Different sweeteners in peach nectar

Many articles have been published with negative visions related to sugar, because people believe that its intake is related to obesity. For this reason, artificial sweeteners have received special attention. In order to substitute sucrose successfully, it is necessary to know previously sweetener concentrations that would be used and their sweetness equivalency related to sucrose. Hence, researchers at Department of Food and Nutrition - Faculty of Food Engineering, University of Campinas, Campinas, Brazil conducted studies to determine the ideal sweetness in a peach nectar sweetened with sucrose, using a just-about-right scale and the equivalent sweetness of samples sweetened with aspartame; cyclamate/saccharin blend 2:1; stevia; sucralose and acesulfame-K, using Magnitude Estimation. The concentration of sucrose considered as ideal by the consumers was 10%, with sweeteners' equivalent concentrations of 0.054% for aspartame; 0.036% for cyclamate/saccharin blend 2:1; 0.10% for stevia; 0.016% for sucralose and 0.053% for acesulfame-K [Juliana Maria Porto Cardoso and Helena Maria André Bolini, Different sweeteners in peach nectar: Ideal and equivalent sweetness, *Food Res Int*, 2007, **40**(10), 1249-1253].

Influence of different amounts of vegetable coagulant from cardoon and calf rennet on cheeses made with sheep milk

Different amounts of powdered vegetable coagulant (PVC) obtained from cardoon [***Cynara cardunculus* Linn.** (normal amount=PVC; double the normal amount=2PVC)] were compared by researchers at Spain with calf rennet in cheese made from sheep milk, by determining different chemical, biochemical, and sensory characteristics throughout of 6 months of ripening. For most of the chemical parameters studied, no differences were observed between the coagulants assayed. However, significantly higher ($P<0.05$) levels of casein hydrolysis, measured as soluble nitrogen (SN), non-protein nitrogen (NPN), amino acid nitrogen (AAN) and ammonia-nitrogen ($N.NH_3$), were observed after 2 days of ripening in cheeses produced with 2PVC compared with those made with normal amount of PVC. Furthermore, only the levels of SN and NPN were significantly higher ($P<0.05$) in cheeses produced with PVC than those obtained with calf rennet. The main sensory characteristics were enhanced ($P<0.05$) in cheeses obtained with vegetable coagulant in comparison to those made with calf rennet. The bitter taste of cheeses produced with 2PVC was not significantly stronger ($P>0.05$) than in those produced with a normal amount of vegetable coagulant. The increased proteolytic activity of the vegetable enzymes enable manufacturers to produce fully ripened cheeses (especially when the amount of the vegetable coagulant is doubled) with all the genuine end-product organoleptic characteristics approximately 3 months earlier than if calf rennet is used [Galán E, Prados F, Pino A, Tejada L and Fernández-Salguero J, Influence of different amounts of vegetable coagulant from cardoon *Cynara cardunculus* and calf rennet on the proteolysis and sensory characteristics of cheeses made with sheep milk, *Int Dairy J*, 2008, **18**(1), 93-98].

Shrinkage and porosity of banana, pineapple and mango slices during air-drying

It is very important to monitor characteristics of fruits (e.g. volume, shrinkage and porosity) during drying. There is lack of study in comparing different methods to measure dried product's apparent volume. Specific volume, shrinkage and porosity of banana, pineapple and mango during air-drying were investigated by the researchers at Department of Process and Chemical Engineering, University College Cork, Cork, Ireland. Banana, pineapple and

