Beverages

Concentration of pineapple juice by osmotic evaporation

A group of researchers at Thailand, Brazil and France worked to evaluate the process of osmotic evaporation to concentrate pineapple juice. In order to study the effect of pulp content on the performance, clarified and single strength pineapple juices were successively concentrated up to 57-100/g total soluble solids (TSS). Trials were carried out with a laboratory unit using saturated calcium chloride brine as the extracting phase. Under the operating conditions, the difference in temperature between the juice and the brine had a large influence on the water evaporation rate. The highest flux was obtained at 35°C in the juice compartment and 20°C on the brine side. Flux ranged from 2 to 13kg/h/m². It significantly decreased when the TSS content of the juice increased. For the same operating conditions, higher flux values were obtained when processing the clarified juice, which indicated an effect of pulp content on performance. At no time were significant changes observed in the quality of the products obtained from raw juices and juices from concentrates [Hongvaleerat Chularat, Cabral Lourdes MC, Dornier Manuel, Reynes Max and Ningsanond Suwayd, Concentration of pineapple juice by osmotic evaporation, J Food Eng, 2008, 88(4), 548-552].

Nutritional properties of oat-based beverages as affected by processing and storage

Oats possess balanced nutritional properties in terms of dietary fibre, protein, fatty acid, vitamins and minerals. As a new way to increase oat consumption, oat-based beverages have been developed. Investigation of the health benefits of oat beverages has proved that liquid oats, as such, retain the cholesterol-lowering effect. Oat-based beverages enriched with vitamins and minerals were produced by the scientists at Lund University, Lund, Sweden, and CEBA Foods AB, Landskrona, Sweden with common hydrothermal treatments and stored at 22°C for 64 weeks. The effects of decanting on the retention of native vitamins, minerals and fatty acids and different UHT (Ultra-high temperature processing) holding time (5s or 20s) at 140°C on vitamins were investigated. Fatty acid profile, vitamin retention and dissolved oxygen concentration were monitored during storage. The decanting process caused a 47% increase of vitamin B6 and a 45-74% loss of phosphorus, zinc, calcium and iron. The steam-injection UHT treatment caused a 60% loss of vitamin D3 for both holding times and a 30% loss of vitamin B12 for 20s. During 1 year of storage, oleic and linoleic acids were stable, whereas linolenic acid decreased only slightly, even in the iron-enriched variety. The dissolved oxygen concentration increased to a low value of 0.71mg/l and reached a balance after 16 weeks. Most enriched vitamins except vitamins A, D3 and B12 were stable during ambient storage. Thus oat-based beverages with highly retained vitamins can be manufactured by adding vitamins prior to direct UHT treatment with a shorter holding time. Additionally, iron enrichment of such beverages, without affecting the fatty acid profile, can be achieved by filter sterilization [Zhang Huanmei, Önning Gunilla, Triantafyllou Angie Öste and Öste Rickard, J Sci Food Agric, 2007, 87(12), 2294-2301].

Concentration of pineapple juice by osmotic evaporation

A group of researchers at Thailand, Brazil and France worked to evaluate the process of osmotic evaporation to concentrate pineapple juice. In order to study the effect of pulp content on the performance, clarified and single strength pineapple juices were successively concentrated up to 57-100/g total soluble solids (TSS). Trials were carried out with a laboratory unit using saturated calcium chloride brine as the extracting phase. Under the operating conditions, the difference in temperature between the juice and the brine had a large influence on the water evaporation rate. The highest flux was obtained at 35°C in the juice compartment and 20°C on the brine side. Flux ranged from 2 to 13kg/h/m². It significantly decreased when the TSS content of the juice increased. For the same operating conditions, higher flux values were obtained when processing the clarified juice, which indicated an effect of pulp content on performance. At no time were significant changes observed in the quality of the products obtained from raw juices and juices from concentrates [Hongvaleerat Chularat, Cabral Lourdes MC, Dornier Manuel, Reynes Max and Ningsanond Suwayd, Concentration of pineapple juice by osmotic evaporation, J Food Eng, 2008, 88(4), 548-552].

