Storage stability of biodiesel from vegetable and used frying oils

Biodiesel is defined as the monoalkyl esters of vegetable oils. Production of biodiesel has grown tremendously in the European Union in the last years. Though the commercial prospects for biodiesel have also grown, there remains some concern with respect to its resistance to oxidative degradation during storage. Due to the chemical structure of biodiesel the presence of the double bond in the molecule produces a high level of reactivity with the oxygen, especially when it is placed in contact with air. Consequently, storage of biodiesel over extended periods may lead to degradation of fuel properties that can compromise fuel quality.

Researchers at Japan used samples of biodiesel prepared by the process of transesterification from different vegetable oils: high oleic sunflower oil (HOSO), high and low erucic Brassica carinata A. Braun. oil (HEBO and LEBO), respectively and used frying oil (UFO). These biodiesels, produced from different sources, were used to determine the effects of long storage under different conditions on oxidation stability. Samples were stored in white (exposed) and amber (not exposed) glass containers at room temperature. The study was conducted for a period of 30-months. At regular intervals, samples were taken to measure the following physicochemical quality parameters: acid value (AV), peroxide value (PV), viscosity (ν), iodine value (IV), and insoluble impurities (II). Results showed that AV, PV, ν and II increased, while IV decreased with increasing storage time of biodiesel samples. However, slight differences were found between biodiesel samples exposed and not exposed to daylight before a storage time of 12 months. But after this period the differences were significant [Bouaid Abderrahim, Martinez Mercedes and Aracil José, Long storage stability of biodiesel from vegetable and used frying oils, Fuel, 2007, 86 (16), 2596-2602].

Cashew-nut tree exudate gum

The researchers at various University Departments of Brazil and Australia jointly worked on Cashew-nut tree (Anacardium occidentale Linn.) exudate gum to identify arabinogalactan-proteins (AGPs), a class of plant proteoglycans. In this work, they found that gel permeation chromatography of the cashew-nut tree exudate gum (CNTG), previously characterized as an acidic arabinogalactan (type II), yield a fraction named fraction III. SDS-PAGE (Sodium dodecyl sulfate polyacrylamide gel electrophoresis) analysis of CNTG had an AGP-like smear, weakly stained by the β-glucosyl Yariv reagent. CNTG and fraction III reacted strongly with the JIM13 anti-AGP monoclonal antibody and presented a protein content of 1.0 and 0.2% (w/w), respectively. CNTG and fraction III showed a high Hyp content (50%), and Ser, Pro, Thr and Leu as the most abundant amino acids. Analysis of the carbohydrate structure, its extracellular location and low protein content and the amino acid composition indicated that CNTG contains at least one fraction that fits the diagnostic features of a “classical” AGP. CNTG-enriched (0.1μg/ml) culture medium stimulates carrot somatic embryogenesis after 2 and 3 weeks of culture. The conversion of somatic embryos into plantlets was also enhanced in CNTG-enriched culture media, making this gum a potential tool for the improvement of conversion rates in systems in which low conversion rates are a constraint to micropropagation and breeding programs [Pereira-Navarro Adaucto Bellarmino, Pettolino Filomena, Cruz-Silva Claudia Tatiana Araujo, Simas Fernanda Fogagnoli, Bacic Antony, Carneiro-Leão Ana Maria dos Anjos, Iacomini Marcello and Maurer Juliana Bello Baron, Cashew-nut tree exudate gum: Identification of an arabinogalactan-protein as a constituent of the gum and use on the stimulation of somatic embryogenesis, Plant Sci, 2007, 173(4), 468-477].
Identification and comparison of natural rubber from two \textit{Lactuca} species

Renewed interest in the identification of alternative sources of natural rubber to \textit{Hevea brasiliensis} (H. B. & K.) Muell.-Arg. has focused on the Asteraceae family. During their search for Asteraceae members for rubber synthesis, the scientists of the Center for Applied Genetic Technologies, University of Georgia, USA, extracted latex from stems of two lettuce species, viz. \textit{Lactuca serriola} Linn., prickly lettuce and \textit{L. sativa} Linn. cv. ‘Salinas’, crisphead lettuce. Both species contained cis-1,4-polyisoprene rubber in the dichloromethane-soluble portions of their latex. Due to the genomic and agronomic resources available in lettuce species, they provide the opportunity for further dissection of natural rubber biosynthesis in plants [Bushman BS, Scholte AA, Cornish K, Scott DJ, Brichta JL, Vederas JC, Ochoa O, Michelmore RW, Shintani DK and Knapp SJ, Identification and comparison of natural rubber from two \textit{Lactuca} species, \textit{Phytochemistry}, 2006, \textbf{67}(23), 2590-2596].

