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fact that indicated that this fraction had pectin macromolecules essentially constituted by homogalacturonan. It also showed the lowest acetylation degree. Water (MA) or ethanol (ME) pretreatment before drying affected significantly ($p < 0.001$) the degree of pectin methylation. An important proportion of lignin was present in the isolated products. ME powder presented the lowest true density and compressibility and no differences were observed on sample X-ray diffraction patterns. Knowledge acquired will help in determining the possibilities of product application for technological purposes, as well as their nutritional potential.

153-21

Broccoli juice - Colour and compositional changes during conventional thermal processing

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Broccoli is a widely consumed vegetable for which evidence of perceived and proven health benefits is accumulating. However, the majority of these health benefits can only be attained by consuming fresh or minimally processed broccoli due to the deleterious effects of processing on health-giving components. Consumers seek variety and convenience so this study was undertaken to investigate the effects of standard processing conditions at a pilot scale on visual and health properties of broccoli juice and identify an alternative delivery vehicle for broccoli. Twenty litre batches of juice were prepared from broccoli harvested from a commercial grower, stored overnight and transported chilled. The chopped broccoli was washed, blanched, cooled in ice slurry and pulped. Juice was extracted from the pulp using a water press and filtered. The juice was acidified and pasteurized then analysed for physical and chemical changes. Chlorophyll levels decreased slightly with increasing pasteurising temperature, although visually the differences were not obvious. This was supported by changes in the spectrophotometric and $L^*a^*b^*$ data. The concentration of vitamin C decreased as predicted with increasing pasteurizing temperature. The pasteurization temperature for an acidic (pH 4.0) broccoli juice was 85°C, and for a neutral pH (pH 6.5) was 95°C. These conditions produced juices with minimal destruction or conversion of chlorophyll and reduced loss of vitamin C and provided adequate heat treatment to maintain food safety. Preliminary sensory assessment indicates that processing affects the peppery flavour of acidic broccoli juice.

Optimizing the use of broccoli in different product delivery vehicles, such as juices, provides consumers with more options and increases this crop's economic value for growers by utilizing more of the crop.

153-22

Effect of trehalose and glucose on viscoelastic characteristics and water mobility of osmotically dehydrated apple

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Osmotic dehydration with aqueous sugar solutions is used to slightly reduce water activity (a_w) for obtaining minimally processed high moisture fruits. This operation occurs simultaneously with complex physical and structure modifications that influence interactions between water and structure and chemical compounds and mechanical behavior. This work studied the effect of the humectant (glucose or trehalose) on the rheological behavior (determined by dynamic oscillatory shear and creep/recovery tests), and on the water mobility (determined by measuring spin-spin relaxation times T_2) of osmotically dehydrated apple tissue. For osmotic dehydration, fresh apple (Granny Smith cv.) cylinders (30 mm. diameter, 6 mm. height) were immersed into aqueous glucose (38.7°Brix) or trehalose (48°Brix) solutions to reach a_w 0.94. Storage (G') and loss (G'') moduli were determined in the viscoelastic linear range (controlled strain mode, frequency 0.1 to 1000 s^{-1}). Creep-recovery tests were conducted by applying a constant shear stress of 35 Pa till 100 s (recovery: 200 s). Transverse relaxation times (T_2) were determined using the CPMG sequence on a pulsed nuclear magnetic resonance (1H -NMR) spectrometer (0.47 T; 20 MHz). Storage modulus greatly exceeded loss modulus for raw and treated tissues, but there was a similar decrease in G' and G'' values due to both osmotic treatments. Although overall compliance significantly increased by treatments, the increase was significantly greater for trehalose than for glucose as humectants.

Fresh and treated tissues generated three distinct groups of water protons with different relaxation times and amplitudes. Relaxation times of the three groups were significantly reduced by the treatments and this reduction was greater when trehalose was used for the osmosis. This behavior can be attributed to different interaction between both sugars and apple matrix and ability of trehalose to form a dihydrate.

These findings could help understanding texture perception and designing minimally processed fruits.

153-23

Rheological and sensory properties of apple subjected to blanching and osmotic dehydration in presence of calcium

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Texture is a quality that is critical in determining the acceptability of raw and processed fruits, so it is of primary concern in product development and/or preservation techniques design.

