

COMPARATIVE EVALUATION OF THE FUNCTIONAL PROPERTIES OF COGON GRASS (*Imperata cylindrica*) FIBRE IN BIODEGRADABLE PACKAGING

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With the growing environmental concerns of plastic packaging, the development of biodegradable packaging has gained widespread attention as a sustainable alternative to conventional, non-biodegradable packaging. Agricultural byproducts and abundant plant biomass serve as valuable sources of natural fibres for such applications. This study investigated the potential of cogon grass leaf fibre (CGLF) in developing biodegradable packaging due to its strong binding ability and reinforcement characteristics. Functional and structural properties of CGLF films were evaluated in comparison to a control composed of sugarcane bagasse (*Saccharum officinarum*) fibre (SBF) and rice straw fibre (*Oryza sativa*) (RSF) in 1:1 ratio (w/w), against three formulations developed by incorporating SBF:RSF:CGLF ratios (w/w) of 1:1:1 (S1), 1:2:1 (S2), and 1:3:2 (S3), respectively. Fibre extraction was done via alkaline treatment. Physical and mechanical properties, such as biodegradability, moisture content (MC), water vapor transmission rate (WVTR), water solubility (WS), hardness and foldability, of the above material were assessed, and data were analysed by one-way ANOVA using MINITAB 19.0 software at 0.05 significance level. Properties were further validated using Fourier transform infrared spectroscopy (FTIR) to confirm the presence of functional groups and interactions. The results demonstrated that incorporation of the highest CGLF percentage; in S3 formulation, significantly improved its overall performance across almost all the parameters determined. It possessed a significantly high biodegradability ($63.63 \pm 9.09\%$), potentially facilitating the eco-friendly disposal. It exhibited the lowest MC ($6.07 \pm 0.15\%$), potentially preserving structural integrity even in the humid conditions. The WVTR was also at its lowest in S3 ($4.71 \pm 0.59\%$), highlighting enhanced water barrier properties. Notably, S3 exhibited zero water solubility as well. Moreover, it showed the highest hardness (1343.70 ± 172.30 g), signifying increased resistance to physical and mechanical stress. Furthermore, S3 exhibited the highest foldability, a crucial attribute for packaging requires to be shaped during the usage. The FTIR spectroscopic analysis further confirmed enhanced structural bonding in S3, including strong intermolecular hydrogen bonding and the presence of major functional groups such as carbonyl (C=O) and hydroxyl (–OH), indicating a well-balanced composition of cellulose and hemicellulose with reduced lignin content. These interactions enhanced surface uniformity and mechanical integrity of S3 formulation. Hence, CGLF offers significant potential as an eco-friendly, functional component for improving the quality and sustainability of biodegradable packaging.

Keywords: Biodegradable, Cogon grass, Fibre packaging, FTIR analysis, Sustainability