Mechanized production and shelf life extension of burfi

Milk based sweets are very common in India and are preferred for their delicious taste and nutritional value. Several varieties of burfi are prepared by adopting traditional method where maintenance of hygienic conditions is doubtful. Keeping in view the export potential of burfi, the researchers at National Dairy Research Institute, Karnal and Mother Dairy, Gandhi Nagar, Gujarat, India worked on the possible extension of shelf life of the product by mechanized process.

During experiment an attempt was, therefore, made to develop a mechanized method for manufacture of burfi, adopting thin film Scraped Surface Heat Exchanger and Stephen processing kettle. Use of cardamom and potassium sorbate, each at 0.1% level, and vacuum packaging were tried for increasing the shelf life of burfi. The changes in acidity, HMF value, FFA, sensory quality and microbial counts were monitored during storage at an interval of 10 days. Despite slightly pasty texture, burfi prepared by mechanized process was highly acceptable. The samples containing potassium sorbate as preservative and vacuum packaged did not show any symptoms of spoilage up to 60 days at 30 ± 1°C [Palit Champak and Dharam Pal, Studies on mechanized production and shelf life extension of burfi, Indian J Dairy Sci, 2005, 58(1), 12-16].

Coconut cream filled Gouda cheese

Gouda cheese is a variety of cheese which possesses relatively milder flavour. It is reported that coconut fat can be replaced to milk fat to reduce the price of Gouda cheese. Therefore, the scientists at National Dairy Research Institute, Karnal, Haryana, India evaluated the proteolytic behaviour of coconut cream filled Gouda cheese. During experiment Gouda cheese was manufactured from cow skim milk and coconut cream. The extent and characteristics of proteolysis were monitored during the 4 months of ripening in terms of soluble protein, ripening index, PAGE pattern of protein breakdown and peptides by RP-HPLC. Results were compared with control. The soluble protein content and ripening index in the control as well as the filled cheese increased during ripening. There was no significant difference in these parameters between the two cheeses. The electrophoretic pattern of cheese revealed that Δ21-casein degraded preferentially over b-casein in both the cheeses. The extent of Δ51-casein breakdown increased with increasing storage till the end of ripening. E-Casein on the other hand, was largely unaffected up to 2 months of storage. At any sampling age, the PAGE pattern of the control and filled cheese were similar, suggesting that the mode and rate of protein breakdown were similar in both the cheeses. Peptide profiles obtained by RP-HPLC of both the cheeses were almost similar throughout the ripening period. Total area of the peaks in both hydrophilic (HI) and hydrophobic (HO) regions was higher in control than that of filled cheese. The total area of the peaks in hydrophilic region increased up to 2 months and decreased thereafter. Same pattern was observed for the hydrophobic peptides in both the cheeses. There was no significant difference in HI/HO ratio between control and filled cheese. However, effect of ripening on HO/HI ratio was highly significant [Mangalika ULP, Arora S, Sharma GS, Mann B and Wadiwa BK, Proteolyis of coconut cream filled gouda cheese during ripening, Indian J Dairy Sci, 2005, 58(3), 177-183].
Application of natural antioxidants in biscuits

Processed foods containing fats and oils, oxidize slowly during storage, various oxidation products cause rancidity and deterioration of the sensory properties of the food products. Auto-oxidation of fats and oils in processed foods may be prevented by the use of oxidation inhibitors or antioxidants. Synthetic antioxidants such as butylated hydroxyl anisole (BHA) and butylated hydroxy toluene (BHT) have been used as antioxidants for foods, since the beginning of this century. The use of these synthetic antioxidants, however, has begun to be restricted because of their toxicity. The keeping quality of baked foods such as crackers, cookies and biscuits is of great economic importance since these products are widely used and are often stored for extended periods before consumption.

Natural antioxidants have gained considerable interest in recent years for their role in preventing the auto-oxidation of fats, oils and fat containing food products. The researchers at Department of Studies in Food Science and Nutrition, University of Mysore, Manasagangotri and Defence Food Research Laboratory, Siddharthnagar, Mysore, India evaluated the utilization of some plant foods as sources of natural antioxidants. The effects of addition of the plant extracts on the stability of fat in biscuits were studied. Three plant foods viz., amla (*Emblica officinalis* Gaertn.), drumstick leaves (*Moringa oleifera* Lam.) and raisins (*Vitis vinifera* Linn.) were used as sources of natural antioxidants. All the three extracts exhibited a high percentage of antioxidant activity evaluated using β-carotene-linoleic acid *in vitro* system, compared to synthetic antioxidants. Biscuits prepared by addition of natural extracts were subjected to sensory studies and chemical analysis. Biscuits treated with natural antioxidants, extracted from raisins (B4) and drumstick leaves (B5) received higher \((P \leq 0.05)\) panel scores during storage period of 6 weeks, than control (B1), butylated hydroxy anisole (BHA) (B2) and amla (B3) extract incorporated biscuits.