Nutritional properties of oat-based beverages as affected by processing and storage

Oats possess balanced nutritional properties in terms of dietary fibre, protein, fatty acid, vitamins and minerals. As a new way to increase oat consumption, oat-based beverages have been developed. Investigation of the health benefits of oat beverages has proved that liquid oats, as such, retain the cholesterol-lowering effect. Oat-based beverages enriched with vitamins and minerals were produced by the scientists at Lund University, Lund, Sweden, and CEBA Foods AB, Landskrona, Sweden with common hydrothermal treatments and stored at 22°C for 64 weeks. The effects of decanting on the retention of native vitamins, minerals and fatty acids and different UHT (Ultra-high temperature processing) holding time (5s or 20s) at 140°C on vitamins were investigated. Fatty acid profile, vitamin retention and dissolved oxygen concentration were monitored during storage. The decanting process caused a 47% increase of vitamin B6 and a 45-74% loss of phosphorus, zinc, calcium and iron. The steam-injection UHT treatment caused a 60% loss of vitamin D3 for both holding times and a 30% loss of vitamin B12 for 20s. During 1 year of storage, oleic and linoleic acids were stable, whereas linolenic acid decreased only slightly, even in the iron-enriched variety. The dissolved oxygen concentration increased to a low value of 0.71mg/l and reached a balance after 16 weeks. Most enriched vitamins except vitamins A, D3 and B12 were stable during ambient storage. Thus oat-based beverages with highly retained vitamins can be manufactured by adding vitamins prior to direct UHT treatment with a shorter holding time. Additionally, iron enrichment of such beverages, without affecting the fatty acid profile, can be achieved by filter sterilization [Zhang Huanmei, Önning Gunilla, Triantafyllou Angie Öste and Öste Rickard, J Sci Food Agric, 2007, 87(12), 2294-2301].

Honey diastase activity modified by heating

Diastase activity is a honey quality parameter used to determine if honey has been extensively heated during processing. Honey heating effect on the diastase activity was studied in two steps by researchers at Argentina. Heating was carried out in the transient heating step, with final temperatures between...
Beverages

60 and 100°C and 14 s elapsed time, and in the isothermal heating step, in which temperature was held between 60 and 100°C at heating times between 120 to 1200 s. Six honey samples with initial diastase activity between 25.8 and 11.2 Schade units were tested. During the transient heating, it was observed a decrease in the diastase activity related to an increase in temperature in all assays. The activity becomes zero at 100°C for both transient and isothermal heating. During isothermal heating, all samples showed a decrease of the diastase activity at short heating times. However, an activity recovery occurs in medium temperature treatments at longer times. The initial activity value, corresponding to the control sample, was not achieved in any case. This changing behaviour makes diastase activity an uncertain parameter to determine if honey has been submitted to heating [Tosi E, Martinet R, Ortega M, Lucero H and Ré E, Honey diastase activity modified by heating, Food Chem, 2008, 106(3), 883-887].

Green tea – A potential preservative for extending the shelf-life of fresh mutton

Researchers at Defence Food Research Laboratory, Siddarthanagar, Mysore, India carried studies to evaluate the feasibility of using green tea (GT) to extend the shelf-life of fresh mutton, at ambient storage conditions (25±2°C and 85±5% RH). The ethanolic extract of GT (GTE) was found to significantly inhibit (P<0.01) spoilage microflora, including certain pathogens of acidulant treated mutton (pH 3.8) for up to 4 days. Application of GTE did not cause any deleterious change in sensorial and physical quality and the mutton was acceptable for up to 4 days. While the control samples showed initial signs of spoilage between 20 and 24 hours and registered an increase in free fatty acids (FFA) from 1.24 g to 4.1 g/100 g lipid and biogenic amine index (BAI) from 0.27 mg to 4.63 mg/100 g mutton, at the end of two days of storage, the GTE treated sample showed FFA levels of 1.5 g/100 g lipid and BAI of 0.25 mg/100 g mutton at the end of the 4 days. GTE treatment could be effectively used to extend the shelf-life of fresh mutton for up to 4 days in Indian climatic conditions, since it significantly (P<0.01) inhibits the formation of these lipolytic and proteolytic degradation products, which are responsible for sensorial spoilage. Since green tea is consumed by people as a daily beverage all over the world, extracts of green tea may be safe to use in food systems to extend the shelf-life [Kumudavally KV, Phanindrakumar HS, Tabassum Aisha, Radhakrishna K and Bawa AS, Green tea – A potential preservative for extending the shelf-life of fresh mutton at ambient temperature (25±2°C), Food Chem, 2008, 107 (1), 426-433].

