Green fodder feeding for enhancing conjugated linoleic acid content of buffalo milk

Conjugated linoleic acid (CLA) is an intermediary product produced during the biohydrogenation of polyunsaturated fatty acids in the rumen. Concentrates and fodders are rich sources of polyunsaturated fatty acids. Foods of animal origin especially dairy products are the major sources of CLA for humans and are reputed to have therapeutic health values including anti-carcinogenic properties. The scientists at Dairy Cattle Nutrition Division, National Dairy Research Institute, Karnal, Haryana, India and Utah State University, Logan, USA made attempt to increase CLA content in milk of buffaloes by feeding them on Berseem (*Trifolium alexandrinum* Linn.) fodder. Eighteen Murrah buffaloes (*Bos bubalis*), having similar milk yield and stage of lactation were divided into three groups. All the groups were offered *ad lib* wheat straw during the 60-day experimental period. Their nutritional requirements were fulfilled through a concentrate mixture (Group I), concentrate mixture + Berseem (Group II) and Berseem (Group III). The ratio of Berseem, wheat straw and concentrate in the diet was 0:42:58, 50:25:25 and 87:13:0 on dry matter basis in the three groups, respectively. Milk yield was recorded daily and its chemical composition was determined fortnightly. Milk products such as *ghee*, *paneer* and mozzarella cheese were prepared using the milk of each group at fortnightly intervals. There was no effect of dietary treatments on milk yield and its composition. Average total CLA content (mg/g fat) was 7.7, 13.4, 17.0 in milk; 9.1, 13.4, 18.8 in *ghee*; and 8.2, 12.7, 18.8 in *paneer* and 8.2, 12.7, 18.8 in *ghee*; and 8.0, 12.0 and 16.3 in cheese in Groups I-III, respectively. There was no effect of dietary treatments on milk yield and its composition. Average total CLA content (mg/g fat) was 7.7, 13.4, 17.0 in milk; 9.1, 13.4, 18.8 in *ghee*; and 8.2, 12.7, 18.8 in *paneer* and 8.0, 12.0 and 16.3 in cheese in Groups I-III, respectively.

Influence of coffee/water ratio on the final quality of espresso coffee

Espresso coffee is a polyphasic beverage in which the physico-chemical and sensory characteristics obviously depend on both the selection of ground roasted coffee and the technical conditions of the percolation process. The researchers at Food Science and Technology, and Toxicology Department, School of Pharmacy, University of Navarra, Pamplona, Spain evaluated the influence of the coffee/water ratio on the physico-chemical and sensory quality of espresso coffee. Furthermore, the influence of botanical varieties, viz. *Coffea arabica* Linn. var. *arabica* and *C. robusta* Lind. var. *robusta* and the type of roast (conventional and torrefacto) on the selection of coffee/water ratio was studied. During experiment some sensory attributes, such as bitterness, astringency and burnt, acid and earthy/musty flavours were proposed as relevant to the selection of 6.5g/40 ml or 7.5g/40ml in conventional roasted coffees (*arabica* 100% and *robusta* blend), and 6.5g/40ml in torrefacto roasted coffees. The addition of sugar during the roasting process in torrefacto roasted coffees seemed to contribute to a higher generation of acids, melanoidins and other compounds by the Maillard reaction or caramelisation, which helped in selecting the lowest coffee/water ratio | Andueza Susana, Vila María A, Peña M Paz de and Gd Concepción, Influence of coffee/water ratio on the final quality of espresso coffee, *J Sci Food Agric*, 2007, 87 (4), 586-592 | Coffea arabica
Pineapple juice and its fractions inhibit enzymatic browning of banana

Many types of fruits, especially bananas become brown rapidly when their tissues are cut or bruised. The brown colour is developed due to the enzymatic oxidation of phenols to quinones by polyphenol oxidase (PPO) in the presence of oxygen. Enzymatic browning impairs not only the colour of fresh fruits but also the flavour and the nutritional quality. Sulfites act as PPO inhibitors by serving as reducing agents and also react with intermediates to prevent pigment formation but nowadays, consumers are concerned about the possible dangers of synthetic food additives. Pineapple [Ananas comosus (Linn.) Merr.] juice is a popular product due to its very pleasant aroma and flavour. The researchers of Department of Food Science and Technology, Faculty of Agro-industry, Kasetsart University, Bangkok and Department of Food Science and Technology, Oregon State University, Corvallis, Oregon identified the fraction of pineapple juice that was most effective for banana PPO inhibition and preventing enzymatic browning in banana puree.