The addition of extracts of the three plant materials, gave an excellent antioxidant effect on the biscuits compared with the effect of BHA. The higher efficiency of the plant extracts could be due to the stability of these natural antioxidant during baking. Results of sensory evaluation revealed that the selected plant extracts at concentrations of 1% and 2% may be used in place of synthetic antioxidants, since, these extracts had no effect on the organoleptic properties of the biscuit. Addition of natural antioxidants can increase shelf-life of food products containing fats and oils. In addition, natural antioxidants are safe and impart health benefits to the consumer [Reddy Vanitha, Urooj Asna and Kumar Anila, Evaluation of antioxidant activity of some plant extracts and their application in biscuits, *Food Chem*, 2005, 90(1-2), 317-321].

Biofortification of staple food crops

Throughout the world deficiencies of vitamin A, iron, and zinc exists, hence researchers have been trying to control micronutrient deficiencies through supplementation and foods fortification, but new approaches are needed, especially to reach the rural poor. Biofortification (enriching the nutrition contribution of staple crops through plant breeding) is one option. Team of scientists at United States and Colombia carried out studies and found that biofortification is technically feasible without compromising agronomic productivity. Predictive cost-benefit analyses also support biofortification as being important in the armamentarium for controlling micronutrient deficiencies. The challenge is to get producers and consumers to accept biofortified crops and increase their intake of the target nutrients [Nestel P, Bouis HE, Meenakshi JV and Pfeiffer W, Biofortification of staple food crops, *J Nutr*, 2006, 136(4), 1064-1067].
Asian noodles containing an oat cereal hydrocolloid

Asian noodles are widely consumed as the Japanese white salted noodles (WSN) and the Chinese yellow alkaline noodles (YAN) in various types and compositions. The functional and rheological properties of these noodles, as related to wheat flour, have been a widely investigated area of research. Important pasting characteristics of noodle flours could be measured by using a variety of rapid-visco analyzer (RVA) operating conditions. Other than wheat flour, rice flour is a useful and a very important component in many WSN and YAN formulations. The RVA also provided important information on these flours for noodle formulators.

Very little information is available on the incorporation of oat products in making WSN and YAN. A study was conducted by researchers at Cereal Products and Food Science Research Unit, National Center for Agricultural Utilization Research, ARS, USDA, Peoria, IL, USA and Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand to determine Nutrim-5’s utility as a substitute for wheat and/or rice flours in the preparation of Asian noodles. Nutrim (5% dispersed solids) was useful in preparing more nutritious foods, by replacing at least 50% coconut milk in eight Thai desserts. It is known to contain 5% by weight of the soluble fibre β-glucan. The soluble β-glucan content of the oat products is known to contribute hypocholesterolemic properties to foods.

The rheological properties of the noodle flour composites indicated that Nutrim-5 contributed binding qualities to the composites. Nutrim-5 appeared to contribute functionality to the rice flour, allowing for larger quantities to be used in the making of Asian noodles. The noodles were prepared in 20 kg batches by mixing blends of wheat flour, rice flour and Nutrim-5 with alkali, salt solution and egg. After mixing and kneading into smooth sheets, the noodles were cut, curled and deep-fat-fried. By using 10% by weight Nutrim-5 in the formulation, it was possible to satisfactorily make noodles using 50% rice flour. The cooking loss and tensile strength were measured and found to be satisfactory for this amount of rice flour in the noodles. A trained sensory panel also indicated that these noodles did not reveal any difference in taste.

Thus, Nutrim-5 component could contribute synergistic binding qualities in the preparation of WSN and YAN noodles. When Nutrim-5 was used in a composite formulation, with equal portions of rice and wheat flours, the Asian noodles, WSN and YAN, were statistically similar to the control [Inglett George E, Peterson Steven C, Craig Carriere J and Maneepun Saipin, Rheological, textural, and sensory properties of Asian noodles containing an oat cereal hydrocolloid, Food Chem, 2005, 90 (1-2), 1-8].

