upon changing wood flour size or type. In both cases, on average, there were often slightly better results with the samples which had underwent a drying pre-treatment. The increased rigidity was confirmed also by the impact tests, even though it decreased upon increasing the WF content. The heat deflection temperature followed the same trend as the elastic modulus. The immersion tests suggested that these materials are not suitable to prolonged contact with water. Humidity absorption tests revealed that the matrix plays a fundamental role in humidity absorption [Morreale M, Scaffaro R, Maio A and La Mantia FP, Effect of adding wood flour to the physical properties of a biodegradable polymer, _Composites A: Appl Sci Manuf_, 2008, _39_ (3), 503-513].

**Food**

**Toasting of corn flakes: Product characteristics as a function of processing conditions**

Toasting of corn flake is an important processing step that shows the attributes of the finished product with particular reference to consumer acceptability. The researchers at Central Food Technological Research Institute, Mysore, India evaluated the effect of important toasting variables such as moisture content, temperature and time of toasting of corn flakes on quality attributes, employing response surface methodology (RSM). A central composite experimental design consisting of five coded levels (-1.682, -1, 0, 1 and 1.682) of each independent variables has been employed. The response functions are thickness of flake, bulk density, puncture force, colour parameters and the sensory overall acceptability. Further, the changes in the microstructure of the flakes have been monitored. The energy expenditure during the toasting process was also determined and 721-746J/g of energy was required to have properly toasted flakes. These response functions can be correlated (\( \gamma \geq 0.82, \rho \leq 0.01 \)) with the independent variables by second order polynomials consisting of linear, quadratic and interaction terms. The effect of temperature and time usually dominates over the moisture content for toasting of corn flakes. Optimum conditions for achieving best puffing and overall acceptability have been obtained [Sumithra B and Bhattacharya Sila, Toasting of corn flakes: Product characteristics as a function of processing conditions, _J Food Eng_, 2008, _88_(3), 419-428].

**Grinding characteristics and batter quality of rice in different wet grinding systems**

The scientists at Department of Food Engineering and Department of Grain Science and Technology, Central Food Technological Research Institute, Cheluvamba Mansion, Mysore, Karnataka, India and Centre for Food Technology, Jiwaji University, Gwalior, Madhya Pradesh, India evaluated grinding characteristics of raw and parboiled rice in various wet grinding systems, namely, mixer grinder, stone grinder and colloid mill. The duration of grinding had inverse impact on the particle size and direct impact on the starch damage as well as energy consumption in batch grinders. Stone grinder was the least energy efficient and specific energy consumption for grinding raw rice (160.6kJ/kg) was nearly twice as that of mixer grinder (74.9kJ/kg). Parboiled rice required longer duration of grinding compared to raw rice, consequently specific energy consumption was higher (\( \sim 220kJ/kg \)). All the three classical laws of grinding (Kick’s, Rittinger’s and Bond’s) seemed to be applicable while Rittinger’s law showed better suitability than the other two followed by Bond’s law. Predominant compressive forces involved in stone grinder reflected in higher starch damage in batter. Parboiled rice slurry exhibited much greater viscosity than raw rice but both displayed non-Newtonian pseudoplastic behaviour [Pankaj Sharma, A Chakkavarthi, Vasudeva Singh and R Subramanian, Grinding characteristics and batter quality of rice in different wet grinding systems, _J Food Eng_, 2008, _88_(4), 499-506].
Grass pea starch as an alternative for cereal starches

The scientists at Agricultural University, Balicka Poland compared selected rheological properties of starch isolated from two cultivars of grass pea (*Lathyrus sativus* Linn.) with those of wheat and corn starch. The phase transition temperatures on pasting (*T_O, T_P, T_E*) of both grass pea starches were lower in comparison to normal corn starch, but higher when compared to wheat starch. Pasting temperature of the starch slurries were significantly lower for grass pea as compared to cereals, and paste viscosity of grass pea starch was significantly higher than of wheat starch. Grass pea starches, exhibit much higher values of storage and loss moduli during heating of starch suspensions. Higher values of shear stress as a function of shear rate obtained during the determination of flow curves for grass pea starch pastes are confirmed by high consistency coefficients in the Herschel-Bulkley model. The mechanical spectra of starch gels are confirmed by high consistency coefficients in the Herschel-Bulkley model. The mechanical spectra of starch gels allow us to state, that grass pea starch gels are characterised by higher values of storage and loss moduli in comparison to cereal starches [Korus Jaroslaw, Witczak Mariusz, Juszczak Leslaw and Ziobro Rafal, Grass pea (*Lathyrus sativus* Linn.) starch as an alternative for cereal starches: Rheological properties and retrogradation susceptibility, *J Food Eng*, 2008, 88(4), 528- 534].

