

Carbohydrate Polymers

Isolation and characterisation of nanoparticles from tef and maize starch modified with stearic acid

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Abstract

Nanoparticles were isolated from tef and maize starch modified with added stearic acid after pasting at 90 °C for 130 min. This was followed by thermo-stable alpha-amylase hydrolysis of the paste. The resultant residues were then characterized using X-ray diffraction (XRD), differential scanning calorimetry (DSC), dynamic laser scattering particle size distribution (DLPSD), atomic force microscopy (AFM) and high-resolution transmission electron microscopy (HRTEM). XRD and DSC showed that the isolated residues consisted of amylose-lipid complexes. These complexes were type II with melting temperature above 104 °C. DLPSD, AFM and HRTEM showed that the isolated tef and maize starch residues consisted of nanoparticles which became more distinct with increased hydrolysis time. The isolated tef and maize nanoparticles had distinct particles of about 3–10 nm and 2.4–6.7 nm, respectively and the yield was about 24–30%. The results demonstrated that distinct (physically separate) nanoparticles of less than 10 nm can be isolated after formation during pasting of tef and maize starch with stearic acid. The production and isolation of the nanoparticles uses green chemistry principles and these nanoparticles can be used in food and non-food systems as nanofillers.