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FUNGAL PECTINESTERASE AS AID PROCESSING FOR RESTRUCTURATION OF NOVEL PECTO-CELLULOSE GELS FROM PASSION FRUIT ALBEDO

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Introduction. Passion fruit processing produces large quantities of waste in the form of rind and seed, which create a disposal problem. The wastes are composed of 51% rind and 11% seed by mass for the yellow passion fruit[1]. Pectinesterase (PE) a demethoxylant enzyme of pectin is commonly found in fruits and vegetables and it is also synthesised by various microorganisms. Our work attempts to use passion-fruit-FP for the preparation of gelified products through a two-step process: solubilisation of pectins by autoclaving in acidic conditions, to retain high molecular weight, followed by treatment with a fungal PME i.e; at a pH more compatible with food processes.

Materials and methods. Yellow passion fruit (*Passiflora edulis*) were obtained from a local supermarket (Porto Alegre, Brazil) in the month of February 2000. This material was stored in a cold room at 5°C until it was used. CPE, a commercial PE preparation was a gift from Gist-Brocades (Seclin, France). The fruits were washed thoroughly in running tap water. Upon arrival, the flavedo was stripped from skin with a potato peeler, followed by removal of the albedo with a knife. After cutting the albedo into small pieces it was blanched at 90°C for 7 min. Blanched albedo were washed twice with tap water and then two times with distilled water to leach out soluble solids and next dried by solvent exchange (ethanol and acetone, 3 times each) and oven-dried (60 °C).
Autoclave extraction of pectic polysaccharides and enzymic gel-formation test. The fibre (0.5 g) was mixed with 40 mL of 1% (w/v) citric acid solution and placed in a 50 mL glass vessel covered with aluminium sheet. Fibre suspension was then autoclaved for 20, 40 and 60 min at 121°C and 15 lb/in^2 and then cooled in an ice-water bath. For determine the time required for complete extraction of pectin from passion fruit-FP was related with the resistance of gels afterwards enzymatic modification. Treatments were carried out in duplicates. Cooled material from autoclave extraction was adjusted to pH 4.5 with NaOH (20% w/v). Then 200 µl of PE enzyme were added and 3 mL $CaCl_2$ (0.4 M) were mixed up and incubated in water bath at 45°C for 30 min and then incubated at room temperature over night (~ 16 h) until determination of gel strength[2].
High-performance size-exclusion chromatography (HPSEC) and high-performance ion-exchange chromatography (HPIEC). The molecular weight distribution and anion-exchange properties of polysaccharides was determined according Denès et al.[3].

Results and Discussion.
Solubilisation of the pectin in the fibre: effect of autoclaving time. In this study a weak acid (citric acid) combined with autoclave was used to extract pectic polysaccharides. Gelification tests were used as pectin index quality after autoclave extraction, substantial yields were obtained for 20 min. Compared with the other times (40 and 60 min), a significantly higher strength was found, which indicates the presence of more polymerised polysaccharides (Figure 1). Results were confirmed using a HPSEC

(Figure 2). Oosterveld et al.[4] developed an pectic polysaccharide extraction procedure from sugar beet pulp that including two sequential autoclave treatments, 121°C, 40 minutes. The advantage of apply weak acid instead of strong acid for pectin extraction is the opportunity to use soluble and insoluble materials either in combined or individual in food or pharmaceutical products. Effect of passion fruit-FP ratio on gel strength was investigated afterwards 20 minutes autoclave treatment. Different ratios 0.5 to 1.5 g/ 43.2 mL of fibre were evaluated during gelification tests. The data showed that the yield strength of the gels increased with the increase of passion fruit-FP content until a maximum value of 7.5N was reached with an acid solution to peel ratio of 1.5 g passion fruit-FP. In order to explain increase in passion fruit-FP gels a parallel experiment for analysis of polymerised AGA was done. The comportment of extraction of pectic substances was related to increases in gel strength. This is an interesting product for the food industry and agriculture since the product can be heated while maintaining a gel structure.

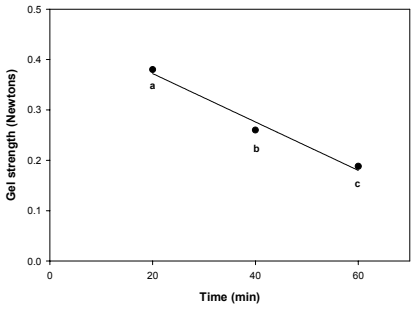

Figure 1. Effect of autoclave time on gel strength prepared from passion fruit fibre pectin modified with fungal PE (200 units). Different letters mean significant difference (α = 0.05)

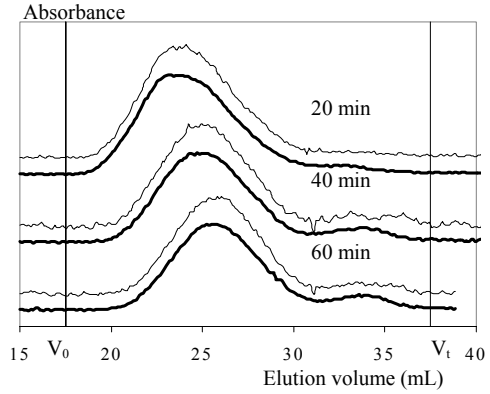

Figure 2. HPSEC chromatography on combined columns of the passion fruit pectin solubilised by autoclaving for 20, 40 and 60 min. Thin line : Total sugars, absorbance at 420 nm; Thick line : Uronic acids, absorbance at 520 nm.

Conclusions. Passion fruit FP was an efficient material for preparation gelified system after enzymatic modification this material will be used in food or non food purposes (agriculture, pharmacy, etc). If passion fruit FP need to use in food or pharmacy applications will be recommend to avoid acetone solvent exchange and to be used solely etanol. The autoclave treatments in short times in combination with citric acid improve significantly pectin extraction process. Optimisation and physico-chemical characterisation of pectin extracted and oligosaccharides generated by autoclaving from passion fruit FP is necessary to attend in next studies. In the same way is necessary to optimise time and temperature of gelification requested in relation to enzyme concentration for minimal consume.

References

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