Effect of flaxseed gum addition on rheological properties of native maize starch

The scientists at China Agricultural University, China and Middle East Technical University, Ankara, Turkey carried out both small amplitude oscillatory and steady shear measurements at 25, 50 and 75°C in order to determine the rheological properties of the mixtures of flaxseed gum (0.1-0.5%) and native maize starch (3%). It was found that the apparent viscosities of the samples increased with the increasing of flaxseed gum concentration. The apparent viscosities of the samples were fitted well to the power law model (the values of *R^2* were between 0.954 and 0.999). The consistency index (*K*) of the gum-starch mixtures increased with the increasing of flaxseed gum concentration. The gum-starch mixtures showed gel-like behaviour since the storage modulus (*G'*) was much larger than the loss modulus (*G'*) and the frequency dependence of both moduli was not significant. The *G'" and G"* of the gum-starch mixtures was increased with the increasing of flaxseed gum concentration. The influence of temperature was more significant for the flaxseed gum-maize starch mixtures compared to maize starch gel [Wang Yong, Wang Li-Jun, Li Dong, Özkan Necati, Dong Chen Xiao and Mao Zhi-Huai, Effect of flaxseed gum addition on rheological properties of native maize starch, *J Food Eng*, 2008, 89(1), 87-92].

Synergistic effect of vitamin B<sub>1</sub> on sanitizer and disinfectant treatments for reduction of coliforms in rice

Rice (*Oryza sativa* Linn.) is the principle food for more than 40% of the world population. Rice has been used in processed foods such as a cakes, gruels, snacks, beverages and alcoholic drinks for many years. The synergistic bactericidal effect of vitamin B<sub>1</sub> (thiamin dilauryl sulfate) and the efficacy of commercial sanitizers and disinfectants for minimization of the contamination of total mesophilic bacteria and coliforms in rice were investigated by scientists of Republic of Korea. Water-treated rice exhibited a 0.7 log<sub>10</sub> CFU/g reduction in both total mesophilic bacteria and coliforms. Reduction in sanitizer-treated rice was greater than for water-treated rice and reduction in sanitizer-treated rice with vitamin B<sub>1</sub> was even greater than for sanitizer-treated rice. Coliforms in cooked rice after treatments with 5000 ppm hydrogen peroxide with 1000 ppm vitamin B<sub>1</sub>, 100 ppm chlorine with 800 ppm vitamin B<sub>1</sub>, 150 ppm chlorine with 500 ppm vitamin B<sub>1</sub>, 200 ppm chlorine with 100 ppm vitamin B<sub>1</sub>, and finally 100,000 ppm ethanol with 800 vitamin B<sub>1</sub> were completely eliminated. The sensory properties of the above-mentioned sanitizer-treated cooked rice did not differ significantly from the same properties for water-treated cooked rice [Lee Min Jeong and Ha Sang-Do, Synergistic effect of vitamin B<sub>1</sub> on sanitizer and disinfectant treatments for reduction of coliforms in rice, *Food Control*, 2008, 19(2), 113-118].
Effect of carboxymethylcellulose and pregelatinized corn starch on the quality of Amaranthus spaghetti

The scientists at Foggia, Italy produced six gluten-free spaghetti typologies in base of Amaranthus flour, using two types of gluten substitutes, carboxymethylcellulose sodium salt (CMC) at three different percentages, 0.1% (LCMC), 0.2% (MCMC), 0.3% (HCMC) and pregelatinized corn starch (PCS) at three different percentages, 5% (LPCS), 7% (MPCS), 9% (HPCS). The Amaranthus spaghetti was compared with a control spaghetti sample of durum semolina (CTRL). Some tests were also conducted on the samples to determine breakage susceptibility by water sorption kinetics, cooking loss, the cooking resistance by fitting the values of elastic modulus, instrumental stickiness and sensory analysis. The spaghetti obtained from Amaranthus flour containing CMC and PCS showed breakage susceptibility higher than that of the CTRL, while they showed a cooking resistance equal or lower with respect to the CTRL. The spaghetti with CMC had a lower stickiness, equal values of cooking loss and similar values of sensory attributes with respect to that of the CTRL. For the spaghetti containing PCS, the cooking loss values were higher and the sensorial attributes were lower with respect to that of the CTRL and of the spaghetti containing CMC. Moreover, the stickiness values for the spaghetti samples with PCS increased as the pregelatinized corn starch concentration increased. From the result it emerged that spaghetti samples containing CMC presented better performances especially in cooking with respect to the spaghetti samples with PCS [Chillo S, Laverse J, Falcone PM and Del Nobile MA, Effect of carboxymethylcellulose and pregelatinized corn starch on the quality of Amaranthus spaghetti, J Food Eng, 2007, 83(4), 492-500].