Functional properties of soy hulls supplemented wheat flour

The researchers at Institute of Food Science and Technology, University of Agriculture, Faisalabad, Pakistan carried out studies to prepare composite flour and to assess suitable level of composition. The main aim was to introduce soy hulls as a rich source of nutrients and to study its impact on the rheological and sensory properties of the unleavened flat bread (chapattis or rotis). Soy hulls were combined with wheat flour at 1.5, 3.0, 4.5, 6.0 and 7.5 per cent in order to prepare the composite flours. Composite flour and chapattis were analyzed for chemical composition, rheological and baking properties. Sensory evaluation (colour, flavour, taste, texture, folding ability and chewing ability) of chapattis was also carried out for the acceptance of suitable level by the consumers. The statistical analysis of data obtained showed significant increase in minerals (Fe, Zn, Cu, Mn, Ca and Mg), proximate composition and phytic acid content of flour. Significant decrease in phytate was found during baking of chapattis. Soy hulls supplementation also affects the water absorption dough development time, dough stability time significantly. Chapattis were found acceptable by the panel of judges up to 4.5 per cent supplementation of soy hulls [Anjum FM, Khan MI, Butt MS, Hussain S and Abrar M, Functional properties of soy hulls supplemented wheat flour, Nutr Food Sci, 2006, 36(2), 82-89].
Food

Influence of variety and processing conditions on acrylamide levels in fried potato crisps

The possibility that acrylamide, a known human toxigen, may be formed in the heat-processing of foods was first postulated in Sweden in 2000. The observation went largely unnoticed until the same authors published a study showing relatively high levels of acrylamide in many heat-processed foods. This publication aroused intense international interest, leading to the initiation of a significant research effort around the world. Potato products have been associated with some of the highest levels of acrylamide, partly due to relatively high levels of suspected acrylamide precursors. Although acrylamide is not present in raw potatoes, or formed during boiling, high levels of acrylamide may be formed at the higher temperatures associated with frying and oven-baking. The fact that most commercially produced potato products are subjected to high temperature processing, at some stage, means that potato products have become associated with high acrylamide levels. For that reason, potatoes and potato-like model systems have been the subject of numerous studies of acrylamide formation.

Thus, investigation was carried out by Campden and Chorleywood Food Research Association, Chipping Campden, Gloucestershire, UK to determine the factors of greatest significance for the level of acrylamide formation in fried potato crisps. Factors under investigation were potato variety, the inclusion of a water soak prior to frying, cooking oil type, cooking temperature and cooking time. Data showed that cooking time and temperature had the greatest influence on acrylamide formation. Cooking oil type and soaking were found to be insignificant. Potato variety had a significant effect, with acrylamide levels found to be controlled by the levels of reducing sugars rather than asparagine. In addition, there were indications that the condition of the cooking oil (as indicated by peroxide value) did not affect acrylamide levels [Williams JSE, Influence of variety and processing conditions on acrylamide levels in fried potato crisps, Food Chem, 2005, 90 (4), 875-881].

Egg-shell as catalyst of lactose isomerisation to lactulose

Egg-shell is made up, for the most part, of calcium carbonate with about 39% of elemental Ca and low levels of Al, Pb, Cd and Hg, and may be used as a Ca source in human nutrition. Proteins are mainly recovered by ultrafiltration of whey and milk and the remaining permeate, which contains approximately 5% of lactose, may be used as a source of lactose to produce lactulose. Both egg-shells from egg-breaking operations and milk ultrafiltrate constitute significant waste disposal problems for the food industry, so the development of value-added by-products from this waste is to be welcomed. Therefore, researchers of Madrid, Spain carried out investigations to examine the feasibility of using egg-shell as an alternative catalyst for lactulose production from milk ultrafiltrate. Lactulose (4-O-β-D-galactopyranosyl-D-fructose) has interest for both health-care and food industries.

A feasible way to produce lactulose, employing milk ultrafiltrate as source of lactose and egg-shell as catalyst, is proposed as an alternative means for utilizing these industrial wastes. Influences of catalyst loadings, lactose concentration and pH on lactose isomerisation were studied. Optimal production of lactulose was reached at 98°C, employing 6mg/ml of catalyst loading within 60 min of reaction. Quantities of lactulose of 1.18g/100ml and low levels of secondary products (epi-lactose, galactose and organic acids) were produced under these conditions of reaction. Methodology to remove coloured by-products from lactulose syrup in a range of 65-92% was established.