Effect of thermosonication on quality improvement of tomato juice

Inactivation of pectin-methylesterase (PME) and polygalacturonase (PG) is required to minimize quality loss in tomato products. Tomato juice was subjected to thermosonication (TS) (24 kHz) by researchers of Australia, at amplitudes of 25, 50 and 75µm at 60, 65 and 70°C or heat only treatments. The TS treatment at 60, 65 and 70°C for 41.8, 11.7 and 4.3 min exposure, respectively reduced PME activity by 90%. The heat only treatment at 60, 65 and 70°C for 90.1, 23.5 and 3.5 min, respectively inactivated PME by 90%. TS treatments with 25-75 µm amplitude had no significant impact on the inactivation efficiency between 60 and 70°C. After TS
Beverages

Sugarcane (Saccharum officinarum Linn.) juice is widely consumed by people of the tropics and subtropics. It has been used to cure jaundice and liver-related disorders in Indian systems of medicine. Its possible mechanism of action was examined in terms of antioxidant availability by researchers at Bhabha Atomic Research Centre, Trombay, Mumbai, India. The assays involved different levels of antioxidant action such as oxygen radical absorbance capacity (ORAC), radical scavenging abilities using 1,1-diphenyl-2-picryl hydrazyl (DPPH); 2,2’-azobis-3-ethyl benzthiazoline-6-sulfonic acid (ABTS); ferric reducing antioxidant power (FRAP); and protection of membranes examined by inhibition of lipid peroxidation. In addition, the content of phenols and total flavonoids were measured. The aqueous extracts of three varieties of sugarcane were studied. These varieties showed good antioxidant properties and were also able to protect against radiation induced DNA damage in pBR322 plasmid DNA and Escherichia coli cultures. In conclusion, the study reveals that the ability of sugarcane juice to scavenge free radicals, reduce iron complex and inhibit lipid peroxidation, may explain possible mechanisms by which sugarcane juice exhibits its beneficial effects in relation to its reported health benefits [Kadam US, Ghosh SB, De Strayo, Suprasanna P, Devasagayam TPA and Bapat VA, Antioxidant activity in sugarcane juice and its protective role against radiation induced DNA damage, Food Chem, 2008, 106 (3), 1154-1160].

Antioxidant activity in sugarcane juice and its protective role against radiation induced DNA damage

Pomegranate wine has greater protection capacity than red wine on LDL oxidation

The researchers at Ege University, Bornova-Izmir, Turkey observed that there is a large number of evidences on the main role of red wine in protection of low-density lipoprotein (LDL) against oxidation but there are few data on the role of pomegranate juice, which has high phenolic content. Considering the possible importance of pomegranate wine as an antioxidant and in order to make a comparison between red and pomegranate wines they conducted a comparative study. The researchers at Ege University, Bornova-Izmir, Turkey observed that there is a large number of evidences on the main role of red wine in protection of low-density lipoprotein (LDL) against oxidation but there are few data on the role of pomegranate juice, which has high phenolic content. Considering the possible importance of pomegranate wine as an antioxidant and in order to make a comparison between red and pomegranate wines they conducted a comparative study. The phenol levels of pomegranate and red wines (4,850 mg/l gallic acid equivalents and 815 mg/l gallic acid equivalents, respectively) were in accordance with their total antioxidant activity (39.5 and 33.7%, respectively). Both wines decreased LDL-diene levels following a 30-minute incubation period compared with controls (145 ± 3.2 µmol/mg of LDL protein). However, pure pomegranate wine demonstrated a greater antioxidant effect ($P<0.01$) on diene level (110 ± 4.6 µmol/mg of LDL protein) than pure red wine (124 ± 3.2 µmol/mg of LDL protein). Thus pomegranate wine has potential protective effects toward LDL oxidation and it may be a dietary choice for people who prefer fruit wines [Ebru Demirel Sezer, Yasemin Delen Akcay, Bilal Ilanbey, Hatice Kalkan Yildirim, Eser Yildirim Sozmen, Pomegranate wine has greater protection capacity than red wine on low-density lipoprotein oxidation, J Med Food, 2007, 10(2), 371-374].
Beverages