Inhibition of Bacillus cereus by lactic acid bacteria starter cultures in rice fermentation

Chinese fermented rice noodle is one of local delicious instant foods consumed mainly as breakfast and snack in south of China and also exported to Southeast Asian and European countries. Contamination by Bacillus cereus occasionally develops in Chinese fermented rice noodle products. In a study by researchers at China, B. cereus at two different concentrations were artificially added to rice fermentation tank to check if its growth might be inhibited by natural mixed lactic acid bacteria (LAB) starters in rice fermentation, B. cereus YSP-A3-2 was artificially added together with LAB starters by inoculation just before the fermentation process. The decrease of pH from 6.8 to 4.0 took place during the first 8 hours and pH stayed under 4.0 during the rest of fermentation process in both the concentrations of B. cereus (10^3 cfu/ml and 10^4 cfu/ml) tested, which decreased to 10^2 cfu/ml and 10^3 cfu/ml final concentration, respectively. The results suggest that the occasional contamination by B. cereus could be inhibited by the natural LAB starter, which was used in Chinese rice noodle factory by the back-slopping way [Yang Yong, Tao Wen-Yi, Liu Ye-Jia and Zhu Feng, Inhibition of Bacillus cereus by lactic acid bacteria starter cultures in rice fermentation, Food Control, 2008, 19 (2), 159-161].

Bread from composite cassava–wheat flour

There is an increasing interest in the use of cassava roots for food and industrial purposes especially in the baking industry in Nigeria. Development of some cassava mosaic disease (CMD) resistant clones and application of inorganic fertilizers are principal strategies targeted in the country to boost and sustain cassava root production and
utilization. A study was conducted by researchers at Nigeria to determine the effect of cassava genotype and field application of nitrogen fertilizer on some physical properties of bread from composite cassava-wheat (CCW) flour. Five CMD cassava clones were planted in a randomized complete block design with two level of fertilizer treatments (0 and 160kg nitrogen/ha) with two replications while harvesting was done 12 months after planting. Composite flour was produced at a ratio of 10/90 (cassava/wheat flour, w/w). The oven spring, specific volume, crumb texture (softness) and crumb moisture of loaves ranged from -0.57 to 0.63cm, 4.37 to 6.85cm$^3$/g, 18.4 to 29.4mm and 31.40% to 34.70%, respectively. The crust’s tristimulus colour parameters $L^*$, $a^*$, $b^*$ and brownness index also ranged from 54 to 67, 9 to 15, 22 to 29, and 57 to 83, respectively. These values differed significantly from each other at $p<0.01$. Out of all these loaf properties, crumb texture was the most affected by the main and interactive effects of cassava genotype and fertilizer application ($p<0.001$) while loaf weight was only affected by their interactive effects ($p<0.05$). Digital image analysis of the bread crumb showed that the total number of cells, number of small cells and total cell area of the bread crumb ranged from about 22 to 27cm$^3$, 20 to 25cm$^3$ and 12 to 29%, respectively. The distribution of large cells and total cell area occupied in the crumb were principally determined by the genotypic difference ($p < 0.05$) in the cassava roots. The main effect of fertilizer application significantly affected the distribution of small cells, total number of cell and the cell area ($p<0.05$). However, the interactive effects of genotype and fertilizer application was more significant ($p<0.01$) on the crumb cell characteristics. The study indicated that optimal quality of CCW bread loaf could be attained by appropriate selection of cassava genotype and fertilizer application. This study has been able to establish that careful selection of cassava root variety and application of fertilizer are important factors that should be considered in optimizing composite cassava-wheat bread quality [Shittu TA, Dixon A, Awonorin SO, Sanni LO and Maziya-Dixon B, Bread from composite cassava–wheat flour. II: Effect of cassava genotype and nitrogen fertilizer on bread quality, Food Res Int, 2008, 41(6), 569-578].

