

Development of Bioplastic Disposable Food Packaging from Starch and Cellulose

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Abstract : Disposable food packaging is a single-use plastics that can include any disposable plastic item which could be designed and use only once. In this context, this study aimed to prepare and evaluate bioplastic food packaging material from avocado seed starch and sugarcane bagasse cellulose and to characterise avocado seed starch. Performed the physicomechanical, structural, thermal properties, and biodegradability of raw materials and readily prepared bioplastic using the universal tensile testing machine, FTIR, UV-Vis spectroscopy, TGA, XRD, and SEM. Results have shown that an increasing amount of glycerol (3-5 mL) resulted in increases in water absorption, density, water vapor permeability, and elongation at the break of prepared bioplastic. However, it causes decreases in % transmittance, thermal degradation, and the tensile strength of prepared bioplastic. Likewise, the addition of cellulose fiber (0-15 %) increases % transmittance ranged (91.34 ± 0.12 - 63.03 ± 0.05 %), density (0.93 ± 0.04 - 1.27 ± 0.02 g/cm³), thermal degradation (310.01 - 321.61 °C), tensile strength (2.91 ± 6.18 - 4.21 ± 6.713 MPa) of prepared bioplastic. On the other hand, it causes decreases in water absorption (14.4 ± 0.25 - 9.40 ± 0.007 %), water vapor permeability ($9.306 \times 10^{-12} \pm 0.3$ - $3.57 \times 10^{-12} \pm 0.15$ g•s⁻¹•m⁻¹•Pa⁻¹) and elongation at break (34.46 ± 3.37 - 27.63 ± 5.67 %) of prepared bioplastic. All the readily prepared bioplastic films rapidly degraded in the soil in the first 6 days and decompose within 12 days with a diminutive leftover and completely degraded within 15 days under an open soil atmosphere. Studied results showed starch derived bioplastic reinforced with 15 % cellulose fiber that plasticized with 3 mL of glycerol had improved results than other combinations of glycerol and bagasse cellulose with avocado seed starch. Thus, biodegradable disposable food packaging cup has been successfully produced in the lab-scale level using the studied approach. Biodegradable disposable food packaging materials have been successfully produced by employing avocado seed starch and sugarcane bagasse cellulose. The future study should be done on nano scale production since this study was done at the micro level.

Keywords : avocado seed, food packaging, glycerol, sugarcane bagasse

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