mango slices were dried to different moisture contents down to approximately 5% wb in an oven dryer at 70°C. The true volume was measured with gas pycnometry. Different methods were compared systematically to measure apparent volume, shrinkage and porosity of banana, pineapple and mango slices. Seven methods were tested: liquid pycnometry, liquid displacement and Archimedes principle, with two organic solvents (toluene and *n*-heptane) and displacement with glass beads. The application of the Archimedes principle with *n*-heptane to measure specific volume yielded the lowest coefficient of variation for banana and pineapple slices, the second lowest for mango slices and therefore it was recommended for measuring the apparent volume of fresh and dried fruit samples. All fruit sample during drying showed a reduced degree of shrinkage at the later stage. With the fruit slices shrinking during drying, the specific volume of dried banana, pineapple and mango showed a minimum at approximately 24, 6 and 30% wb moisture content, respectively. Porosity of banana and mango slices increased 3-folds up to 17% wb and 5-folds up to 12% wb from fresh sample, respectively. Porosity of pineapple increased with moisture content of dried pineapple from around 6 to 33% wb and then kept decreasing till raw pineapple. Image analysis was successfully applicable to measure the diameter and perimeter and describe the structural changes of fruits during drying [Yan Zhengyong, Sousa-Gallagher Maria J and Oliveira Fernanda AR, Shrinkage and porosity of banana, pineapple and mango slices during air-drying, *J Food Eng*, 2008, **84**(3), 430-440].

An assessment of the mechanisms for diffusion in the drying of bananas

The scientists at School of Chemical and Biomolecular Engineering, University of Sydney, Australia have assessed the dominant type of diffusion in drying bananas, together with performing an analysis of the effect of temperature and moisture content on the diffusivity, investigating the variations in the diffusivities within and between the bananas and studying the effect of the degree of ripeness on the diffusivity. Drying experiments were carried out at dry-bulb temperatures of 60 and 80ºC and wet-bulb temperatures of 30 and 40ºC. Samples prepared from different parts of the bananas and bananas at different degrees of ripeness were used in the experiments. The pore size distribution of the bananas was found to be from 1 to 18nm and the Knudsen numbers were estimated to be from 3 to 55, suggesting that Knudsen diffusion may be a significant type of diffusion occurring during the drying of bananas. However, the diffusivities, from 4.1×10^{-7} to 7.94×10^{-6} m^2/s, for Knudsen diffusion are larger than those estimated experimentally. Surface diffusion may be the limiting transport mechanism for diffusion in dried bananas, which describes the diffusivity in the same way as Fickian diffusion. The diffusivity for bananas was best described as a function of temperature and moisture content with a standard error of 0.06kg/kg. The diffusivities within and between the bananas at the same overall degree of ripeness showed only small variations, but overripe bananas were found to have larger diffusivities compared with ripe and unripe bananas [Baini R and Langrish TAG, An assessment of the mechanisms for diffusion in the drying of bananas, *J Food Eng*, 2008, **85**(2), 201-214].

Osmotic dehydration of pineapple

Osmotic dehydration can be used as a pre-treatment for tropical fruits for obtaining high quality dried fruit products. Hence the scientists at CSIR, Biosciences Unit, South Africa, Universidad Politecnica de Valencia, Spain and Department of Process and Chemical Engineering, University College Cork, Cork, Ireland applied this concept to South African grown Cayenne type pineapple pieces. The effect of osmotic dehydration on mass fluxes (water loss, solids gain and weight reduction) was investigated. Pineapple cylinders of 2cm in diameter and 1cm thick were immersed in sucrose solutions of 45, 55 and 65 ºBrix at 30, 40 and 50°C for 20, 40, 60, 20, 180 and 240min. Experiments were conducted at both

atmospheric pressure and applying a 200mbar vacuum pulse during the first 10min. Water loss and solids gain increased with temperature and concentration. Applying a vacuum pulse facilitated water loss especially at the highest concentration and temperature. Furthermore, the yield was improved by applying a vacuum pulse, as mass loss was less in those cases. Temperature affected mostly the water loss while the concentration of the solution affected mostly the solids gain. Prototypes of high/low water loss and high/low solids gain combinations were selected for quality evaluation [Lombard GE, Oliveira JC, Fito P and Andrés A, Osmotic dehydration of pineapple as a pre-treatment for further drying, *J Food Eng*, 2008, **85**(2), 277-284].