Sugar beet pectin: A novel emulsifying wall component for microencapsulation

A scientist at Institute of Human Nutrition and Food Science, University of Kiel, Kiel, Germany microencapsulated fish oil rich in long-chain polyunsaturated fatty acids in a matrix of sugar beet pectin and glucose syrup. In two emulsification experiments, composition and homogenization conditions were optimized for preparation of a stable feed emulsion for spray drying. The median of the oil droplet size was significantly influenced by the composition of the emulsion as well as homogenization pressure, but not by the number of passes.

Properties of biodegradable plastics based on glycerol-plasticized wheat gluten

Now-a-days, more attention is paid to white pollution caused by non-biodegradable synthetic polymers, which has resulted in world wide concern on biodegradable package films and plastics made from renewable agricultural resources. Industrial wheat gluten contains more than 75% proteins with 40-50% gliadins and 35-45% glutenins. Wheat gluten can fully biodegrade after 36 days in aerobic fermentation and within 50 days in farmland soil without releasing toxic products, which makes it as an ideal candidate for development of biodegradable materials. Therefore, researchers at Department of Polymer Science and Engineering, Institute of Polymer Composite, Zhejiang University, Hangzhou, China conducted a study to investigate the influence of aldehydes and l-cysteine on the morphology and the
properties of thermo-molded biodegradable plastics based on glycerol-plasticized wheat gluten. The aldehydes and l-cysteine in 10% aqueous solution were incorporated with gluten and glycerol by mixing at room temperature and the resultant mixtures were thermo-molded at 100°C for 12 minutes. Morphology, moisture absorption, dynamic mechanical properties, tensile properties (tensile strength and elongation at break) and thermal degradation behaviour of the plastics produced were evaluated in relation to the crosslinking type. Experimental results have shown that the morphology, the glass transition of gluten and the tensile properties were closely linked to the type of the crosslinking reaction that led to the formation of a protein network. Crosslinking through disulfide bonding led to a high degree of phase separation and a high glass transition temperature of the gluten-rich phase while aldehyde-induced crosslinking restricted the phase separation in a low degree and lowered the glass transition temperature of the gluten-rich phase. Aldehyde-induced crosslinking improved tensile strength whereas lowered elongation at break and Young’s modulus in comparison with crosslinking via disulfide bonding in the crosslinker-free and the l-cysteine-containing plastics [Sun Shaomin, Song Yihu and Zheng Qiang, Morphologies and properties of thermo-molded biodegradable plastics based on glycerol-plasticized wheat gluten, Food Hydrocol, 2007, 21(7), 1005-1013].

Effect of natural rubber on wood-reinforced tannin composites

To evaluate the effect of natural rubber on wood-reinforced tannin composites the researchers at University of Mar del Plata, Argentina and University of São Paulo, Brazil added natural rubber latex to composite materials formulated from a quebracho tannin adhesive crosslinked with hexamethylenetetramine and wood flour as a reinforcing filler. The final microstructure of the thermoset modified by the addition of different concentrations of latex was observed by scanning electron microscopy. The flexural and impact behaviour of the modified materials was analyzed and related to the final microstructure of the composites. The effect of exposing the materials to humid environments was also evaluated. The measurements indicated that the addition of latex did not significantly reduce water absorption. However, it facilitated the preparation process of samples with low filler contents because of the increased viscosity of the mixture, which inhibited particle settling. On the other hand, the flexural properties increased with the addition of latex-containing proteins through a reaction similar to tanning in leathers. The impact properties presented a similar trend, with the largest change occurring between 0 and 5% natural rubber in the matrix formulation [Mosiewicki MA, Aranguren MI, Curvelo AAS and Borrajo J, Effect of natural rubber on wood-reinforced tannin composites, J Appl Polym Sci, 2007, 105(4), 1825-1832].

