Development and characterization of galactomannan acetate nanoparticles

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Nanoparticles from natural polysaccharides are a good alternative for synthetic compounds due to their biocompatibility, biodegradability, hydrophilicity and protective properties. Galactomannans are neutral, water-soluble polysaccharides highly used in food industry. They have potential for the preparation of nanoparticles that can be used as a carrier for functional compounds for food and pharmaceutical applications. The present work aimed at developing nanoparticles from guar gum through acetylation of the galactomannan and using the solvent diffusion method for nanoparticle formation. The obtained nanoparticles were characterized by means of dynamic light scattering (DLS) (size and polydispersivity), Fourier transform infrared (FTIR) and transmission electron microscopy (TEM).
Guar gum was acetylated through solubilization in formamide at 54 ºC. Then pyridine and acetic anhydride were added and left under stirring for 48 h at 54 ºC. The obtained solution was precipitated and purified in water. After successive washings with water the precipitate was dried at 35 ºC during 48 h. The nanoparticles were obtained through the solvent diffusion method by solubilization of acetylated galactomannan solution in DMSO that was then dispersed in water.
The formation of galactomannan acetate was confirmed by FTIR spectra with the presence of the characteristic bands of the acetyl group at 1760 cm-1 (C=O), 1381 cm-1 (CH3) and 602 cm-1 (O-C=O) when compared with untreated guar gum.
DLS measurements and TEM showed that nanoparticles size is on the order of hundreds of nanometers. Results show that changing the ratio DMSO/water during the nanoparticles formation will change their size and polydispersivity, presenting values ranging between 194.5 and 401.1 nm for size and 0.480 and 0.620 for polydispersivity. Also the degree of acetylation can be controlled and used to change the size of the particles, which will possibly influence entrapment of functional compounds and the nanoparticles properties.
This galactomannan nanoparticles can be a promising nanostructure to the encapsulation of functional compounds for application in food and pharmaceutical industries.

Keywords: Galactomannan, Nanoparticles, Guar gum.