Orange-Fleshed, Organic Honeydews

The rough outer surface of cantaloupes or muskmelon is known to harbor human-illness pathogens and defy sanitation measures. Microbes can hide in the netting's crevices, covered by naturally forming biofilms that protect them from sanitizers. When netted melons are cut, any microbes present on the exterior can be transferred to the inner flesh. For organic melon growers—who use manure as fertilizer—this is a major concern. Plant physiologist Gene Lester, in the Crop Quality and Fruit Insects Research Unit at Weslaco, Texas, team is developing ways to reduce foodborne illness associated with cantaloupe. They suggested that netted cantaloupes be replaced with nonnetted melon genotypes,

such as an orange-fleshed honeydew (***Cucumis melo* Linn.**, Inodorus group). This kind of melon is a cross between a cantaloupe and a honeydew. The smooth-skinned honeydew types don't carry the same consumer risk as melons with rough outer netting.

Another benefit of these melons is their nutrient content. Until recently, little has been known about how the health-promoting phytochemicals or antioxidant capacity of orange-fleshed honeydews compare to those of netted cantaloupes. Lester's collaborations have shown that orange-fleshed melons contain higher amounts of vitamins (C, A and folic acid), minerals (calcium, iron, magnesium and potassium) and antioxidants (phenolics and enzymes).

Orange-fleshed honeydews could easily be marketed as specialty produce as they store well i.e. around 3 weeks, compared to 10 to 14 days for a typical netted cantaloupe in simulated commercial retail storage. One cultivar, 'Orange Dew', is being grown organically in limited quantities in the United States. It has Brix of 11 to 14, compared to 9 for most cantaloupes [Alfredo Flores, A New Specialty Crop, Orange-Fleshed, Organic Honeydews!, *Agric Res Mag*, 2007, **55**(10), 17].

Great Guava

For years, there's been a common notion that you get the best nutritional punch from a few well-publicized foods, such as blueberries, black beans and broccoli. Well, they can move over now and make room for a surprising new addition: guava.

Until recently, only limited information has been available about the nutritional composition of tropical fruits–especially the more exotic ones. But in South Florida, growers are not only

producing guava, carambola, mango, papaya and citrus, but also pitaya, sapodilla, lychee, longan and mamey sapote. So researchers at the U.S. Citrus and Subtropical Products Research Laboratory at Winter Haven, Florida, have been using standard methods to analyze these fruits for components that could be beneficial to human health. It's no wonder that nutritionists and scientists have for years recommended that we eat five to nine servings of fruits and vegetables each day.

The function of natural antioxidants and dietary fibre in foods and biological systems has received a lot of attention lately. Fruits and vegetables are playing an increasingly significant role in

the daily diet, because many of them provide an optimal mix of antioxidants such as vitamins C and E, polyphenols, and carotenoids along with complex carbohydrates and fibre. Food writers and marketers have been emphasizing foods known to be high in antioxidants– adding chocolate, oats, onions, soy, spinach, sweet potatoes, tomatoes and walnuts to the list.

Guava's antioxidant content proved to be around that of orange, grapefruit and broccoli and just below that of spinach all foods that are considered to be high in antioxidants. Other fruits that ranked surprisingly high in antioxidants included lychee and papaya [Alfredo Flores, Great Guava! Tropical fruits offer nutrition—along with color, taste, and variety, *Agric Res Mag*, 2007, **55**(9), 10-11].

Keeping Apples crunchy and flavourful after storage

An apple starts to turn soft and rot after few weeks but in storage under controlled-atmosphere conditions it will last up to 10 months, depending on variety. Fruit distributors treat their apple bins with a gaseous compound, 1-methylcyclopropene (1-MCP). North Carolina Some State University (NCSU) researchers Edward Sisler and Sylvia Blankenship found this compound that worked great to inhibit ethylene. They used

carnations as test plant to see the results quickly and also treated apples and tomatoes. They found 1-MCP as a more potent inhibitor, which was also nontoxic and easier to handle. It extends the fruits' poststorage quality by blocking ethylene, a colourless gas that naturally regulates ripening and aging. Slower ripening during transport and marketing ultimately results in better quality on the shelf for consumers. On average, treated apples stayed firm for 3 to 6 months longer than untreated controls when placed in controlled-atmosphere storage conditions [Jan Suszkiw, "Keeping Apples Crunchy and Flavorful After Storage", *Agric Res Mag*, 2007, **55**(9), 18-19].