Thus, egg-shell and milk ultrafiltrate can be employed as raw materials to produce lactulose which may be used as an ingredient in foods, providing an alternative use for these wastes of the food industries. The procedure is simple and a reasonable balance between lactulose production and its degradation is achieved [Montilla A, del Castillo MD, Sanz ML and Olano A, Egg shell as catalyst of lactose isomerisation to lactulose, Food Chem, 2005, 90 (4), 883-890].
Wheat biscuits supplemented with fenugreek flour

Biscuits are convenient food products, becoming very popular among both rural and urban populations of India. Some of the reasons for such wide popularity are low cost among other processed foods, varied taste, easy availability and longer shelf life. The enrichment of protein may be achieved through incorporation of protein-rich non-wheat flours. Among them fenugreek seed flour has a great potential, due to its high and good quality protein (20-25%), lysine (5-6%), soluble (20%) and insoluble dietary fibre and, it also possesses hypocholesterolemic and hypoglycemic properties. Hence, development and consumption of such therapeutic bakery products would help to raise the nutritional status of the population.

Biscuits prepared from the blends containing different proportions (0, 5, 10, 15 and 20%) of raw, soaked and germinated fenugreek [Trigonella foenum-graecum Linn.] seed flour were evaluated by researchers at Department of Foods and Nutrition, CCS Haryana Agricultural University, Hisar, India for width, thickness, spread ratio and sensory characteristics. The thickness of fenugreek supplemented biscuits increased, whereas width and spread ratio of biscuits decreased with the increasing level of fenugreek flour. The sensory results showed that a maximum of 10% fenugreek flour could be incorporated to prepare acceptable quality biscuits. Addition of raw, soaked and germinated fenugreek flour to wheat flour increased the contents of protein (10.5, 10.4 and 11.0%), lysine (2.15, 2.20 and 2.25g/100g protein), dietary fibre (12.7, 11.3 and 10.9%), total Ca (58.3, 57.1, 57.7mg/100g) and total iron (7.40, 7.26 and 7.36mg/100g), respectively, at 10% level of substitution. These biscuits can be safely stored in polypropylene bags up to one month without altering their organoleptic properties.

The physical, sensory and nutritional characteristics, in general, revealed that biscuits containing 10% germinated fenugreek flour were the best among all the composite fenugreek flour biscuits. Hence, development and utilization of such functional foods will not only improve the nutritional status of the general population but also help those suffering from degenerative diseases [Hooda Shalini and Jood Sudesh, Organoleptic and nutritional evaluation of wheat biscuits supplemented with untreated and treated fenugreek flour, Food Chem, 2005, 90(3), 427-435].

Lupin kernel fibre foods improve bowel function

The effect of Australian Sweet Lupin (Lupinus angustifolius Linn.) kernel fibre (LK Fibre) as dietary fibre is unknown hence the researchers at School of Exercise and Nutrition Sciences, Deakin University, Australia examined the effect of a high-fibre diet containing LKFibre on bowel function and faecal putative risk factors for colon cancer compared to a control diet without LKFibre. Thirty-eight free-living, healthy men consumed an LKFibre and a control diet for one month each in a single-blind, randomized, crossover study. Depending on subject energy intake, the LKFibre diet was designed to provide 17-30 g/day fibre (in experimental foods) above that of the control diet. Bowel function self-perception, frequency of defecation, transit time, faecal output, pH and moisture, faecal levels of SCFA and ammonia and faecal bacterial β-glucuronidase activity were assessed. In comparison to the control diet, the LKFibre diet increased frequency of defecation by 0.13 events/day ($P=0.0047$), increased faecal output by 21% ($P=0.020$) and increased faecal moisture content by 1.6% units ($P=0.027$), whilst decreasing transit time by 17% ($P=0.012$) and decreasing faecal pH by 0.26 units ($P<0.001$). Faecal butyrate concentration was increased by 16% ($P=0.006$), butyrate output was increased by 40% ($P=0.002$) and β-glucuronidase activity was lowered by 1.4 µmol/hour/g wet faeces compared to the control diet ($P<0.001$). Addition of LKFibre to the diet incorporated into food products improved some markers of healthy bowel function and colon cancer risk in men [Johnson SK, Chua V, Hall RS and Baxter AL, Lupin kernel fibre foods improve bowel function and beneficially modify some putative faecal risk factors for colon cancer in men, Brit J Nutr, 2006, 95(2), 372-378].
Microwave heating of soybean for detoxification

Soybean is a protein rich food and like other pulses it also contains unusually large number of biologically active substances such as trypsin inhibitor, haemagglutinins and goitrogens, etc. The trypsin inhibitor is one of the toxic constituents occurring naturally in the legumes and reported to exert deleterious effect on the intestinal contents.