This work investigated the linear viscoelastic characteristics (dynamic oscillatory shear and creep/recovery tests) and the mechanical characteristics at large deformations (compression test) of apple tissue, subjected to blanching, and/or glucose osmotic dehydration and addition of calcium lactate. Sensory evaluation (difference from control test) was performed by 48 non trained panelists to found differences between treated apples. Apples slices (3 cm diameter, 0.6 cm thickness) were subjected to: steam blanching (B) by immersion in saturated steam 90 seconds and cooling in water at 5°C; osmotic

dehydration (OD) by immersion into an aqueous 22% w/w glucose solution (water activity = 0.97) with 0.1 %w/w calcium lactate at 25°C; or to both treatments, steam blanching and osmotic dehydration (ODB). Creep compliance data were fitted by a mechanical model (a spring, two Kelvin-Voigt elements and a dashpot element). MANOVA and ANOVA tests were used to analyze rheological and sensory data respectively. All samples showed a predominant solid behaviour ($G' > G''$) but storage modulus decreased similarly for all treated apples. Creep curve parameters showed significant differences between fresh and treated samples and also between apples subjected to OD and heated apples (subjected to ODB or B). Compression curves exhibited abrupt rupture peaks and bioyield for fresh and osmotically dehydrated apples, while for heated ones the curves did not present bioyield. Rupture force and deformability modulus showed significant differences between all apple samples. According to sensory test, there were significant differences between the texture of blanched apples and osmotically dehydrated ones.

The treatments caused significant changes on linear viscoelastic and compression properties of apple. Creep test would be the most appropriate to correlate rheological and texture evaluation.

153-24

Extraction of bio-active components from fruit and vegetable processing wastes: Using grape waste from the wine processing industry as a model

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Wastes generated from the fruit and vegetable processing industries cause significant disposal problems. A simple method to recover bio-active components from the waste would be economically advantageous. Therefore the objective of our research was to evaluate the effectiveness of different extraction methods in recovering antimicrobial components from processing wastes. Grape pomace from the wine making industry was used as a model to evaluate the extraction efficacy.

Grape waste was ground under liquid nitrogen to a uniform particle size (<3.6mm). Influence of process parameters such as solvents utilized (100% petroleum ether, 70% methanol, 50% acetone and 0.01% pectinase), solvent: waste ratio (2:1 or 4:1) and interaction time (1, 2, 4 and 8h) were studied. Efficacy of the treatment parameters were studied based on antimicrobial testing of the extracts against common gram negative and gram positive food borne pathogens: *Escherichia coli* 0157:H7 and *Staphylococcus aureus*. Antimicrobial activity was measured based on time taken to increase absorbance by 0.5U. Probit models were fit to the increase in absorbance (A_{600}) data and inverse predictions were used to identify time required for a 0.5U increase. Results have shown that both the pathogens were inhibited by 50% Acetone in a 4:1 ratio at 1h. For Petroleum Ether, ratios did not have an effect on inhibition of *S. aureus* at 4h; however the 2:1 ratio inhibited *E. coli* at 2h. With regard to 70% Methanol and 0.01% Pectinase, at 4:1 ratio, interaction time had no effect on inhibition of the pathogens. In conclusion results indicated the optimum interaction times and extraction ratios for each solvent. In recovering antimicrobial bioactive components from fruit and vegetable processing wastes were effective.

153-25

Chemical, biochemical and volatile characterization of noni (*Morinda citrifolia L.*) pulp and its products

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Noni fruit has been studied for its possible health attributes and its products can be found in many countries. However scientific knowledge related to its processing and composition of its products can not be easily found. Another important factor for consumption is noni odor, which is strong and for some consumers unacceptable. In this work we studied the chemical and biochemical characteristics of noni pulp and some of its products, as well as its deodorization through resin treatment.

Noni pulp was obtained from ripe fruits and submitted to freezing, freeze-drying, fermentation, microfiltration and concentration. The microfiltrated juice was also treated with different adsorbent resins to remove volatile compounds. Noni pulp and its products were analyzed for vitamin C, sugars, total phenolics and volatile compounds. Enzymatic activity, pectin, hemicellulose and cellulose were determined only on pulp. All products except fermented and FPA 54 treated juice presented vitamin C values higher than 100 mg/100g. Total phenolics values were high in all products except for FPA 54 treated juice and the fermented juice presented the highest value (192 mg/100g), which was superior even to the pulp (161 mg/100g). The main sugars present were glucose and fructose with the former in higher concentration. Noni pulp presented high activities of superoxid dismutase, catalase and guayacol peroxidase, which are important to prevent and repair cellular damages produced by free radicals. The pulp presented pectin (4.8%), hemicellulose (1.8%) and cellulose (0.8%). Dynamic headspace analysis allowed the identification of alcohols, ketones and fatty acids in all products, but when compared to the pulp the amounts were different. Microfiltrated juice and freeze-dried pulp had a significant decrease in peak numbers and intensity. Resin treatment led to a volatile compounds reduction, specially with XAD 4, followed by FPX 66, XAD 761 and FPA 54.

153-26

Optimizing type of peeling and cut of minimally processed papaya (*Carica papaya L.*) and pineapple (*Ananas comosus L., Merr.*) fruits

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The peeling and cutting stages are crucial when preparing fresh-cut fruit because they directly affect the quality of the final product, as well as the by-products produced and the labor involved. This work evaluates how the type of peeling (manual peeling

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