Prediction of water and soluble solids concentration during osmotic dehydration of Mango

The researchers at Mozambique, Sweden and Ireland conducted studies to develop a mathematical model to predict the kinetics of the change in water and soluble solids fractions in mango (cv. 'Haden') osmotically dehydrated in a sucrose solution. A full factorial design at three levels was used, varying temperature (T) and concentration of soluble solids in the osmotic solution (SSC). The models based on the Weibull distribution were built up in two steps: (i) primary models to determine the kinetic parameters at constant T and SSC, (ii) secondary models to further include the influence of T and SSC on the

parameters of the primary model. The Weibull model can successfully describe both water and sugar fractions during osmotic dehydration (R^2 = 0.98 and 0.96, respectively for water and sugar models). The time constant (τ) for both models followed an Arrhenius-type relationship with temperature, with the reference time constant (τ_{ref}) at the average T and increasing linearly with SSC. The shape factor (β) was constant. The prediction accuracy of the models to predict water and sugar fraction was tested by cross validation and using a third set of experimental data, showing very good results with shrinkage values below 4.6% and errors on predictions lower than 1.6% [Khan MAM, Ahrné L, Oliveira JC and Oliveira FAR, Prediction of water and soluble solids concentration during osmotic dehydration of mango, *Food Bioprod Process*, 2008, **86**(1), 7-13].

Postharvest grapefruit seed extract and chitosan treatments of table grapes to control *Botrytis cinerea*

Table grapes (***Vitis vinifera* Linn.** cv 'Redglobe'), undergoing deterioration were selected as model fruit with, *Botrytis cinerea*, to test the antifungal activity of grapefruit seed extract (GSE) *in vitro* and *in vivo*. The results of inhibition of spore germination and radial growth of *B. cinerea in vitro* indicated that GSE could efficiently inhibit the growth of the tested fungi. The effectiveness of GSE and chitosan to control postharvest decay and quality of 'Redglobe' grape berries stored at 0-1°C was also investigated by the researchers at China Agricultural University, Beijing, and Ministry of Agriculture, Beijing, China.

Chitosan and GSE treatments, alone or combined, significantly reduced postharvest fungal rot of the fruit compared with controls challenged with *B. cinerea*. Differences in weight loss, colour change, ripening, sensory quality and microorganism index between grapes treated with GSE and control fruit suggested that GSE had both antifungal and antioxidative activity. Moreover, the sensory analyses revealed beneficial effects in terms of delaying rachis browning and dehydration and maintenance of the visual aspect of the berry without detrimental effects on taste or flavour. GSE and chitosan might have a synergistic effect in reducing postharvest fungal rot and maintaining the keeping quality of 'Redglobe' grapes [Xu Wen-Tao, Huang Kun-Lun, Guo Feng, Qu Wei, Yang Jia-Jia, Liang Zhi-Hong and Luo Yun-Bo, Postharvest grapefruit seed extract and chitosan treatments of table grapes to control *Botrytis cinerea*, *Postharv Biol Technol*, 2007, **46**(1), 86-94].

Commercial packing and storage of Navel oranges alters aroma volatiles and reduces flavour quality