Influence of processing steps in cold-smoked salmon production on survival and growth of *Listeria monocytogenes*

Cold-smoked salmon is a ready-to-eat product in which *Listeria monocytogenes* sometimes can grow to high numbers. The bacterium can colonize the processing environment and it is believed to survive or even grow during the processing steps. The purpose of the study conducted by scientists at National Institute of Aquatic Resources, Technical University of Denmark, Lyngby, Denmark was to determine if the steps in the processing of cold-smoked salmon affect survival and subsequent growth of a persistent strain of *L. monocytogenes* to a lesser degree than presumed non-persistent strains. They used a sequence of experiments increasing in complexity: (i) small salmon blocks salted, smoked or dried under model conditions, (ii) fillets of salmon cold-smoked in a pilot plant and finally, (iii) assessment of the bacterial levels before and after processing during commercial scale production. *L. monocytogenes* proliferated on salmon blocks that were brined or dipped in liquid smoke and left at 25°C in a humidity chamber for 24 hours. However, combining, brining and liquid smoke with a drying (25°C) step reduced the bacterium 10-100 fold over a 24 h period. Non-salted, brine injected or dry salted salmon fillets were surface inoculated with *L. monocytogenes* and cold-smoked in a pilot plant. *L. monocytogenes* was reduced from 10$^3$ to 10-10$^2$ CFU/cm$^2$ immediately after cold-smoking. The greatest reductions were observed in dry salted and brine injected fillets as compared to cold-smoking of non-salted fresh fillets. Levels of *L. monocytogenes* decreased further when the cold-smoked fish was vacuum-packed and stored at 5°C. A similar decline was seen when inoculating brine injected fillets after cold-smoking. High phenol concentrations are a likely cause of this marked growth inhibition. In a commercial production facility, the total viable count of salmon fillets was reduced 10-1000 fold by salting, cold-smoking and process-freezing (a freezing step after smoking and before slicing). The prevalence of *L. monocytogenes* in the commercial production facility was too low to determine any quantitative effects; however, one of nine samples was positive before processing and none after.
together, the processing steps involved in cold-smoking of salmon are bactericidal and reduce, but do not eliminate \( L.\ monocytogenes \) [Cisse Hedegaard Porsby, Birte Fonnesbech Vogel, Mona Mohr and Lone Gram, Influence of processing steps in cold-smoked salmon production on survival and growth of persistent and presumed non-persistent \( Listeria\ monocytogenes\), \textit{Int J Food Microbiol}, 2008, \textbf{122}(3), 287-295].

Use of nisin-coated plastic films and potential antimicrobials to control \( Listeria\ monocytogenes\) on vacuum-packaged cold-smoked salmon

The researchers at Department of Animal & Food Sciences and Department of Marine & Earth Studies, University of Delaware, DE, United States carried out studies and highlighted the potential for incorporating nisin into plastic films for enhancing the microbial safety of smoked salmon as well as controlling its microbial spoilage. Cold-smoked (\textit{Salmo salar}) salmon samples were surface-inoculated with a cocktail of three nisin-resistant strains of \( L.\ monocytogenes\) (PSU1, PSU2 and PSU21) to a level of approximately \( 5 \times 10^2 \) or \( 5 \times 10^5 \) CFU/cm\(^2\) of salmon surface. The inoculated smoked salmon samples were vacuum-packaged with control film (no nisin) or nisin-coated plastic films and stored at either 4 or 10°C. When the inoculated smoked salmon samples were packaged with film coated with 2000 IU/cm\(^2\) of nisin, a reduction of 3.9 log CFU/cm\(^2\) (compared with control) was achieved at either temperature for samples inoculated with \( 5 \times 10^2 \) CFU/cm\(^2\) of \( L.\ monocytogenes\) after 56 (4°C) and 49 (10°C) days of storage while reductions of 1.8 and 0.8 log CFU/cm\(^2\) were achieved for samples inoculated with high level of \( L.\ monocytogenes\) after 58 (4°C) and 43 (10°C) days, respectively. In addition, nisin inhibited the proliferation of background microbiota on smoked salmon in a concentration-dependent manner at both storage temperatures although the bacteriostatic effect was more pronounced at refrigeration temperature.