The scientists at Institute of Food Technology, Bundelkhand University, Jhansi and Soybean Processing & Utilization Center, Bhopal, India have done preliminary studies to develop pilot scale microwave processing equipment to produce detoxified soybean which could be used for cottage level processing. Among the heat labile antinutrients trypsin inhibitor activity is required to be reduced below 10%. The urease activity which is also one of the antinutrient of soybean is required to be reduced to 0.05. Since, estimation of urease activity is analytically simple, it was considered as an index for detoxification in their present study. The microwave heating experiment was conducted using 17litre capacity rotating platform domestic microwave oven. The microwave detoxification was considered to be optimum when urease activity was reduced below 0.05 pH units. The average time required at 100, 200 and 300 g/cm² spreading density were 7.3, 9.3 and 14 minutes, respectively. It was also found that the pre-treatments like soaking in hot or cold water or in NaHCO₃ solution did not have significant effect on the detoxification time by microwave heating. Colour of detoxified full fat Soyflour samples obtained by different methods was measured by Hunter Spectro Colorimeter in terms of ‘L’, ‘a’ and ‘b’ values which showed no significant variation from control [Saxena Alok, Chaturvedi Brijesh, Patil RT and Sinha LK, Impact of microwave heating on detoxification of soybean, Beverage Food World, 2006, 33(3), 58-61].

Chhana (Paneer) production by ultrafiltration

In India about 50 to 55 per cent milk is not consumed directly but in the form of various other products. Chhana, a heat and acid-coagulated milk product, is used as a base material for making sweetmeats. The scientists at National Dairy Research Institute, Karnal, Haryana, India have done investigations to make good quality Chhana and some important Chhana based sweets using ultrafiltration (UF) process.

During experiment cow skim milk was ultrafiltered and diafiltered to an optimum 23.88% TS. The required quantity of 63-65% fat fresh cream was then added to the UF retentate for standardization of fat. The UF Chhana prepared from this UF retentate mixture employing traditional approach (Heat treatment at 90°C/5 min and coagulation with 10% citric acid at 70°C and pH 5.5) was observed to be harder, retaining lesser moisture and unsuitable for sweet making (Rasogolla and Sandesh). Lowering of coagulation temperature (60, 50 and 40°C) improved the softness in UF Chhana to some extent, but lower temperature of coagulation significantly (P<0.05) increased total solid losses in whey. An innovative new approach i.e. addition of coagulant to UF retentate mixture at room temperature and then heating to coagulation temperature, optimum being 60°C, resulted in production of desired softer Chhana with higher moisture content, suitable for making sweets (Rasogolla and Sandesh), along with higher yield (12.92%) and higher total solid recovery (10.89%) than in traditional Chhana and lesser total solid losses in whey compared to when UF Chhana was prepared using traditional approach. Slow stirring (60-80 rpm) during heating and coagulation of UF retentate mixture yielded lower moisture (54.53%) content in Chhana compared to 56.93% moisture with rapid stirring (130-150 rpm). Standardized UF Chhana met PFA standards and was comparable to traditional Chhana organoleptically. Rasogolla and Sandesh, prepared with modified process from UF Chhana, scored liked moderately to liked very much on sensory evaluation [Kumar J, Gupta Vijay Kumar and Patil GR, Studies on improvement of Chhana production using ultrafiltration process, Indian J Dairy Sci, 2005, 58(3), 62-168].
Effect of extraction rate of wheat flour on the quality of vermicelli

Normally vermicelli is made using refined wheat flour (wheat flour - 129 µ) or semolina (450 µ) milled out of durum wheat (*Triticum aestivum Linn*). Several varieties of Indian durum wheat have been used to study the suitability for semolina milling and vermicelli preparation. The composition of flours varies with the extraction rate. With an increase in the extraction rate, the protein content, fibre, sugar, lipids and mineral matter increases whereas the starch decreases.