Synthesis and characterization of cardanol-grafted natural rubber

Cardanol, a by-product of the cashew industry, has been recently proven to be a multifunctional additive (MFA) in rubbers. Therefore, researchers at Rubber Technology Centre, Indian Institute of Technology, Kharagpur, West Bengal, India worked on the synthesis and characterization of cardanol-grafted natural rubber by the solution technique. It is expected that grafting of cardanol onto natural rubber (NR) would impart inherent MFA characteristics to the rubber. During experiment grafting was carried out in solution using toluene as the solvent and a peroxide initiator. Optimized conditions of grafting reaction could be arrived at using a statistical tool namely, orthogonal array testing strategy, keeping the maximum percentage of grafting as the selection criteria. Further, studies were conducted to study the influence of monomer concentration and initiator concentrations. The effect of the reaction temperature and reaction time were also investigated. Characterization of grafted rubber was carried out with the help of infrared spectroscopy, nuclear magnetic resonance spectroscopy and thermal analysis. IR spectrum of cardanol exhibited the characteristic peak of cardanol at 3356/cm. Per cent grafting (PG) of cardanol onto NR was determined by residual weight method. PG increased with increasing cardanol quantity reached an optimum and then decreased. The increase in reaction time and reaction temperature also caused increasing levels of the grafted cardanol. However, PG continuously increased with increasing initiator concentrations. Differential scanning calorimetry studies of the grafted NR showed a lower glass transition temperature than that of the raw NR, which is indicative of the plasticization effect of cardanol. The thermogravimetric analysis showed a higher thermo-oxidative stability for cardanol-grafted natural rubber [Vikram T and Nando GB, Synthesis and characterization of cardanol-grafted natural rubber — The solution technique, J Appl Polym Sci, 2007, 105(3), 1280-1288].
Membrane-assisted precipitation for the concentration of xanthan gum

The scientists of Technical Institute of Veracruz, Veracruz, Mexico, Fresenius-Kabi, Bad Homburg, Germany and University of Guelph, Guelph, Canada studied the effect of combining ultrafiltration and precipitation to improve the productivity of xanthan separation. During experiment changes in solution properties and the association behaviour of xanthan were modified by salt (KCl) and solvent (isopropanol) addition and were assessed using scanning electron microscopy (SEM). The concentration polarization layer produced by xanthan dissolved in buffer solution had a very high specific flux resistance that was enhanced by the addition of either KCl or isopropanol. SEM analysis revealed that the fine macromolecular structure observed with xanthan in buffer was further stabilized in the presence of KCl. Isopropanol addition induced phase separation and the formation of closely packed soft aggregate particles that significantly increased fouling layer specific resistance. The simultaneous salt and organic solvent addition resulted in surface morphologies containing aggregates that associated to create gels with varying porosities. When at least 1% (w/v) KCl and >30% (v/v) isopropyl alcohol was added to 2.5% (w/v) xanthan solution, a very porous fouling layer was created, which dramatically increased membrane flux. Membrane-assisted precipitation reduced the amount of precipitating solutes used while greatly increasing membrane flux, resulting in a large improvement in separation productivity [Torrestiana-Sanchez Beatriz, Balderas-Luna Laura, Brito-De la Fuente Edmundo and Lencki Robert W, The use of membrane-assisted precipitation for the concentration of xanthan gum, J Membr Sci, 2007, 294(1-2), 84-92].

Effect of γ-irradiation on some physiochemical properties of konjac glucomannan

Konjac glucomannan (KGM) is a high molecular weight water-soluble non-ionic polysaccharide extracted in high yield from the tubers of Amorphophallus konjac K. Koch plant. The researchers at China conducted studies to determine whether γ-irradiation is useful for enlarging the application of KGM. Konjac glucomannan was irradiated at 5, 20, 50 and 100kGy and the effects of γ-irradiation on some physiochemical properties of KGM were studied by using viscosimeter, colorimeter, gel permeation chromatography (GPC), Fourier transform infrared (FT-IR) spectroscopy, ultraviolet (UV) spectroscopy, thermal gravimetric (TG) analysis and scanning electron microscopy (SEM). γ-irradiation led to significant degradation of KGM according to the significant reduction of the weight-average molecular weight ($M_w$). The apparent viscosity of KGM decreased with increasing dose, while the viscosity stability was improved after irradiation. The colour of KGM became more intense brown with increasing dose up to 20kGy. FT-IR spectra indicated that γ-irradiation introduced no significant changes into the structure but UV spectra showed a distinct absorption peak at about 265nm, increasing with irradiation dose, which was attributed to the formation of carbonyl groups or double bond. High irradiation dose (100kGy) caused a small decrease of thermal stability but presented no visible fissures or splitting of KGM granules according to the TG analysis and SEM microphotographs. The results indicated that, in a certain degree, γ-irradiation modification is useful for enlarging application fields of KGM [Xu Zhenlin, Sun Yuanming, Yang Youhui, Ding Jinlong and Pang Jie, Effect of γ-irradiation on some physiochemical properties of konjac glucomannan, Carbohydr Polym, 2007, 70(4), 444-450].