The minimum inhibitory concentrations (MICs) of nisin and salts of organic acids [sodium lactate (SL), sodium diacetate (SD), sodium benzoate (SB) and potassium sorbate (PS)] against twelve strains of \( L.\ monocytogenes\) in a TSBYE broth medium at 35°C were also determined by these researchers. The MICs were strain-dependent and fell in the range of 0.00048-0.00190% for nisin, 4.60-5.60% for SL, 0.11-0.22% for SD, 0.25-0.50% for SB and 0.38-0.75% for PS, respectively. The two most antimicrobial-resistant strains were used as a cocktail in the following experiments to represent a worst case scenario. The five antimicrobials alone and in binary combinations were screened for their efficacy against the two-strain cocktail in TSBYE at sub-MIC and sub-legal levels at 35°C. Seven effective antimicrobial treatments were then selected and evaluated for their long-term antilisterial effectiveness in cold-smoked salmon pâté and fillets during refrigerated storage (4°C) of 3 and 6 weeks, respectively. The two most effective antimicrobial formulations for smoked salmon pâté, 0.25% SD and 2.4% SL/0.125% SD, were able to inhibit the growth of \( L.\ monocytogenes\) during the 3 weeks of storage. Surface application of 2.4% SL/0.125% SD was the most effective treatment for smoked salmon fillets which inhibited the growth of \( L.\ monocytogenes\) for 4 weeks. These antimicrobial treatments could be used by the smoked salmon industry in the U.S. and Europe in their efforts to control \( L.\ monocytogenes\) as they are effective against even the most antimicrobial-resistant strains tested in this study [Neetoo Hudaa, Ye Mu, Chen Haijiang, Joerger Rolf D, Hicks Doris T and Hoover Dallas G, Use of nisin-coated plastic films to control \( Listeria\ monocytogenes\) on vacuum-packaged cold-smoked salmon, \textit{Int J Food Microbiol}, 2008, \textbf{122}(1-2), 8-15; Neetoo Hudaa, Ye Mu and Chen Haiqiang, Potential antimicrobials to control \( Listeria\ monocytogenes\) in vacuum-packaged cold-smoked salmon pâté and fillets, \textit{ibid}, 2008, \textbf{123} (3), 220-227].
Physico-chemical properties of the flours and starches of two cowpea varieties \([Vigna unguiculata \text{ (Linn.) Walp}]\)

The physical and chemical properties of the starches and flours of whole grain and decorticated two cowpea varieties \([Vigna unguiculata \text{ (Linn.) Walp}]\) were investigated by researchers at Institute für Gartenbauwissenschaft, University of Bonn, Bonn, Germany and Central Food Technological Research Institute, Mysore, India. The two cowpea varieties were: ‘C-152-White’, having big grain and ‘S-1552-White’, having small grain with black eye. Results showed that starch yields were 19.2 and 16.4g/100g food grain for ‘C-152’ and ‘S-1552’, respectively. Statistical analysis shows that the total amylose contents of the starch of the two cowpea varieties were significantly higher \((P\leq 0.05)\) than that of the whole grain and decorticated flours. The swelling power of ‘C-152’ starch was significantly higher than that of ‘S-1552’ starch. The water-binding capacity \((\text{WBC})\) for ‘S-1552’ starch was higher than for ‘C-152’ starch. The results of pasting profile of both the flour and the starch showed that the two cowpea varieties possess different properties in relation to gelatinization temperature, peak viscosity, hot paste viscosity, cold paste viscosity, break down, set back, total set back and relative breakdown. The information generated in this study on the properties of the starch could provide guidance on possible industrial uses of starches of these two varieties [Adebooye Odunayo Clement and Singh Vasudeva, Physico-chemical properties of the flours and starches of two cowpea varieties \((Vigna unguiculata \text{ (L.) Walp})\), Innov Food Sci Emerg Technol, 2008, 9(1), 92-100].

Modeling dehydration and rehydration of cooked soybeans subjected to combined microwave-hot-air drying

Pre-cooked soybeans were subjected to convective hot-air, microwave and combined microwave-hot-air dehydration by researchers at Ireland. Three microwave levels \((210, 300, 560 \text{ W})\) and three air temperatures \((160, 180, 200^\circ\text{C})\) were examined. Drying kinetics, rehydration kinetics and colour change were investigated relative to microwave level and air temperature. Combined microwave-hot-air drying decreased the drying time required when compared to drying with either hot-air or microwave energy alone. Predictive models were developed to describe dehydration and rehydration kinetics. Dehydration rate, rehydration rate and total colour change of dehydrated product generally increased with microwave level and air temperature. Within the studied range, optimal drying occurred for the lowest levels of both microwave and air temperature studied, i.e. microwave power=210W, air temperature=160°C. Therefore, application of combined microwave-hot-air drying to pre-cooked soybeans resulted in significant saving in process time, while also producing a dehydrated product with fast rehydration properties [Gowen AA, Abu-Ghannam N, Frias J and Oliveira J, Modeling dehydration and rehydration of cooked soybeans subjected to combined microwave–hot-air drying, Innov Food Sci Emerg Technol, 2008, 9(1), 129-137].

Fruit

Osmotic dehydration of tropical fruits and vegetables

Osmotic dehydration cannot simply be explained (because of microstructural complexity of plant tissue) as a pure osmotic process in which cell membranes act as a semipermeable barrier allowing water to pass through. Instead, osmotic dehydration is considered a process in which many simultaneous mechanisms, acting at different levels, are responsible for mass transport. Different compositional and structural profiles are induced in fruits and vegetables,