The researchers at San Joaquin Valley Agricultural Sciences Center, USDA-ARS, University of California and Sunkist Growers, Lindmore St., Lindsay, United States sampled Navel oranges [***Citrus sinensis* (Linn.) Osbeck**] either from the harvest bin, after the washer, after the waxer or at the end of the packing process in a commercial packing house and stored for 0, 3 or 6 weeks at 5°C followed by 4d at 13°C and 3d at 20°C. Individual oranges were analyzed for percent juice, soluble solid concentration (SSC) and titratable acidity (TA) and ethanol concentration and a portion of each fruit tasted and rated for freshness, tartness, sweetness and likeability (hedonic score). Ethanol levels increased in the fruit as a result of storage and as a result of the waxing step of the packing line in both of the two tests. In one of the tests there was a significant increase in ethanol caused by each of the packing line steps, indicating a physiological effect on the fruit of the packing line itself. The freshness and likeability rating both decreased as a result of storage and packing although packing had a lesser effect. The individual packing line steps could not be differentiated between each other in terms of an effect on flavour but the waxing step seemed to have the most impact. The SSC/TA ratio increased significantly during storage, mainly due to a decline in TA. In the third test navel oranges were sampled from the harvest bin and after the packing line and stored for 0, 3 or 6 weeks at 5°C followed by 4d at 13°C and 3d at 20°C. Quality and sensory attributes were evaluated as in the previous two tests and fruits were also characterized for changes in aroma-active volatiles using GC-olfactometry. Freshness and likeability decreased as a result of storage, but only in packed fruit. Percent juice, SSC and TA did not change as a result of any of the treatments. Ethyl butanoate, ethyl hexanoate and four constituents with uncertain identification were aroma-active compounds that increased while limonene decreased in amount to a greater degree in the packed fruit and may be at least partially responsible for the observed flavour changes. Ethanol was not identified by GC-olfactometry but was more abundant in packed fruit and may have influenced flavour [David Obenland, Sue Collin, James Sievert, Kent Fjeld, Julie Doctor and Mary Lu Arpaia, Commercial packing and storage of navel oranges, *Citrus sinensis* (Linn.) Osbeck alters aroma volatiles and reduces flavour quality, *Postharv Biol Technol*, 2008, **47**(2), 159-167].

Comparison between atmospheric and vacuum frying of Apple slices

Vacuum deep-fat frying is a new technology that can be used to improve quality attributes of fried food because of the low temperatures employed and minimal exposure to oxygen. The Scientists at Department of Chemical and Bioprocess Engineering, Pontificia Universidad Católica de Chile, Santiago, Chile compared atmospheric and vacuum frying of apple slice, in terms of oil uptake, moisture loss and colour development. In addition, some apple slices were pre-dried (up to 64% w.b.) before vacuum frying to determine the overall effect. To carry out appropriate comparisons between both technologies equivalent thermal driving forces were used in both processes (ΔT = 40, 50 and 60 °C), keeping a constant difference between the oil temperature and the boiling point of water at the working pressure. Vacuum frying was shown to be a promising technique that can be used to reduce oil content in fried apple slices while preserving the colour of the product. Particularly, drying prior to vacuum frying was shown to give the best results. For instance, when using a driving force of ΔT = 60 °C, pre-dried vacuum fried slices absorbed less than 50% of the oil absorbed by atmospheric fried ones. Interestingly, a strong relationship between water loss and oil content was observed in both technologies, allowing the extension of observations that have been made for atmospheric frying [Mariscal M and Bouchon P, Comparison between atmospheric and vacuum frying of apple slices, *Food Chem*, 2008, **107**(4), 1561-1569].

The effect of modified atmosphere packaging on the quality of Strawberries

Strawberries (cvs 'Honeoye' and 'Korona') were stored in perforated polypropylene bags at 5°C for 10 days by researchers at The Swedish Institutes for Food and Biotechnology, Ideon and Gothenburg, Sweden and monitored several quality parameters during the storage period. Unpackaged strawberries were used as a reference. The packaged strawberries retained their weight throughout the experiment as opposed to the unpackaged samples which lost 1.5% of their weight per day because of dehydration. The aroma profile of Honeoye strawberries was not affected by storage in modified atmospheres. In Korona fruits, on the other hand, there was a considerable increase in ethyl acetate levels, indicating unwanted metabolism caused by the altered gas composition. The production of potential off-odours was, however, not possible to distinguish in the sensory analyses of the strawberries. The results indicated that storage in a modified atmosphere (11-14% O_2 and 9-12% CO_2) can be used to maintain the quality of 'Honeoye' and 'Korona' strawberries for a longer time, than if kept in air in open containers [Nielsen Tim and Leufvén Anders, The effect of modified atmosphere packaging on the quality of Honeoye and Korona strawberries, *Food Chem*, 2008, **107**(3), 1053-1063].