Studies on extraction and antioxidant potential of green coffee

Green coffee conserves were prepared from the species *Coffea arabica* Linn. and *C. robusta* Linden by flaking, powdering and extraction with solvent mixtures of isopropanol and water in different ratios and their antioxidant properties were investigated by scientists at Central Food Technological Research Institute, CSIR, Mysuru, India. The yields of conserves were highest 27% for *C. arabica* and 29% for *C. robusta*, when isopropanol and water in ratio of 60:40 was employed. The total polyphenol content was determined and found to be higher (31.7-32.2%) in these conserves. At a concentration of 200 ppm, coffee conserves from Arabica and Robusta, exhibited 92% and 88% antioxidant activity, respectively in comparison to 95% for BHA. The conserves were analyzed by HPLC and three phenolic compounds could be identified. The chlorogenic acid, the major compound in the purified extracts (56±10%), was isolated and characterized by $^1$H and $^{13}$C NMR spectral data. While the caffeic acid part of the molecule was confirmed from the signals for aromatic protons and olefinic protons, the quinic acid group was evident from the signals for methine protons $\alpha$ to hydroxyl groups as well as for the methylene protons of the cyclohexane moiety. Similarly, $^{13}$C spectra showed signals for two carbonyl carbons, apart from eight signals corresponding to six aromatic and two olefinic carbons and signals for the six carbons in the cycloalkane side chain. Results indicated that the conserves from green coffee possess potential antioxidant activity and could be used as nutraceuticals as well as preservatives in food formulations [Naidu M Madhava, Sulochanamma G, Sampathu SR and Srinivas P, Studies on extraction and antioxidant potential of green coffee, *Food Chem*, 2008, 107 (1), 377-384].

Alkaline phosphatase and microbial inactivation by pulsed electric field in bovine milk

The effects of pulsed electric field (PEF) treatments at field intensities of 25-37 kV/cm and final PEF treatment temperatures of 15 and 60°C on the inactivation of alkaline phosphatase (ALP), Total Plate Count (TPC), *Pseudomonas* and *Enterobacteriaceae* counts were determined in raw skim milk by scientists at Australia. At 15°C, PEF treatments of 28 to 37 kV/cm resulted in 24-42% inactivation in ALP activity and <1 log reduction in TPC and *Pseudomonas* count, while the *Enterobacteriaceae* count was reduced by at least 2.1 log units to below the detection limit of 1CFU/mL. PEF treatments of 25 to 35kV/cm at 60°C resulted in 29-67% inactivation in ALP activity and up to 2.4 log reduction in TPC, while the *Pseudomonas* and *Enterobacteriaceae* counts were reduced by at least 5.9 and 2.1 logs, respectively, to below the detection limit of 1CFU/mL. Kinetic studies suggested that the effect of field intensity on ALP inactivation at the final PEF treatment temperature of 60°C was more than twice that at 15°C. A combined effect was observed between the field intensity and temperature in the inactivation of both ALP enzyme and the natural microbial flora in raw skim milk [Shamsi Kambiz, Versteeg Cornelis, Sherkat Frank and Wan Jason, Alkaline phosphatase and microbial inactivation by pulsed electric field in bovine milk, *Innov Food Sci Emerg Technol*, 2008, 9(2), 217-223].