The results revealed that after storage of banana slices at 15°C for 3 days, pineapple juice showed browning inhibition to a similar extent as 8 mM ascorbic acid but less than 4mM sodium metabisulfite. Fractionation of pineapple juice by a solid-phase C18 cartridge revealed that the directly eluted fraction (DE fraction) inhibited banana polyphenol oxidase (PPO) about 100% when compared to the control. The DE fraction also showed more inhibitory effect than 8mM ascorbic acid in enzymatic browning inhibition of banana puree during storage at 5°C for 24h. Further identification of the DE fraction by fractionation with ion exchange chromatography and confirmation using model systems indicated that malic acid and citric acid play an important role in the enzymatic browning inhibition of banana PPO [Chaisakdanugull Chitsuda, Theerakulkait Chockchai and Wrolstad Ronald E, Pineapple Juice and Its Fractions in Enzymatic Browning Inhibition of Banana [Musa (AAA Group) Gros Michel], J Agric Food Chem, 2007, 55(10), 4252-4257].

Deodorization of off-odour during sweet potato juice production

Although sweet potato has a great potential as an ingredient in functional foods, it exhibits a potential off-flavour in the boiling process. The mechanism and efficiency of three types of deodorants, namely activated carbon (AC), maltosyl cyclodextrin (MCD) and apple polyphenol (AP), in reducing the “boiled heavy odour” of saccharified sweet potato juice was investigated by researchers at USA and Japan. Among the three deodorants studied, AC was the most efficient at removing the off-odour of saccharified sweet potato juice. MCD is effective at stabilizing and solubilising the functional compounds such as β-carotene, although it did not deodorize the odour as much as AC. Based on the results it is suggested that MCD may serve as an effective deodorant against off-odours of intermediate substances formed during the production of functional sweet potato juice [Tamaki Kazuhiko, Tamaki Takeshi and Suzuki Yoshitake, Deodorisation of off-odour during sweet potato juice production by employing physical and chemical deodorants, Food Chem, 2007, 105 (2), 454-461].
Goat and sheep milk products other than cheeses and yoghurt

The use of goat and sheep milk for manufacture of different milk and milk products is increasing, although the proportion is much less compared to cow and buffalo milk worldwide, but it is much better organized in some countries than in others. Manufacturing of goat and sheep milk commercially or artisanally on the farm for direct sales is done successfully for pasteurized beverage, UHT (ultra high temperature), evaporated milk, ice cream, milk powder, traditional goat milk products, even soaps, lotions and sweets, besides the popular cheeses and yoghurt. The problem of “goaty” or “mutton” flavour may exist in some areas, but products such as ice cream, beverage milk and milk powder made from goat or sheep milk, due to their nutritional and anti-allergenic properties, can be a beneficial alternative milk product for children, young and sick people. A review published by scientists at Department of Dairy Processing and Operations, Anand Agricultural University, Anand, Gujarat, India covers technological details of milk, cream, butter, ice cream, whey protein concentrate, evaporated milk, UHT milk, milk powder, chhana, paneer, and ghee from goat and sheep milk. The technology for utilization of goat and sheep milk for commercial manufacture of products has received some attention by research workers, but a great deal more work needs to be undertaken to make the goat and sheep milk industry a viable partner to the dairy cattle industry, and to assure, that producers of goat and sheep milk get an adequate value for their milk, especially in areas where only goats and sheep can survive. While application of goat or sheep milk for cheese making is well known, few attempts have been made to systematically study the use of goat or sheep milk for manufacture of milk beverages, ice cream, butter, milk powder, condensed milk, traditional products, even yoghurt, etc. Low daily volume, even of herd bulk milk may be one of the reasons for the difficulty in establishing an efficient processing industry of goat and sheep milk in many countries. Large scale goat and/or sheep farms may not be a solution for solving this situation in many regions with steep mountains and harsh desert, where only goats and sheep can still support a farm family. It also remains to be accepted, that technical knowledge generated through research with cow milk is most often not applicable to the manufacture of quality products from goat and sheep milk [Pandya AJ and Ghodke KM, Goat and sheep milk products other than cheeses and yoghurt, Small Rumin Res, 2007, 68(1-2), 193-206].