Evaluation of the toxicity of mastic gum

Dietary toxicity of mastic gum (Pistacia lentiscus Linn.), a natural food additive, was studied by researchers of Department of Pathology, Osaka City University Medical School, Osaka, Japan in male and female F344 rats fed 0, 0.22, 0.67 and 2% levels mixed into powdered basal diet for 13 weeks. No mortality or obvious clinical signs were observed in any of the animals throughout the experimental period. Body weights were significantly reduced in the high dose-treated group from week 2 to the end of the experiment in males and at weeks 8 and 13 in females. There were increased absolute and relative liver weights in a dose-related manner or limited to the high dose group males or females, along with changes in hematological parameters, including increased WBC and platelet in high dose males. Altered serum...
biochemistry parameters included increases of total proteins, albumin and total cholesterol in both sexes and γ-GTP in females only. However, macroscopic examination at necropsy revealed no gross lesions and microscopic examination also revealed no treatment-related findings in any organs examined. As dietary treatment of mastic gum for 13 weeks caused decreased body weights at the high dose, especially in males and increased liver weights in a dose-related manner in both genders without any morphological findings, it was concluded that the administration of it had a no observed adverse effect level (NOAEL) of 0.67% in the diet [Kang Jin Seok, Wanibuchi Hideki, Salim Elsayed I, Kinoshita Anna and Fukushima Shoji, Evaluation of the toxicity of mastic gum with 13 weeks dietary administration to F344 rats, *Food Chem Toxicol*, 2007, 45 (3), 494-501].

**Gum/Rubber**

*Ganoderma lucidum* (Curtis) P. Karst has long been used as a folk or oriental medicine to cure various human diseases. During the development of functional foods containing *G. lucidum* polysaccharide, its rheological characteristics play an important role. Therefore, to characterize the rheological properties of its polysaccharides in the dilute and semi-dilute regions, intrinsic viscosity, coil overlap and Mark-Houwink parameters of the hot water extracted polysaccharides from the fruit body and mycelia of *G. lucidum* were measured as a function of solvents and dehydration methods by researchers at Taiwan. Effects of ionic strength on the intrinsic viscosity, salt biochemistry parameters included increases of total proteins, albumin and total cholesterol in both sexes and γ-GTP in females only. However, macroscopic examination at necropsy revealed no gross lesions and microscopic examination also revealed no treatment-related findings in any organs examined. As dietary treatment of mastic gum for 13 weeks caused decreased body weights at the high dose, especially in males and increased liver weights in a dose-related manner in both genders without any morphological findings, it was concluded that the administration of it had a no observed adverse effect level (NOAEL) of 0.67% in the diet [Kang Jin Seok, Wanibuchi Hideki, Salim Elsayed I, Kinoshita Anna and Fukushima Shoji, Evaluation of the toxicity of mastic gum with 13 weeks dietary administration to F344 rats, *Food Chem Toxicol*, 2007, 45 (3), 494-501].

