Development and characterization of bio-composite films made from bacterial cellulose derived from oil palm frond juice fermentation, chitosan and glycerol

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ABSTRACT

This study reported for the first time, the combined effects of chitosan and glycerol addition on the properties of bacterial cellulose (BC) based films for food packaging applications. Films were prepared by solution casting method using BC derived from oil palm frond juice as the main material combined with different concentrations of chitosan (0.5 and 1 %w/v) and glycerol (0.5, 1.5 and 2.5 %v/v). Pure BC, chitosan-free and glycerol-free films were used as control. The effect of incorporating chitosan and glycerol on bacterial cellulose (BC) based films was evaluated based on the physical properties (thickness, moisture content, solubility), mechanical properties (tensile strength, modulus Young, elongation at break) and chemical structure by FTIR. Increased concentration of chitosan and glycerol affected the physical and mechanical properties. The combination of 1 %w/v chitosan and 0.5 %v/v glycerol had a strengthening effect on the BC-based films with maximum tensile strength of 15 MPa and Young's modulus of 772 MPa. Meanwhile, BC films incorporated with 1 %w/v chitosan and 2.5 %v/v glycerol demonstrated high plasticizing effect of 7 % elongation at break. The acquired FTIR spectrum of the bio-composite films suggested intermolecular interactions between BC, chitosan, and glycerol. Therefore, the BC-based bio-composite films incorporated with chitosan and glycerol have the potential to be used as food packaging materials.

KEYWORDS

Bacterial cellulose; Bio-composite films; Chitosan; Food packaging; Glycerol; Mechanical properties

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