Evaluation of pulsed electric field and minimal heat treatments for enhancement of milk shelf-life

Pulsed Electric Field (PEF) treatment of milk provides the opportunity to increase the shelf-life of fresh milk for distribution to distant markets. PEF treatments were evaluated by scientists of Australia in sterile (UHT) milk to determine the inactivation of added spoilage *Pseudomonas* isolates and the subsequent gains in microbial
shelf-life (time taken to reach $10^7$ CFU/ml). Little inactivation of *Pseudomonas* was achieved at 15 or 40°C compared with 50 or 55°C. The greatest inactivation (>5 logs) was achieved by processing at 55°C with 31kV/cm (139.4kJ/l). Heat treatment at the application temperature without PEF treatment caused minimal inactivation of *Pseudomonas* (only 0.2 logs), demonstrating that the inactivation of the *Pseudomonas* was due to the PEF treatment rather than the heat applied to the milk. At added *Pseudomonas* levels of 10³ and 10⁵ CFU/ml, the microbial shelf-life of PEF-treated milk was extended by at least 8 days at 4°C compared with untreated milk. The total microbial shelf-life of the PEF-treated milk was 13 and 11 days for inoculation levels of 10³ and 10⁵ CFU/ml, respectively. The results indicated that PEF treatment is useful for the reduction of pseudomonads, the major spoilage bacteria of milk. [Craven HM, Swiergon P, Ng S, Midgely J, Versteeg C, Coventry MJ and Wan J, Evaluation of pulsed electric field and minimal heat treatments for inactivation of pseudomonads and enhancement of milk shelf-life, *Innov Food Sci Emerg Technol*, 2008, 9(2), 211-216].

**Production of concentrated cherry and apricot juices by cryoconcentration technology**

The scientists at Department of Food Engineering, Laval University, Québec, Qc, Canada prepared apricot and cherry juices successfully by cryoconcentration technology. Two freezing temperatures $-10 \pm 1°C$, $-20 \pm 1°C$ and three cryoconcentration stages were studied. Freezing temperature did not show any affect on total dry matter content of the concentrated juices, as well as on their physico-chemical properties. At the same time, the cryoconcentration stage effect was highly significant on total dry matter content and juice qualities. Total dry matter of the apricot juice increased from 14.50±1.12g/100g up to 35.50±2.09g/100g in three cryoconcentration stages. Cherry juice total dry matter increased from 15.50±1.26g/100g up to 45.50±2.47g/100g. Concentrated juices had high aroma numbers and high content of ascorbic acid compared to the same juices obtained by the conventional method. The present study demonstrated that cryoconcentration as an environmentally friendly technology is a promising and highly effective food processing technique in the juice industry. Aroma number increased from 3.55 up to 8.38 and from 5.23 up to 15.75 for apricot and cherry juices, respectively. The juices obtained by cryoconcentration technology were compared to the same juices obtained by the conventional method of evaporation [Aider Mohammed and Halleux Damien de, Production of concentrated cherry and apricot juices by cryoconcentration technology, *LWT-Food Sci Technol*, 2008, 41(10), 1768-1775].

**HPLC quantification of dye flavonoids in *Reseda luteola* Linn.**

The scientists at Portugal developed a HPLC method for the simultaneous identification of *Reseda luteola* Linn. (Weld) flavonoids and quantification of the main compounds responsible for the yellow colour. This method was applied to a large number of wild Portuguese Weld to evaluate its potential application as dyestuff for textile factories, as a substitute for the synthetic dyes currently used. Portuguese Weld dyestuff content ranged between 1.04 and 5.87%, corresponding to a wide variation of the flavonoids amount (1.39-9.04%). Luteolin 4′-O-glucoside was found for the first time in *R. luteola*, but kaempferol, isorhamnetin and their glycosides were not detected in the Portuguese specimens [Moiteiro Cristina, Gaspar Helena, Rodrigues Ana I, Lopes João F and Carnide Valdemar, HPLC quantification of dye flavonoids in *Reseda luteola* Linn. from Portugal, *J Separ Sci*, 2008, 31(21), 3683-3687].