**Rheological properties of the hot water extracted polysaccharides in Ling-Zhi (Ganoderma lucidum)**

*Ganoderma lucidum* (Curtis) P. Karst has long been used as a folk or oriental medicine to cure various human diseases. During the development of functional foods containing *G. lucidum* polysaccharide, its rheological characteristics play an important role. Therefore, to characterize the rheological properties of its polysaccharides in the dilute and semi-dilute regions, intrinsic viscosity, coil overlap and Mark-Houwink parameters of the hot water extracted polysaccharides from the fruit body and mycelia of *G. lucidum* were measured as a function of solvents and dehydration methods by researchers at Taiwan. Effects of ionic strength on the intrinsic viscosity, salt biochemistry parameters included increases of total proteins, albumin and total cholesterol in both sexes and γ-GTP in females only. However, macroscopic examination at necropsy revealed no gross lesions and microscopic examination also revealed no treatment-related findings in any organs examined. As dietary treatment of mastic gum for 13 weeks caused decreased body weights at the high dose, especially in males and increased liver weights in a dose-related manner in both genders without any morphological findings, it was concluded that the administration of it had a no observed adverse effect level (NOAEL) of 0.67% in the diet [Kang Jin Seok, Wanibuchi Hideki, Salim Elsayed I, Kinoshita Anna and Fukushima Shoji, Evaluation of the toxicity of mastic gum with 13 weeks dietary administration to F344 rats, *Food Chem Toxicol*, 2007, 45 (3), 494-501].

**Effect of tara gum on the rheological and structural properties of gels**

Tara gum is extracted by grinding the endosperm portions of the seeds of the legume plant *Caesalpinia spinosa* Kuntze. It is used in food and industrial applications as a thickening agent; it does not form gels by itself. The researchers at Portugal studied the effect of the non-gelling tara gum (TG) galactomannan on the thermal gelation of β-lactoglobulin, at 80°C and on the rheological behaviour and microstructure of the gels after quenching to 20°C at pH 7.0 and 4.6, near the isoelectric point of the protein. Gels were analyzed rheologically with dynamic mechanical analysis in shear and microstructurally by confocal scanning laser microscopy (CSLM). For all the concentrations studied, TG affected the gelation rate, the strength and the strain sensitivity of the final gels but these effects depended on TG concentration and *pH*. Gels obtained at *pH* 4.6 were stronger and showed higher sensitivity to strain than similar gels obtained at *pH* 7.0. The CSLM micrographs revealed that the mixed gels were two-phase and that the state of aggregation of β-lactoglobulin depended on TG concentration and *pH*. In general, the microstructures for pure and mixed β-lactoglobulin gels, obtained at *pH* 4.6, were more open and with larger clusters than the microstructures observed for gels obtained at *pH* 7.0 [Sittikijyothin W, Sampaio P and Gonçalves MP, Heat-induced gelation of β-lactoglobulin at varying *pH*: Effect of tara gum on the rheological and structural properties of the gels, *Food Hydrocol*, 2007, 21 (7), 1046-1055].
Effects of locust bean, xanthan and guar gums on the ice crystals of a sucrose solution

Hydrocolloids are added in ice creams and frozen desserts to produce smooth texture and protect the product during its storage. The high-pressure freezing techniques also aimed to enhance product qualities. In a research work done by scientists at Argentina and Spain, both the hydrocolloid and the high-pressure processing actions were combined. A 0.3% (w/w) of guar gum (viscous solution) or of locust bean gum plus xanthan gum (gel) were mixed in sucrose solutions (16% w/w) to analyze whether water mobility affected ice crystal formation. Sucrose solutions with or without hydrocolloids were frozen by high-pressure assisted freezing (HPAF) at 100MPa and by high-pressure shift freezing (HPSF) from 210MPa to 0.1 and 100MPa, to compare their effects on the ice crystal characteristics. Ice crystal sizes were determined from images obtained by low temperature scanning microscopy (LT-SEM). Ice crystals were smaller after HPSF than after HPAF, due to greater supercooling following expansion and to shorter phase transition times. As regards the hydrocolloids, ice crystals were smaller when the mixture of locust bean and xanthan gums were added irrespective of the freezing method. The formation of a gel-like structure at ambient temperature strengthened by a cryo-gelation effect in the frozen state may limit water molecule diffusion and ice crystal growth [Fernández PP, Martino MN, Zaritzky NE, Guignon B and Sanz PD, Effects of locust bean, xanthan and guar gums on the ice crystals of a sucrose solution frozen at high pressure, Food Hydrocol, 2007, 21 (4), 507-515].