In order to develop newer varieties of vermicelli with improved nutritional quality, studies were carried out at Central Food Technological Research Institute, Mysore, India on the quality of vermicelli as influenced by different extraction rate of wheat flour, from 66% to 100%. Chemical and rheological studies carried out showed considerable variation among the flours. With increase in extraction rate, the water absorption of the vermicelli dough increased from 35% to 42.5%. There was no significant difference in the colour of vermicelli when extraction rate was increased from 66% to 80%. However, a further increase made the vermicelli more brownish. The cooking quality of vermicelli made from different extraction rate flour of wheat showed reductions in cooked weight from 420% to 315%, and increase in solid loss during cooking from 8% to 10.5%, with increase in extraction rate. The solid loss during cooking was reduced by the addition of 0.25% glycerol mono-stearate and 0.25% of sodium stearoyl lactylate, whereas the water uptake increased. Addition of 2% gluten strengthened the strands and reduced surface stickiness. The results showed the possibility of making vermicelli from either 100% extraction rate flour or whole-wheat flour, which could be a product of better nutritional value [Vetrimani R, Sudha ML and Rao P Haridas, Effect of extraction rate of wheat flour on the quality of vermicelli, *Food Res Int*, 2005, 38(4), 411-416].

Effect of heat-moisture treated maize starch on the properties of dough and bread

Twenty percent of wheat flour was substituted with heat-moisture treated maize starch (HMT-M) or native maize starch (N-M), and the dough properties and the bread qualities were studied by researchers at Laboratory of Food Chemistry, Graduate School of Agriculture and Biological Sciences, Osaka Prefecture University, Gakuen-cho, Sakai, Japan. Bread was baked with optimum [farinograph water absorption (63.0-66.4%)], 70 and 75% of water in the presence or absence of shortening. Elasticity of the dough with HMT-M decreased as compared with that of N-M and the control (without any maize starches) as measured by farinograph. Differential scanning calorimetry (DSC) and visco graph results showed that HMT-M hardly swelled and gelatinized in the dough. Specific volume of bread and softness of crumb baked with optimum water absorption decreased by the substitution of HMT-M. Bread quality containing HMT-M was improved at 70% water absorption as compared with optimum water absorption. Addition of around 5% of water more than the optimum farinograph water absorption improved the loaf volume and softness of crumb. By addition of shortening, the loaf volume of bread baked with HMT-M increased and the crumb grain structure became fine. However, the firmness of crumb baked with HMT-M in the presence or absence of shortening was the same. As a result, HMT-M is still needed to study further for its application in breadmaking [Miyazaki Megumi and Morita Naofumi, Effect of heat-moisture treated maize starch on the properties of dough and bread, *Food Res Int*, 2005, 38 (4), 369-376].
Physicochemical, cooking, textural and roasting characteristics of chickpea cultivars

The seeds of Bengal gram or Chickpea, *Cicer arietinum* Linn. (Hindi — *Channa*), are widely used in India as a pulse and its flour for various preparations. It is considered to be a nutritive pulse having rich quantity of protein. The scientists at Department of Food Science and Technology, Guru Nanak Dev University, Amritsar, India evaluated the physicochemical (seed weight, seed volume, hydration capacity, hydration index, swelling capacity and swelling index), cooking, instrumental textural (hardness, cohesiveness, gumminess, springiness, chewiness and fracturability) and roasting (puffing capacity, puffing index and expansion index) characteristics and their relation to each other. During experiment seeds of five desi types (‘PBG-1’, ‘PDG-4’, ‘PDG-3’, ‘GL-769’ and ‘GPF-2’) and one kabuli type ‘L-550’ chickpea cultivars were evaluated. Significant variation in physicochemical, cooking, textural and roasting properties was observed among different chickpea cultivars. The results showed that cultivars having higher seed weight and volume had higher cooking time, swelling capacity and hydration capacity. The interrelationships between roasting characteristics of seeds from different chickpea cultivars showed a significant negative correlation of puffing capacity, puffing index and expansion index with seed weight, volume, swelling and hydration capacity. The kabuli chickpea cultivar was observed to have poor roasting and textural properties. Swelling and hydration capacity correlated well with cooking time, springiness and hardness of soaked chickpea seeds. Cooking time had a positive correlation with hardness and gumminess and a negative correlation with springiness. It was also observed that cultivars with high fat and carbohydrate and low fibre content had high soaked-seed hardness [Kaur Maninder, Singh Narpinder and Sodhi Navdeep Singh, Physicochemical, cooking, textural and roasting characteristics of chickpea (*Cicer arietinum* Linn.) cultivars, *J Food Eng*, 2005, 69(4), 511-517].