Beverage

Quality and shelf life of orange juice aseptically packaged in PET bottles

The scientists at Technical University of Cartagena, Agricultural Equipment and Food Engineering Department, Spain did studies on packaging of orange juice aseptically packaged in bottles using different materials and filling procedures was conducted to determine their influence on the evolution of juice quality and shelf life. Glass, multilayer PET (polyethylene terephthalate) and monolayer PET bottles were used. A characterisation study including DSC thermograms, intrinsic viscosity and scanning electron microscopy (SEM) photographs let identify the different material used, taking part in multi- and monolayer PET bottles for juice packaging. Monolayer PET showed the lowest retention of ascorbic acid during storage and shelf life compared with multilayer PET and glass. But the results revealed that if different factors, such as oxygen scavenger, liquid nitrogen drop addition in headspace during filling, aluminium foil seal in screw-cap and refrigeration temperatures, are combined with the monolayer PET bottles, orange juice shelf life can be extended and values similar to glass and multilayer PET bottles can be obtained [Ros-Chumillas María, Belissario Yulissa, Igaz Asunción and López Antonio, Quality and shelf life of orange juice aseptically packaged in PET bottles, J Food Eng, 2007, 79(1), 234-242].
**Detection of corn adulteration in Brazilian Coffee**

*Coffea arabica* Linn. has a higher commercial value than *C. robusta* Lind. due to its pronounced flavour, and it is speculated that it is adulterated with lower priced adulterants, viz. cereals, coffee twigs, coffee, brown sugar, etc.

The researchers at NCAUR, Agricultural Research Service, U.S. Department of Agriculture, North University Street, Peoria, Illinois, USA investigated a new method, based on high-performance liquid chromatography (HPLC) tocopherol determination to detect coffee adulteration by corn. During studies tocopherols were analyzed in six Brazilian coffee varieties, six commercial coffee brands and one pure commercial coffee sample intentionally adulterated with roasted corn (5, 10 and 20%, w:w, corn:coffee) and six roasted corn samples. On the basis of these values, a new method to detect adulteration of commercial coffee with corn has been reported.

Percentages of $\alpha$-, $\beta$-, $\gamma$- and $\delta$-tocopherol determined by HPLC in six coffee varieties were 29.0, 61.7, 3.3 and 6.0, respectively. Similar values were obtained in six popular coffee brands. The percentages of $\alpha$-, $\gamma$- and $\delta$-tocopherol in six corn samples were 3.6, 91.3 and 5.1, respectively. These differences could be applied to detect corn in a pure coffee sample intentionally contaminated with corn with the best result obtained with $\gamma$-tocopherol. With this methodology, one coffee brand was apparently adulterated (8.9%), most likely with corn. Thus, tocopherol fingerprinting offers the potential to detect adulteration [Jham Gulab N, Winkler Jill K, Berhow Mark A and Vaughn Steven F, $\gamma$-Tocopherol as a Marker of Brazilian Coffee (*Coffea arabica* L.) Adulteration by Corn, *J Agric Food Chem*, 2007, 55(15), 5995-5999].

**Dietary fibre in brewed coffee**

Coffee is one of the most widely consumed and appreciated beverages for its taste carbohydrates, minerals and volatile compounds and the amounts of these substances vary depending on coffee bean origin, roasting grade, extraction method and conditions, and cup concentration. Hot water extractable polysaccharides are the main high molecular weight components of coffee infusions and play an important role in the viscosity of the brew, in the foam stability of espresso coffee, and hence in the retention of volatile substances. Dietary fibre (DF) is the non-digestible part of vegetable foods and beverages and plays an important role in nutrition and health. Green and roasted coffee beans are rich in DF and may pass into the brewed coffee in the brewing process. Therefore, the scientists at Department of Metabolism and Nutrition, Madrid, Spain worked to ascertain whether DF is a common constituent of brewed coffee and whether some phenolics (and their antioxidant activity) are associated with this fibre. During experiments a specific method to determine dietary fibre in beverages (enzymatic treatment plus dialysis) was applied to the coffees brewed by the most common methods (espresso, filter, soluble); results showed that brewed coffee contained a significantly higher amount of soluble dietary fibre (0.47-0.75g/100 ml of coffee) than other common beverages. Coffee dietary fibre contains a large amount of associated antioxidant phenolics (8.7-10.5 mg/100 ml of brewed coffee) [Díaz-Rubio M Elena and Saura-Calixto Fulgencio, Dietary Fibre in Brewed Coffee, *J Agric Food Chem*, 2007, 55(5), 1999-2003].
Inactivation of *Saccharomyces cerevisiae* and *Lactobacillus plantarum* in orange juice

