



ULTRASOUND-ASSISTED EXTRACTION OF PECTIN FROM PRICKLY PEAR PEEL (*Opuntia albicarpa* S.)

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Introduction. Pectin is a complex polysaccharide present in the cell walls of higher plants. Extracted pectin is widely used as thickener, stabilizer or gelling agent in the food and pharmaceutical industries. The convectional extraction methods of vegetal polysaccharides depend largely on energy input (agitation, solvent temperature) to improve mass transfer; hence they are time consuming and low productivity processes. Ultrasound assisted extraction (UAE) is a novel technique that consists in the application of high intensity ultrasound to the raw material in the extraction media, creating continuous high-low pressure cycles, which generate a cavitation phenomenon that lead to cell disruption and to the mass transfer improvement (1).

The objective of this work is to study the effect of power input and time of ultrasound on the yield and the productivity of the extraction process of calcium-bonded pectins from prickly pear peel (*O. albicarpa* Scheinvar 'Reyna'). The chemical and rheological characterizations of the extracted polysaccharides are also reported.

Methods. Fresh prickly pears (*O. albicarpa* Scheinvar 'Reyna') were collected from plantations in San Martín de las Pirámides, Estado de México, Mexico. Prickly pear peel were leached with deionized water at 60°C for 2 h in order to remove mucilages; then, peel were re-suspended in an aqueous solution of 0.5% EDTA and the suspension was sonicated. An ultrasonic processor (Sonics & Materials, VCX-1500; 1500 W) equipped with a 20 kHz probe was used. Temperature was controlled at 60 °C. Two levels of power input (450, 1350 W) and four sonication periods (5, 10, 15 & 30 min) were evaluated. The polymer extracted was precipitated with 96% ethanol, dried at 40°C and analyzed on chemical composition and rheological properties. The results are compared to those obtained in "the convectional extraction" which was carried out in a stirred tank at 550 rpm, 60 °C for 2 h.

Results. The yield of pectin extraction increased with the sonication time. A larger yield of polysaccharides occurred with power input of 1350 W at the latter periods. The yields of 10 and 15 minutes were comparable to those achieved by the conventional method. On the other hand, the productivity of all treatments was significantly higher (i.e. 4 to 14 gL⁻¹h⁻¹) to that of convectional extraction (i.e. 0.75 gL⁻¹h⁻¹) (Fig. 1). The prickly pear pectin dispersions showed a non-Newtonian rheological behavior. Their apparent viscosities were significantly higher than commercial citrus pectins.

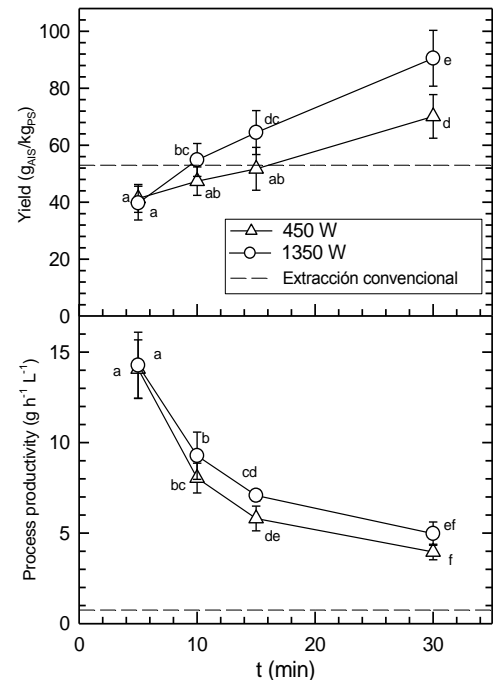


Fig.1 Extraction yield (ratio of alcohol insoluble solids (AIS) to prickly pear peel solids (PS)) and productivity of the extraction process, as a function of sonication time. The line shows the value corresponding to conventional extraction (2h, 60°C, stirred tank).

Conclusions. UAE have demonstrated to be an efficient process to extract calcium-bonded pectins from by-products of prickly pear.

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References.

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