Effect of natural coagula maturation on Hevea natural rubber

While investigating the effect of natural coagula maturation on the processability, cure and mechanical properties of unfilled vulcanizates of Hevea natural rubber, the scientists of IRAD Ekona Regional Research Centre, Buea and Department of Chemistry, University of Buea, Cameroon coagulated the fresh latex from different Hevea brasiliensis (H. B. & K.) Muell.-Arg. clones. It was subjected to different durations of maturation, processed into solid rubber and compounded into pure gum stocks and vulcanized. Coagula maturation had clone-specific effects on the processability of the raw rubber: reduced for some clones, while others was less sensitive. The cure and mechanical behaviours of the compounded stocks and vulcanizates, respectively, were not sensitive to the clonal origin of coagula and their duration of maturation. Although coagula maturation could be associated with leaching, deactivation of inherent antioxidants in Hevea latex, as well as crosslinking and/or oxidation of polyisoprene chains. These results showed that compounding with a standard pure gum recipe compensates for the Hevea latex constituents are affected by maturation. Hence, extended maturation of Hevea coagula, for economic or other reasons, would influence much more the bulk behaviour of raw rubber and have insignificant effects on the compounded stocks and vulcanizates [Fri Pamela Soh, Nkeng George E and Elabe Eugene E, Effect of natural coagula maturation on the processability, cure and mechanical properties of unfilled vulcanizates of Hevea natural rubber, J Appl Polym Sci, 2007, 103(4), 2359-2363].
Whey protein-maltodextrin conjugates as emulsifying agents: An alternative to gum arabic

The emulsifying properties of covalent complexes of maltodextrin (MD) with whey protein (WP) isolate have been investigated by researchers of Procter Department of Food Science, University of Leeds, Leeds, UK under both acidic and high electrolyte concentration conditions in systems containing medium-chain triglyceride oil or orange oil. Covalent coupling of protein to polysaccharide was achieved by dry-heat treatment of a protein+polysaccharide mixture for up to 2h. It was confirmed by SDS-polyacrylamide gel electrophoresis that the WP does become directly linked to the MD. Analysis of droplet-size distributions has shown that this covalent linking of MD to WP leads to a very substantial enhancement in the protein emulsifying behaviour under both acidic and neutral conditions. Analogous dry-heating treatment of MD with soy protein does not have this positive effect. A whey protein-MD conjugate WP-MD19, made from MD (DE=19) of intermediate mean molecular weight (8.7kDa), has been found to be capable of producing fine emulsion droplets (0.5-1µm) with either triglyceride oil or orange oil. Optimized WP-MD19 conjugates can produce fine stable emulsions (20vol% oil) at 2wt% emulsifier content, whereas the equivalent emulsion made with gum arabic requires a 20-30wt% level of emulsifier. A WP-MD19 conjugate of protein/polysaccharide ratio 1:2 or 1:3 is effective in stabilizing low-pH emulsions of a commercial flavour oil (containing a weighting agent) over a storage period of several weeks, with no visible precipitation or phase separation when mixed with colouring agents, either before or after extensive emulsion dilution.

A major potential application of this type of protein-polysaccharide complex is in the stabilization of citrus oil emulsions as an alternative to GA. In addition to the extended shelf-life of the concentrates, it has been shown that these systems can be successfully diluted with carbonated sugar syrup to produce stable dilute coloured emulsions, with direct relevance for commercial soft drink applications [Akhtar Mahmood and Dickinson Eric, Whey protein-maltodextrin conjugates as emulsifying agents: An alternative to gum Arabic, Food Hydrocol, 2007, 21 (4), 607-616].

Corn fibre gum: A potential gum arabic replacer for beverage flavour emulsification