Inactivation kinetics of inoculated *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella enterica* on Strawberries by chlorine dioxide gas

Inactivation kinetics of inoculated *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella enterica* on strawberries by chlorine dioxide gas [ClO(2)] at different concentrations (0.5, 1, 1.5, 3 and 5 mg/l) for 10 min were studied by scientists at Department of Food Science, Purdue University, West Lafayette, USA. A cocktail of three strains of each targeted organism (100 microl) was spotted onto the surface of the strawberries (approximately 8-9 log/

ml) separately followed by air drying and then treated with ClO(2) gas at 22°C and 90-95% relative humidity. Approximately a 4.3-4.7 log CFU reduction per strawberry of all examined bacteria was achieved by treatment with 5 mg/l ClO(2) for 10 min. The inactivation kinetics of *E. coli* O157:H7, *L. monocytogenes* and *S. enterica* were determined using first-order kinetic models to establish D-values and z-values. The D-values of *E. coli, L. monocytogenes* and *S. enterica* were 2.6+/-0.2, 2.3+/-0.2 and 2.7+/-0.7 min, respectively, at 5 mg/l ClO(2). The z-values of *E. coli, L. monocytogenes* and *S. enterica* were 16.8+/-3.5, 15.8+/-3.5 and 23.3+/-3.3 mg/l, respectively. Furthermore, treatment with ClO(2) gas significantly ($P \leq 0.05$) reduced the initial microflora (mesophilic, psychrotrophic bacteria, yeasts and molds) on strawberries. Treatment with ClO(2) gas did not affect the colour of strawberries and extended the shelf-life to 16 days compared to 8 days for the untreated control [Mahmoud BS, Bhagat AR and Linton RH, Inactivation kinetics of inoculated *Escherichia coli* O157:H7, *Listeria monocytogenes* and *Salmonella enterica* on strawberries by chlorine dioxide gas, *Food Microbiol*, 2007, **24**(7-8), 736-744].

Drying characteristics of Kiwifruit during hot air drying

The scientists at National Food Research Institute, Ibaraki, Japan and Chiba University, Japan investigated drying characteristics and l-ascorbic acid changes of a kiwifruit slice (10mm) during hot air drying at four temperatures ranging from 40 to 70°C. A relationship between hardening of the sample surface and the drying rate was also investigated. Using the measured data, a non-linear least squares method was applied to an exponential model for the first period of drying and an infinite plane sheet model for the diffusion equation for the second period of drying. The empirical moisture content changes agreed well with both models. The values determined for the diffusion coefficients were 3.79×10^{-12} to 7.53×10^{-12} m^2/s. An Arrhenius-type equation was used to relate the diffusion coefficient of kiwifruit to temperature and the activation energy of kiwifruit for hot air drying was estimated. In addition, it was estimated that the drying rate of kiwifruit might increase by avoiding hardening of the sample surface. In order to examine the nutrient changes in kiwifruit during hot air drying, a first-order rate equation was applied to the changes in the decomposition of l-ascorbic acid contents during drying. An Arrhenius-type equation was applied to the estimation of the decomposition rate constant k'. The activation energy for the decomposition during hot air drying of kiwifruit was estimated to be 38.6kJ/mol [Orikasa Takahiro, Wu Long, Shiina Takeo and Tagawa Akio, Drying characteristics of kiwifruit during hot air drying, *J Food Eng*, 2008, **85**(2), 303-308].

Optimization of low calorie mixed fruit jelly

Scientists at Costa Rica used response surface methodology (Box-Behnken design) to evaluate and observe model effects of three factors [sweetener, low methoxyl (LM) pectin and calcium content] at three levels each, on the overall acceptability of a tropical mixed fruit (pineapple, banana and passion fruit) jelly, determined by 100 consumers. Results showed that the model fit was significant ($P = 0.014$) and there was satisfactory correlation between actual and fitted values ($R^2 = 0.940$ and adjusted $R^2 = 0.832$). The model presented no significant lack of fit ($P = 0.253$). Calcium level had a significant effect on overall acceptability, but LM pectin and sweetener levels did not. The statistical model was used to optimize the factors' levels for highest acceptability, to obtain a jelly that provided less than 12 calories per serving, allowing the product to be labelled as "low calorie" [Acosta O, Víquez F and Cubero E, Optimisation of low calorie mixed fruit jelly by response surface methodology, *Food Qualit Prefer*, 2008, **19**(1), 79-85].