FORMATION OF A POLYELECTROLYTE COMPLEX BETWEEN JICAMA PECTIN AND WATER SOLUBLE CHITOSAN

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A polyelectrolyte complex was formed through the reaction between water soluble chitosan (WSCh, 0.5, 1.0 and 2.0 g/L) and jicama pectin (1 g/L). The yield and infrared spectroscopic analysis of the polyelectrolyte was evaluated. The formation of polyelectrolyte complexes between biopolymers depends upon the oligosaccharide ratio employed.
Key Words: *Pachyrhizus erosus , starch.*

Jicama (Pachyrhizus erosus (L.) Urban) is a tropical legume originally from Mexico (1). Jicama pectin residues obtained after starch extraction is a very promising source of low methoxylated pectin (2). Low methoxylated pectin is considered as an anionic biopolymer able to form polyelectrolyte complexes with anionic macromolecules (3). WSCh perform a variety of biological activities (4). The aim of this work was evaluate the formation of a polyelectrolyte complex between pectin extracted from jicama and WSCh. Destarched jicama pomace was mixed with 1% w/v sodium hexamethaphosphate solution and placed in glass vessel covered with aluminum foil. Then the fiber was autoclaved for 10 min at 121 ℃ (2 atm) and the final volume was registered. The pectic substances from filtrate were precipitated by adding isopropanol extract. The precipitate was recovered by centrifugation and kept at room temperature until its use. Treatments were carried out in duplicate. Jicama pectin was dissolved (1 g/L) in 20 mM sodium acetate buffer (pH 5.0). The pectin was added slowly to avoid the conglomerates formation. WSCh was dissolved in distilled water at 0.5, 1.0 and 2.0 g/L. Later 20 mL of jicama solution were mixed with 20 mL of each WSCh solution in a conical tube. The tubes were settled by 30 min at room temperature and after that, were centrifuged at 8000 rpm by 20 min at room temperature. The supernatant was discarded and the pellet was washed with isopropanol (3×) and centrifuged at 8000 rpm by 20 min. Finally, the complex was dried at 60ºC until constant weight and its weight was registered. All experiments were carried out by duplicate. The polyelectrolyte complex was investigated by FTIR attenuated total reflectance spectroscopy, which was performed by Perkin Elmer (Waltham, MA, USA) equipment operating at 4 cm^{-1} resolution. The mirror velocity was 0.08 cm^{-1} and 35 interfeforgrams were co-added before Fourier transformation. Spectra were collected from 4000 to 650 cm^{-1} and normalized that the absorption band at ca. 1008 cm^{-1} equaled 1. Normalization did not alter the proportion of signals in the origin spectra.

The polyelectrolyte complex was between pectin from jicama and water soluble chitosan (20 kDa). Figure 1 shows the appearance of the pellets obtained after centrifugation. The pellet of greatest size was observed when WSCh 2 g/L was used and the smallest size pellet was produced when WSCh 0.5 g/L was occupied. When WSCh was used, the formation of an intermediate size pellet was registered. The pellet size was according to the WSCh ratio utilized, and it suggests the quantity of polyelectrolyte formed. When the pellets were dried, the registered weights were the following: 4±0.0 mg for WSCh 0.5 g/L, 8 ± 0.0028 mg for WSCh 1 g/L and 5.5±0.0007 mg for WSCh 2 g/L. FTIR from the complex are being analyzed.

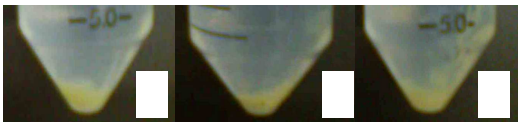

Figure 1. Polyelectrolyte complex formation using 0.5 g/L (a), 1 g/L (b) and 2 g/L (c) of 20 kDa WSCh.

It is possible to obtain a polyelectrolyte complex when pectin from jicama and a 20 kDa WSCh are combined. The yield in dry basis depends upon the oligosaccharide ratio employed.

REFERENCES

1. Aquino-Bolaños, E.N., Cantwell, M.I., Peiser, G., Mercado-Silva, E. (2000). Changes in the quality of fresh-cut jicama in relation to storage temperatures and controlled atmospheres. *Journal of Food Science.* 65:1238-1243.
2. Contreras-Esquivel, J.C., Espinoza-Pérez, J.D., Montañez, J.C., Charles-Rodríguez, A.V., Renovato, J., Aguilar, C.N., Rodríguez-Herrera, R., Wicker, L. (2006). Extraction and characterization of pectin from novel sources. *American Chemical Society*. 935:215-229.
3. McClements, Julian. (2000). Isothermal titration calorimetry study of pectin-ionic surfactant interactions. *J. Agric. Food. Chem.* 48: 5604-5611.
4. Yeon, J.C., Eun, J.K., Zhe, P., Young, C.Y., Yong, C.S. (2004). Purification and characterization of chitosanase from *Bacillus* sp. Strain KCTC 0377BP and its application for the production of chitosan oligosaccharides. *Applied and Environmental Microbiology.* 70:4522-4531.