The US food industry would benefit from a domestically produced gum with a dependable supply and consistent quality that can be used for preparing oil-in-water (O-in-W) emulsions, such as citrus oil emulsions for beverages. Corn fibre gum (CFG) is an arabinoxylan (hemicellulose) extracted from the corn kernel pericarp and/or endosperm fibre fractions that can possibly fulfill this need. In a study conducted by scientists of Eastern Regional Research Center, Agricultural Research Service, US Department of Agriculture, Wyndmoor, PA, USA two different types of CFG, CFG-1 and 2, were prepared from corn fibre collected from different wet or dry corn milling facilities by (a) sequential alkaline extraction and alkaline hydrogen peroxide bleaching and (b) an additional alkaline hydrogen peroxide treatment of the alkali treated residue, respectively. CFG-1 might be linked to the cell wall matrix through ester linkages and CFG-2 by non-ester linkages and/or other strong interactions. The stabilization of O-in-W emulsions by corn fibre and acacia gums was investigated by preparing emulsions with a high pressure homogenizer and monitoring the emulsion breakage by turbidity measurements. All CFG samples were effective emulsifiers but CFG-2 extracted separately from three different corn fibre sources was determined to be a better emulsifier than the corresponding CFG-1. CFGs isolated from wet milled pericarp and endosperm fibre and wet milled pericarp fibre have a higher protein content than CFGs isolated from dry milled pericarp fibre and were determined to be better emulsifiers for the O-in-W emulsion system. The emulsifying properties of all CFGs including an industrial grade commercial CFG were determined to be better than native and modified acacia gums [Yadav Madhav P, Johnston David B, Hotchkiss Arland T Jr and Hicks Kevin B, Corn fibre gum: A potential gum arabic replacer for beverage flavour emulsification, Food Hydrocol, 2007, 21 (7), 1022-1030].
Influence of purified konjac glucomannan on the gelatinisation and retrogradation properties of maize and potato starches

Konjac glucomannan has been introduced into Europe (E425) and the USA as a food additive due to its gelling and emulsifying properties. The effects of purified konjac glucomannan (PKG) on the gelatinisation and retrogradation properties of different starches was investigated by scientists of Food Research Laboratories, Department of Biological and Biomedical Sciences, Division of Food Science, Glasgow Caledonian University, Glasgow, UK by differential scanning calorimetry (DSC) and α-amylase digestion. PKG extended the starch gelatinisation endotherm and hence increased $T_c$. This was most likely to be attributed to the PKG’s sequestering effect, which restricted the amount of water available to starch for gelatinisation. The PKG was extremely effective at retarding ‘long-term’ starch retrogradation, which is well known to be the result of amylopectin re-crystallization. This resulted in greater amounts of digestible starch in stored systems containing the PKG. Incorporation of hydrocolloids such as konjac glucomannan, which readily hydrate and imbibe water, clearly has an impact on processing conditions of starch-based foods. The retardation effect that konjac has on starch retrogradation demonstrates its functionality as a stabilizer which can be used to control end product quality [Khanna S and Tester RF, Influence of purified konjac glucomannan on the gelatinisation and retrogradation properties of maize and potato starches, Food Hydrocol, 2006, 20 (5), 567-576].

Insecticides/Fungicides/Nematicicides

Removal of fire ant colonies by hot water

The use of poison baits to eliminate the fire ants is not recommended because such baits are not specific to fire ants, or even to ants. Hot water is an extremely effective and specific killing agent for fire ant colonies, but producing large amounts of hot water in the field and making the production apparatus mobile have been problematical. Hence, the scientists at Department of Biological Science, Florida State University, Tallahassee, Florida constructed a charcoal-fired kiln made from a 55-gal oil drum lined with a sand-fireclay mixture. An automobile heater fan powered from a 12-v battery provided a draft. Dual bilge pumps pumped water from a large tank through a long coil of copper tubing within the kiln to produce 4 to 5 litre of water per minute. The hot water was collected in 20 litre buckets and poured into fire ant nests previously opened by piercing with a stick. The entire assembly was transported in and operated from the back of a pickup truck.

Five experimental plots containing 32 to 38 colonies of the fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae) were treated with hot water over a period of two years. All colonies on the treatment plots were treated twice with hot water early in 2004, reducing their numbers to zero. However, new colonies were formed and mature colonies expanded into the plots. A third treatment was made in the spring of 2005, after which fire ant populations were suppressed for over a year. Whereas the 5 control plots contained a total of 166 mostly large colonies, the 5 treatment plots contained no live colonies at all. Averaged over a two-year period, a 70% reduction in total number of colonies was achieved ($P<0.001$) on the treatment plots and a 93% reduction of large, mature colonies. Over this same time span, the number of colonies in control plots remained stable. The reduction in colony numbers on the treatment plots was reflected in the pitfall trap samples that recorded a 60% reduction in fire ants [Tschinkel WR and King JR, Targeted removal of ant colonies in ecological experiments, using hot water, J Insect Sci, 2007, 7, 41].