF-treated cranberries was in the range of 7.27-7.69B, similar to the TSS content of untreated berries (7.4B) before storage. The skin puncture strength of different HVEF-treated cranberries was in the range of 11.7-14.3N; while the untreated berries (11.2N) showed lower values prior to storage [Palanimuthu V, Rajkumar P, Orsat V, Gariépy Y and Raghavan GSV, Improving cranberry shelf-life using high voltage electric field treatment, J Food Eng, 2009, 90(3), 365-371].