Yeasts and lactic acid bacteria are the usual contaminants in orange juice and responsible for decreasing the shelf life of the product. Ultra high-pressure homogenization has been shown to be an alternative to the traditional thermal pasteurisation of pumpable foods. Hence, in a study on inactivation of microorganism contaminants (*Lactobacillus plantarum* and *Saccharomyces cerevisiae*) of orange juice using dynamic ultra high process technology was conducted by scientists at Brazil. The product was pumped through a homogeniser valve at 100MPa, 150MPa, 200MPa, 250MPa and 300MPa using two synchronized overlapped intensifiers at a flow rate of approximately 270mL/min. The inlet temperature was kept at 10°C, pH at 4.1 and soluble solids at 10.0°Bx. After processing, the product was immediately cooled to 4°C and the microbiological count was determined. The study showed that *L. plantarum* and *S. cerevisiae* are sensible to ultra high-pressure homogenisation treatment and pressures higher than 250MPa were able to completely destroy initial loads of 1.2×10^7 UFC/ml of *L. plantarum* and 2.9×10^5 UFC/ml of *S. cerevisiae* in orange juice, making this technology a promising way to nonthermally processing of orange juice. It is of industrial interest and relevance to evaluate the use of this non-thermal emerging technology to process fluid foods that may result into better taste, optimum product functionality, safety and quality characteristics [Campos FP and Cristianini M, Inactivation of *Saccharomyces cerevisiae* and *Lactobacillus plantarum* in orange juice using ultra high-pressure homogenisation, *Innov Food Sci Emerg Technol*, 2007, 8(2), 226-229].

Biocontrol of *Staphylococcus aureus* in curd manufacturing processes using bacteriophages

The current technologies employed to inactivate bacterial pathogens in foods are not always foolproof and, therefore, new approaches for improving food safety are necessary. The exploitation of bacteriophages has great potential for use as biocontrol agents in foods. Therefore, researchers at Instituto de Productos Lácteos de Asturias, Villaviciosa, Asturias, Spain conducted studies to determine the ability of specific bacteriophages to inhibit *S. aureus* growth in curd manufacturing processes. Two lytic bacteriophages specific against *S. aureus* were obtained by DNA random deletion from the milk-isolated temperate phages, φH5 and φA72. A cocktail of these lytic phages, φ88 and φ35, at multiplicity of infection (MOI) of 100, produced a complete elimination of 3×10^6 cfu/ml of the pathogen in ultra-high-temperature (UHT) whole milk at 37°C. Furthermore, the frequency of emergence of bacteriophage-insensitive mutants was reduced up to 200-fold in the presence of the two lytic phages compared with that detected with the combination of the temperate counterparts. The lytic phage derivatives, added to milk, were able to decrease rapidly the viable counts of *S. aureus* during curd manufacture. In acid curd, the pathogen was not detected after 4h of incubation at 25°C, whereas pathogen clearance was achieved within 1h of incubation at 30°C in renneted curd. These results indicate that lytic bacteriophages could be used as biopreservatives in the manufacture of particular dairy products [García Pilar Madera, Carmen, Martínez Beatriz and Rodríguez Ana, Biocontrol of *Staphylococcus aureus* in curd manufacturing processes using bacteriophages, *Int Dairy J*, 2007, 17 (10), 1232-1239].
**Lactobacillus helveticus** fermented milk reduces arterial stiffness

Fermented milk products with casein-derived biologically active peptides isoleucyl-prolyl-proline (Ile-Pro-Pro) and valyl-prolyl-proline (Val-Pro-Pro) attenuate the development of hypertension in spontaneously hypertensive rats (SHR) and reduce blood pressure in moderately hypertensive subjects, partially by angiotensin converting enzyme (ACE) inhibition. Arterial stiffening is markedly accelerated in hypertension and it is an independent predictor of coronary heart disease in essential hypertension. The effect of Ile-Pro-Pro and Val-Pro-Pro on arterial stiffness in hypertensive subjects has not been studied earlier. Therefore, researchers at Finland conducted studies to evaluate whether the antihypertensive effect of *Lactobacillus helveticus* fermented milk containing Ile-Pro-Pro and Val-Pro-Pro is related to reduced arterial stiffness.