Glycemic and insulminemic responses in women consuming extruded *Amaranthus cruentus* Linn. seeds

Amaranth leaves and grain possess good nutritional and functional values. Snack foods with good acceptance and high nutritive value have been developed by extrusion cooking of the defatted flour obtained from milling the grain. Amaranth snack foods also present characteristics such as cholesterol-lowering effects in hypercholesterolemic rabbits, protein of high biologic value and high bioavailability of calcium, zinc and magnesium. Amaranth has also become popular among patients with celiac disease because it does not cause allergic reactions in the intestinal mucosa. However, the high prevalence of diabetes mellitus among these patients and vice-versa, is also reported.

The nutritionists at Brazil studied the effect of consuming extruded amaranth on physiological response, the glycemic index and insulminemic response among women in relation to a reference food (white bread). They investigated the starch digestibility of an extruded amaranth product. The responses of women to amaranth gave rise to a mean glycemic index of 107 and an insulminemic curve that indicated greater capacity to stimulate insulin production. This digestion profile was probably due to the drastic processing, that the amaranth grain had been subjected to, which provided suitable conditions for enzyme attack. Because of its fast digestion, such amaranth snacks are recommended for athletes and when consumed by diabetic patients with celiac disease should be assessed in a dietary program [Guerra-Matias, Andrea C and Arêas José AG, Glycemic and insulminemic responses in women consuming extruded amaranth (*Amaranthus cruentus* Linn.), *Nutr Res*, 2005, 25(9), 815-822].
Peanut skin extract effect on quality and storage stability of beef products

Precooked and restructured food products especially meat preparations are quite susceptible to lipid oxidation and off-flavour development. The rancidity and/or warmed-over flavour caused by lipid oxidation in precooked meat also causes great challenges to the meat industry. Various synthetic antioxidants like BHA (butylated hydroxyanisole), BHT (butylated hydroxytoluene), glycine, propyl gallate, etc. and some spices and their extracts, such as sage, rosemary or cloves are used as antioxidant. Peanut skins are a low-value by-product of peanut processing operations and they have been found to contain significant levels of natural antioxidants. The researchers at Department of Food Science and Technology, Virginia Polytechnic Institute and State University, Blacksburg, United States evaluated the effects of peanut skin extracts on oxidation, colour, texture and microbiological growth in ground beef and ground beef cooked with and without salt, phosphate (STP) and nitrite/erythorbate. Cooking loss, microbial growth, aroma acceptability and texture were also examined.

For experiment the phenolic antioxidants were extracted from skins using methanol. Peanut skins (120g) were shaken overnight with 1200ml of methanol at room temperature. The skins were removed by a coarse screening (3.0mm screen opening). The extract was centrifuged at 5500g (3°C) for 30min and then the supernatant was collected and filtered (Whatman No. 1). The extract was concentrated (evaporating methanol) to about 80ml (7% of original value) using an Evapotec Rotary Film Evaporator. The evaporator was set at 40rpm with the water bath held at 45ºC and vacuum at –600kpa. The concentrated extract was placed in centrifuge tubes and stored in a freezer (−10°C) overnight to let most of fat solidify. The extract was centrifuged again at 3000g (2°C) for 20min and then the tubes were placed in the freezer. The fat was removed after fat chunk was formed (about 10 hours). The colour of the final extract solution was dark red due to the pigments from peanut skins.

The most significant reduction in oxidation was in ground beef or samples with salt, followed by phosphate (STP) or nitrite/erythorbate. Because of their low effective concentrations (200ppm), the extracts did not cause colour change (P>0.05) of the products. The extracts had no effect (P>0.05) on sensory aroma. The phenolic extract from peanut skin had no effect (P>0.05) on the cooking loss of the ground beef as well as the cured and uncured formulated products. The microbial growth in fresh ground beef was not affected (P<0.05) by the phenolic extract [Keefe, O’and Wang H. Effects of peanut skin extract on quality and storage stability of beef products, Meat Sci, 2006, 73(2), 278-286].

Antioxidant activity of legume phenolic compounds

Legumes contain several phenolic compounds which are considered to be natural antioxidants and may prevent the development of many diseases such as atherosclerosis and cancer.

