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PRODUCTION AND CHARACTERIZATION OF CHITOSAN-BASED FILMS USING DEEP EUTETIC SOLVENTS AS PLASTICIZERS

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Chitosan (CH) is a polysaccharide widely used in biomedicine, tissue engineering, pharmaceutical and food industries, among others. Its biodegradability, biocompatibility, non-toxicity, and antimicrobial activity make chitosan especially attractive for food packaging and biomedical applications [1]. To enhance the flexibility and performance of CH films, additives known as plasticizers are commonly incorporated. Among them, deep eutectic solvents (DESs) represent a novel class of plasticizers composed of hydrogen bond donors (HBDs) and acceptors (HBAs) that decrease polymer chain entanglement and increase free volume by establishing strong intermolecular interactions [2]. In this study, CH films were produced *via* casting by dissolving CH in dilute acetic acid and incorporating different amounts of DESs (30% and 70% w/w). The DESs were obtained by heating the mixtures of HBAs (choline chloride or betaine) and HBDs (glycerol, lactic acid, or malonic acid) at 80 °C, which resulted in transparent liquids upon cooling. Two chitosan samples were studied, namely a commercial sample (C_CH) with DA = 17% and Mw = 221 kDa, and sample U_CH, with DA = 32% and Mw = 193 kDa, that was produced by applying the ultrasound-assisted process to beta-chitin [3]. Preliminary mechanical tests on U_CH films containing malonic acid as HBD revealed a substantial increase in Young's Modulus for betaine-based films (314.1 ± 76.6 MPa) compared to choline chloride-based films (34.5 ± 7.9 MPa), highlighting the key role of the HBA in modulating the films properties. This tunability is particularly advantageous for food packaging applications, where the formulation and content of the DES can be adjusted according to specific requirements. To evaluate the effect of DES type and concentration changes on the films properties, further studies are under development involving morphological analysis, enzymatic degradation profile, swelling behavior and wettability.

References:

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