They evaluated the 10-week-treatment effect of *L. helveticus* fermented milk containing the tripeptides isoleucyl-prolyl-proline and valyl-prolyl-proline on ambulatory arterial stiffness index (AASI) by using the ambulatory 24h blood pressure registration. The AASI improved significantly in the peptide milk group ($P=0.043$), but not in the placebo group ($P=0.47$), suggesting a mechanism for the antihypertensive effects of these peptides. Thus, in addition to its antihypertensive effects, fermented milk has beneficial cardiovascular effects by reducing arterial stiffness [Jauhiainen T, Rönnback M, Vapaatalo H, Wuolle K, Kautiainen H and Korpela R, *Lactobacillus helveticus* fermented milk reduces arterial stiffness in hypertensive subjects, *Int Dairy J*, 2007, 17(10), 1209-1211].

**Effect of processing on the composition and microstructure of buttermilk**

Buttermilk is the liquid phase released during churning of cream in the process of butter making. This liquid phase contains most of the water-soluble components of cream. The effect of cream pasteurization on the composition and microstructure of buttermilk after pasteurization, evaporation and spray-drying was studied by researchers at STELA Dairy Research Group, Institute for Nutraceuticals and Functional Foods (INAF), Université Laval, Quebec City, Que, Canada and Dairy Products and Technology Center, California Polytechnic State University, San Luis Obispo, CA, USA. The composition of milk fat globule membrane (MFGM) isolated from buttermilk samples was also characterized. Pasteurization of cream resulted in higher lipid recovery in the buttermilk. Spray-drying of buttermilk had a significant effect on phospholipid content and composition. After spray-drying, the phospholipid content decreased by 38.2% and 40.6%, respectively in buttermilk from raw or pasteurized cream when compared with initial buttermilks. Pasteurization of cream resulted in the highest increase in whey protein recovery in MFGM isolates compared with all other processing steps applied on buttermilk. A reduction in phospholipid content was also observed in MFGM isolates following spray-drying [Morin Pierre, Jiménez-Flores Rafael and Pouliot Yves, Effect of processing on the composition and microstructure of buttermilk and its milk fat globule membranes, *Int Dairy J*, 2007, 17(10), 1179-1187].

**Probiotic cultures for fortification in fruit juices**

Researchers at Ireland examined the suitability of probiotic cultures as fruit juice supplements by assessing their acid tolerance and technological robustness. Survival of *Lactobacillus* and *Bifidobacterium* strains in orange juice (OJ), pineapple juice (PJ) and cranberry juice (CJ) was monitored. Probiotic tolerance to thermal and non-thermal processing was studied to determine the feasibility of their addition to OJ prior to pasteurisation. OJ fortified with probiotic
Presently, Lactobacillus acidophilus or bifidobacteria Bifidobacterium animalis are increasingly being incorporated into yoghurt due to the health benefits of these probiotic bacteria. Intestinal microorganisms can produce conjugated linoleic acid (CLA), and CLA supply can be increased not only by consuming CLA-enriched dairy products but also by modifying the gut flora by introducing high CLA-producing lactic acid. Oligosaccharides, especially fructo-oligosaccharides (FOS) have received much attention recently as functional food ingredients. They are used to enhance the survivability and colonization of probiotic bacteria that are added to foods and may affect the CLA occurrence in probiotic yoghurts. Therefore, researchers at Turkey carried out studies to determine the effect of milk processing, addition of L. acidophilus or B. animalis, supplementation with FOS and storage on CLA levels in regular set yoghurts.

A gas chromatographic procedure was used for the analysis of CLA isomers, c9t11-CLA and t10c12-CLA, in yoghurts containing L. acidophilus or B. animalis and/or 2% FOS. Two groups of set yoghurts containing no supplement or 2% FOS were manufactured using three different starter cultures to determine the effect of processing, starter culture type, FOS supplementation and storage on CLA content. It was observed that addition of these bacteria contributed to significant increases in the CLA content of yoghurt and supplementation of milk with 2% FOS resulted in an additional increase of CLA in the yoghurts. The highest level of total CLA was obtained in the product containing FOS and B. animalis. It is concluded that CLA levels could be enhanced by probiotic bacteria with high CLA-producing potential and FOS supplementation during processing of yoghurt. Total CLA content of the probiotic yoghurts was stable over a 28 days storage period [Akalin AS, Tokusoglu O, Gönç S and Aycan S, Occurrence of conjugated linoleic acid in probiotic yoghurts supplemented with fructooligosaccharide, Int Dairy J, 2007, 17(9), 1089-1095].

