

## The Use of Waste Fibers as Reinforcement in Biopolymer Green Composites

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**Abstract :** Following this trend, natural fiber reinforcements have been gaining importance in the composites sector. The effectiveness of natural fiber-reinforced PLA composite as an alternative material to substitute the non-renewable petroleum-based materials has been examined by researchers. In this study, we investigated the physicochemical, particle size and distribution, and thermal behavior of prickly pear seed flour (PPSF). Then, composites were manufactured with 20% in PPSF. Thermal, morphological, and mechanical properties have been studied, and water absorption tests as well. The characterization of this fiber has shown that cellulose is the majority constituent (30%), followed by hemicellulose (27%). To improve the fiber-matrix adhesion, the PPS was chemically treated with alkali treatment. The addition of PPSF decreases the thermal properties, and the study of the mechanical properties showed that the increase in the fiber content from 0 to 20% increased Young's modulus. According to the results, the mechanical and thermal behaviors of composites are improved after fiber treatment. However, there is an increase in water absorption of composites compared to the PLA matrix. The moisture sensitivity of natural fiber composites limits their use in structural applications. Degradation of the fiber-matrix interface is likely to occur when the material is subjected to variable moisture conditions.

**Keywords :** biopolymer, composites, alkali treatment, mechanical properties

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