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Effect of Different Choline Chloride-Based Deep Eutectic Solvents on Chitosan Extraction from Blue Crab Shells (*Callinectes sapidus*)

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Abstract

Deep eutectic solvents (DESs) have recently attracted considerable attention as environmentally friendly alternatives to conventional extraction systems for chitin and chitosan production. In this study, the effects of different choline chloride-based DES systems on chitosan extraction from blue crab (*Callinectes sapidus*) shells were investigated. Fructose, ethylene glycol, and urea were used as hydrogen bond donors (HBDs) in combination with choline chloride (ChCl) at a molar ratio of 1:2. Chitin extraction was performed using DES systems, followed by alkaline deacetylation to obtain chitosan. The structural characteristics of the resulting chitosan samples were evaluated by Fourier transform infrared spectroscopy (FTIR), and the degree of deacetylation (DD) was calculated from characteristic absorption bands. In addition, chitosan yield, deproteinization (DP), and demineralization (DM) efficiencies were determined. FTIR spectra confirmed successful conversion of chitin to chitosan across all DES systems. Characteristic absorption bands corresponding to O–H/N–H stretching, amide groups, and polysaccharide backbone vibrations were clearly observed. ChCl:Fructose exhibited the highest DD value (90.85%), followed by ChCl:E.Glycol (90.53%) and ChCl:Urea (89.82%). ChCl:Fructose also showed the highest chitosan yield (48.60%) and the highest deproteinization efficiency (40.78%). Regarding demineralization performance, ChCl:Urea showed the highest efficiency (28.62%), followed by ChCl:E.Glycol (26.18%) and ChCl:Fructose (10.30%). The results demonstrated that the chemical nature of the hydrogen bond donor significantly affected the extraction behavior, deacetylation efficiency, and physicochemical properties of the resulting chitosan. Among the evaluated systems, the fructose-based DES showed the most balanced extraction performance due to its high DD, chitosan yield, and deproteinization efficiency.

Keywords: *Chitosan, Deep eutectic solvent, Crab shell, FTIR, Deacetylation degree, Green extraction*