Occurrence of conjugated linoleic acid in probiotic yoghurts supplemented with fructo-oligosaccharide

Production of free fatty acids and conjugated linoleic acid in probiotic dahi

Several studies have revealed that the addition of lactic acid bacteria (LAB) to dairy products may contribute to the production of free fatty acids (FFAs) by lipolysis of milk fat. Moreover, LAB also have the ability to produce conjugated linoleic acid (CLA) from linoleic acid, which has attracted much attention as a novel type of beneficial functional lipid. Therefore, the production of FFAs and CLA in probiotic dahi containing Lactobacillus acidophilus and L. casei during fermentation and 10 days of storage at 4°C was evaluated and compared with control dahi by researchers at National Dairy Research Institute, Karnal, Haryana, India. The total FFAs in terms of acid degree values...
significantly increased during fermentation and storage of both types of dahi samples. In addition, gas chromatographic analysis of FFAs showed that butyric and linoleic acids increased in the probiotic dahi compared to control dahi during fermentation and storage. Furthermore, the CLA content also increased during fermentation and remained stable during storage, whereas no change was observed in the control. Probiotic lactobacilli appeared to increase the production of FFAs by lipolysis of milk fat, and produced CLA by using internal linoleic acid, which may confer nutritional and therapeutic value to the product [Yadav Hariom, Jain Shalini and Sinha PR, Production of free fatty acids and conjugated linoleic acid in probiotic dahi containing Lactobacillus acidophilus and Lactobacillus casei during fermentation and storage, Int Dairy J, 2007, 17(8), 1006-1010].

**Efficacy of whey protein to ameliorate the toxic effects of aflatoxins**

Aflatoxins (AFTs) are secondary metabolites of some mould strains of Aspergillus flavus and A. parasiticus that frequently contaminate cereal crops. The physiological effects of AFT consumption include liver damage characterized by enlargement, release of enzymes into the blood and impaired protein synthesis. Whey protein concentrates (WPCs) and isolates are considered as functional food ingredients of important nutritional and health effects. They represent a mixture of secreted proteins with wide range of chemical, physical and functional properties.

A study was conducted by researchers at National Research Center, Dokki, Cairo, Egypt to assess the ability of whey protein concentrate to protect against aflatoxicosis. Three groups of Sprague-Dawley male rats were used. The control (a) was fed on casein diet, the control (b) received the same diet contaminated with aflatoxins (AFT; 2.5mg AFB1/kg). The AFT-contaminated diet was supplemented with WPC and fed to the third group for 9 weeks. Compared with control (a) rats, those fed the contaminated diet control (b) showed significant drop ($P<0.05$) in body weight gains, food efficiency ratio (FER), an increase in the liver function enzymes, malondialdehyde level and a decrease in blood glutathione, plasma calcium, magnesium and potassium. Addition of WPC to the AFT-contaminated diet realized better growth rate and FER and improved the above biochemical parameters. These findings indicate that whey proteins can alleviate some of the toxic effects of AFT [Saleh Zeinab A, El-Garawany Gamaal A, Assem Faya and El-Shibiny Safinaz, Evaluation of the efficacy of whey protein to ameliorate the toxic effects of aflatoxins in rats, Int Dairy J, 2007, 17 (7), 854-859].

**Flow behaviour of inulin-milk beverages**

Inulin is a natural component of several fruits and vegetables. It is mainly obtained from chicory roots by an extraction process with hot water, followed by purification and crystallisation. In addition to its beneficial effects on health, as a dietetic fibre and as a prebiotic ingredient, inulin shows interesting technological properties, as a low-calorie sweetener, as a fat substitute, or it can be used to modify texture.

