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Abstract

Covalent Electrosprayed Nanoparticles Based on Protease Treated Arabinoxylans

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Abstract: Arabinoxylans (AX) are polysaccharides constituted by a linear chain of β-(1→4) xylose units and α-L-arabinose substitutions, which can be esterified to ferulic acid (FA). A small amount of protein is associated with the AX chains [1]. AX have the ability to form covalent gels via FA oxidative coupling [2]. AX gels are resistant to pH and temperature changes but fermented by colonic microbiota, being therefore attractive as controlled release systems for therapeutic agents directed to the colon [3]. The AX capability to form covalently cross-linked nanoparticles was recently reported [4]; however, that investigation did not consider the effect of protein content in this polysaccharide property. The present study aimed to evaluate the effect of AX protein partial remotion on the polysaccharide potential to form covalent electrosprayed nanoparticles. AX were partially deproteinized using protease (AX-PD), resulting in a decrease in protein content from 16.4±0.5 to 10.8±0.1 %. Fourier transform infrared spectrum of AX-PD showed a diminution in the amide I and II bands concerning AX. The elastic modulus of laccase-induced AX-DP gels (1% w/v) was higher (284±12 Pa) than the value registered for AX gels (222±5 Pa). Electrosprayed 1% (w/v) AX and AX-PD nanoparticles revealed a spherical morphology when analyzed by transmission electron microscopy. The nanoparticles size distribution ranged from 19 to 390 nm and from 30 to 330 nm for AX and AX-PD, respectively. These results indicate that AX protease treatment improves the polysaccharide capability to form covalent electrosprayed nanoparticles, which could be used for pharmaceutical and biomedical applications.

Keywords: arabinoxylans; protease; polysaccharide; nanoparticles

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