The scientists at Instituto de Fermentaciones Industriales, Madrid, Spain studied the effects of varying germination conditions for beans (Phaseolus vulgaris Linn., cultivar ‘La Granja’), Beans lentils (Lens culinaris Linn., cultivar ‘Castellana’) and peas (Pisum sativum Linn., cultivar ‘Elsa’) at semi-pilot scale, on bioactive compounds such as flavonoid and non-flavonoid phenolic compounds. It has also evaluated the free radical scavenging activity of these samples. The legumes studied contain different hydroxybenzoic acids and aldehydes, hydroxycinnamic acids and derivatives, flavonol glycosides, and flavan-3-ols and procyanidins. The results indicated that germination modifies the quantitative and qualitative phenolic composition of legumes and the changes depend on the type of legume and the germination conditions. These changes influence the functional properties of the legumes as consequence of the variation in antioxidant activity. Peas and beans undergo a significant increase in antioxidant activity after germination, whereas lentils show a decrease [López-Amorós ML, Hernández, T and Estrella I. Effect of germination on legume phenolic compounds and their antioxidant activity, J Food Comp Anal, 2006, 19(4), 277-283].
Energy conservation in domestic rice cooking

India ranks second in the world production of rice, a major cereal crop next to wheat and maize. The cooking process and the choice of cooked rice texture are different from place to place. However, Indian preference is for medium grain with fluffy, light individual kernel of rice with cooked flavour and without hard core. The two important variables in rice cooking are the amount of water and the control of heating. The water-to-rice ratio is important in keeping the cooked rice from being either too hard or too soft. Presoaking is a simple technique that offers great savings (energy and cooking time) in cooking stored or freshly milled rice. However, cooking rice without presoaking is the general practice in many parts of the world. While presoaking needs to be promoted as an energy conservation measure, there is a necessity to look for further saving in energy.

The researchers at Central Food Technological Research Institute, Mysore, India and Tezpur University, Assam, India carried out investigations to optimize the energy requirements in rice cooking by controlling the cooking conditions in the domestic cooking appliances such as electric rice-cooker and pressure cooker. During experiment one lot (100 kg) of milled B.T. ‘Bangara Thigadu’ variety rice was procured from the local market and stored in a refrigerator at 4°C and the required quantity of rice was taken out as and when necessary for the experimental work. The moisture content of the raw rice was 12.8% (w.b.) as determined by oven dry method (105°C for 24 hours). Experiments were conducted to measure the energy consumption during normal and controlled cooking of both unsoaked and presoaked rice using two types of domestic cooking appliance, namely, an electric rice cooker and a pressure cooker. Cooking rice with controlled energy input, under pressure and with presoaking were the three approaches, which resulted in saving of energy. Electric rice cooker was found to be the most energy-efficient among the different combinations of cooking appliance and the types of heat source used in the study. The energy consumption was much less (23-57%) compared to other methods. Prior soaking of rice generally reduced energy consumption as well as cooking time, more prominently during normal cooking. Controlled cooking offered more savings in energy compared to presoaking rice. Considering the energy consumption and cooking time, controlled cooking of presoaked rice was found to be the best among the several approaches investigated. Measurement of water evaporation loss appears to be a good indirect method of assessing the efficiency of heat utilization. Controlled energy input is another useful method that optimizes the energy utilization for cooking, besides presoaking and pressure cooking. Controlled cooking is desirable in all types of rice cooking [Das Tribeni, Subramanian R, Chakkaravarthi A, Singh Vasudeva, Ali SZ and Bordoloi PK, Energy conservation in domestic rice cooking, J Food Eng, 2006, 75(2), 156-166].

Fruit

Commercial scale drying of Aonla

In traditional system dry aonla (Emblica officinalis Gaertn.) is used in large quantities for various medicines and cosmetics preparation. Therefore, for commercial production of dry aonla adequate processing is very essential for getting good quality and earn more money. The scientists at college of Dairy and Food Science Technology, Maharana Pratap University of Agriculture and Technology, Udaipur, India have developed a new approach for drying of aonla. This approach includes installation of an aonla Shredder unit and a Solar Tunnel dryer. They evaluated design specifications and performance of different devices used in drying the pulp of aonla. An integrated approach to use aonla in efficient manner has been developed, which include different unit operations, viz. removing seeds from aonla fruit through shredder stones extractor machine and drying of one tonne of aonla pulp in Solar Tunnel dryer. [Rathore NS, Jhala AS and Vijayvargiya Jully, New approach for drying of Aonla on commercial scale, Beverage Food World, 2006, 33(3), 50-53].