The effects of the addition of different types of inulin (oligofructose, native and long chain) at different concentrations (2, 4, 6, 8 and 10% w/w) on the flow behaviour of milk beverages model systems were studied by researchers in Spain. The flow of the inulin-milk solutions was Newtonian, except for whole milk samples with higher long chain inulin concentrations (8 and 10%), which were shear thinning. All inulin-κ-carrageenan-milk samples were shear thinning. The viscosity of 3.1% fat whole milk could be approximated by skim milk with 4-10% short chain inulin or with 6-8% native inulin or with 4-6% long chain inulin. In κ-carrageenan-milk samples, the addition of inulin could not replace the effect of milk fat on the viscosity of these systems. The results showed that the effect of the inulin average chain length and of the inulin concentration on viscosity of milk beverages depended on the type of milk (skimmed or whole) and on the addition or not of κ-carrageenan [Villegas B and Costell E, Flow behaviour of inulin-milk beverages. Influence of inulin average chain length and of milk fat content, Int Dairy J, 2007, 17 (7), 776-781].
Loss of rutin and antioxidant activity of asparagus juice

Asparagus (Asparagus officinalis Linn., family Liliaceae) is a green vegetable with high antioxidant activity. As asparagus deteriorate quickly after harvest, it is often processed to extend its shelf-life. Asparagus juice could be a potential product for human consumption.

Researchers at Washington State University, Pullman, WA, USA found that a commercial pectolytic enzyme preparation from Aspergillus niger (pectinase AN) contained laccase activity that decreased rutin content and antioxidant activity of asparagus juice. Asparagus juice was incubated with pectinase AN at different pH (3.2, 4.5 and 5.8), temperatures (25, 37 and 50°C) and enzyme concentrations (0.1, 0.5 and 1%). Rutin content and antioxidant activity of samples was determined by HPLC and 2,2'-diphenyl-1-picrylhydrazyl (DPPH) free radical method, respectively. The rate of loss of rutin and antioxidant activity of asparagus juice was smaller at pH 3.2 than at pH 4.5 and pH 5.8, smaller for 0.1% pectinase AN than 0.5% and 1% pectinase AN. The rate of loss of rutin of asparagus juice was greater at 25°C than at the other two temperatures. Pectinase AN can decrease rutin content and antioxidant activity of asparagus juice at the selected conditions. But rutin content and antioxidant activity of asparagus juice produced using pectinase AN could be less decreased at pH 3.2 and 0.1% of enzyme with less than 2h of incubation time. This information was helpful for juice industry to produce juices with high antioxidant activity using pectinase AN [Sun Ting, Powers Joseph R and Tang Juming, Loss of rutin and antioxidant activity of asparagus juice caused by a pectolytic enzyme preparation from Aspergillus niger, Food Chem, 2007, 105 (1), 173-178].

Optimization of enzymatic prepress treatment of elderberry juice

Researchers from Denmark examined the effects of different, statistically designed, enzymatic maceration treatments on juice yield, turbidity and phenol yield (total phenols and total anthocyanins) in experimentally produced elderberry (Sambucus nigra Linn.) juice. Increased pectinolytic enzyme dose, longer maceration time and elevated reaction temperature all had significantly positive effects on the juice yield. Increased enzyme dose and maceration temperature also increased the yields of anthocyanins in the elderberry juice, while none of the reaction parameters affected the juice turbidity. The juice yield was optimized further in a new experimental template, made by using the statistical steepest ascent optimization method. In the new response surface design template an optimal maceration treatment giving maximal juice yield and anthocyanin yields and low turbidity was identified. With the optimal treatment with a pectinolytic enzyme preparation, Pectinex BE 3L, produced by a cloned Aspergillus strain, a maximal juice yield of 77% w/w of the berry mash, an anthocyanin yield of 2380mg/kg fresh berry mash and a turbidity level of 128 formazin nephelometric units (FNU) were obtained. Enzymatic prepress treatment generally decreased turbidity levels by 30% as compared to pressing without prior enzymatic treatment. A comparison of the responses obtained after the optimal enzymatic treatment with five different pectinolytic enzyme preparations showed that the Aspergillus niger preparation Pectinex BE Color gave slightly better juice and phenol yields and lower turbidity levels than the other enzyme preparations tested. The results demonstrated that juice and phenolic yields in elderberry juice could be improved with enzyme treatment and that the optimal reaction conditions for obtaining the best juice yield, highest phenolics and lowest turbidity levels could be rationally identified via statistical factor level optimization [Landbo Anne-Katrine, Kaack Karl and Meyer Anne S, Statistically designed two step response surface optimization of enzymatic prepress treatment to increase juice yield and lower turbidity of elderberry juice, Innov Food Sci Emerg Technol, 2007, 8 (1), 135-142].
ACE-inhibitory activity of probiotic yoghurt

Fermented milk products, in addition to providing both energy and nutrients, are an excellent source of bioactive peptides. Among various bioactive peptides, the antihypertensive peptides or angiotensin-converting enzyme inhibitors (ACE-I) are the most widely studied. ACE inhibition leads to a decrease in the level of the vasoconstricting peptide, angiotensin II and a corresponding increase in the level of the vasodilatory peptide, bradykinin, therefore, yielding an overall reduction in blood pressure. These biologically active peptides could represent a healthier and natural alternative for the ACE-I drugs. Although yoghurt culture exhibited a substantial level of proteolytic activity in the control yoghurt, the amount of liberated peptides was further enhanced by the action of probiotic bacteria in the probiotic yoghurt. Consequently, the increased proteolytic activity could have resulted in better survival of some probiotic organisms in yoghurt during storage.

Researchers of Australia assessed in vitro ACE-I activity of peptide fractions from different yoghurt batches. Inhibition of ACE activity resulted in an overall antihypertensive effect. Yoghurts were prepared either using a sole yoghurt culture including Lactobacillus delbrueckii ssp. bulgaricus Lb1466 and Streptococcus thermophilus Stt1342, or L. acidophilus L10, L. casei L26 and Bifidobacterium lactis B94 in addition to yoghurt culture. ACE-I activity was determined at weekly intervals during 28 days of cold storage. Peptide fractions showing high ACE-I activity were further purified using multiple-steps of RP-HPLC. All probiotic yoghurts showed appreciable ACE-I activity during initial stages of storage compared with the control yoghurt, with a significant (P<0.05) decrease afterwards. The ACE-I activity ranged from IC_{50} of 103.30-27.79µg/ml with the greatest ACE inhibition achieved during first and third week of storage. The in vitro ACE-I activity could be related to the peptide liberation via degradation of caseins. In total, 8 ACE-I peptides were characterized originating from α_s-casein (1), κ-casein (2) and β-casein, of which two well-known ACE-inhibiting peptides, namely Val–Pro–Pro (VPP) and Ile–Pro–Pro (IPP) were identified. These peptides are already used in commercial products. However, further studies are necessary to elucidate the formation and degradation mechanism of these peptides. The development of yoghurt containing higher concentrations of released bioactive ACE inhibitors and viable probiotics may deliver health benefits to consumers [Donkor ON, Henriksson A, Singh TK, Vasiljevic T and Shah NP, ACE-inhibitory activity of probiotic yoghurt, Int Dairy J, 2007, 17 (11), 1321-1331].

Use of probiotic and dairy cultures in fermented soymilk

The metabolic activities of Lactobacillus acidophilus (LAFTI® L10 and La4962) Bifidobacterium (lactis LAFTI® B94 and longum BI536), Lactobacillus casei (LAFTI® L26 and Lc279), Lactobacillus delbrueckii ssp. bulgaricus Lb1466 and Streptococcus thermophilus Stt1342 were assessed in soymilk by researchers of Australia. Strains were initially analyzed for α-galactosidase activity and organic acid production in MRS broth at 37°C. Consequently, soymilk was fermented with each strain and cell growth, production of organic acid, metabolism of oligosaccharides and proteolytic and ACE-inhibitory activities were assessed during 48h of incubation at 42°C. All strains exhibited variable α-galactosidase activity, with Bifidobacterium lactis B94 showing the highest activity. The oligosaccharide metabolism depended on α-galactosidase activity. B. lactis B94, S. thermophilus Stt1342 and L. acidophilus La4962 reduced raffinose substantially by 77.4, 64.5 and 55.9%, respectively. All strains reached the desired therapeutic level of 10^8cfu/ml in soymilk after 48h at 42°C. The hydrolysis of protein in soymilk likely depended on strain (P<0.0001) and time (P<0.0001). The strains also released bioactive peptides with ACE-inhibitory activities between 17 and 43%. Thus, fermented soymilk could be converted into a rich functional product containing probiotics and bioactive compounds [Donkor Osaana N, Henriksson A, Vasiljevic T and Shah NP, α-Galactosidase and proteolytic activities of selected probiotic and dairy cultures in fermented soymilk, Food Chem, 2007, 104 (1), 10-20].