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Enhancing Sustainability and Performance of Pineapple Leaf Fibres in Textile Applications: A Comprehensive Review

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Abstract

The utilization of pineapple leaves (*Ananas comosus*) has gained significant momentum as a source of value-added products, owing to the myriad benefits offered by Pineapple Leaf Fibres (PALF). PALF presents a range of advantages, including its contribution to a greener environment and sustainability. PALF production plays a pivotal role in reducing environmental pollution and minimizing waste. Moreover, PALF stands out due to its availability, remarkable thermal and acoustic insulation properties, cost-effectiveness, and exceptional tensile strength. Further, the extraction of PALF can be accomplished manually or mechanically, and various methods have been explored to enhance its compatibility with textile applications. In this context, extensive research has been carried out to modify PALF for its application in the textile industry. Researchers have primarily focused on surface modifications. These modifications encompass chemical treatments, physicochemical treatments, physical treatments, and thermal treatments. All of these contribute to improved interfacial adhesion and enhanced physical, mechanical, and thermal properties of PALF. Additionally, investigations into bleaching and dyeing of PALF have led to achieving superior whiteness and the ability to impart various colours to the fibres. PALF fibres exhibit remarkable qualities, including excellent sweat absorption, breathability, durability, and notable air and water permeability. These attributes make PALF a sought-after material for creating blended fabrics in conjunction with other polymers, such as polyester and wool, enhancing the performance of resulting textiles. The versatility of PALF enable its integration into an extensive range of textile products, underscoring its significance in the industry. This review also explores innovative approaches, such as blending PALF with jute, resulting in the creation of home textiles and carpets, while simultaneously improving the quality of blended yarns. Furthermore, within the textile industry, PALF fibres find diverse applications in the production of an array of products. This involves the crafting of wedding dresses, casual attire, and formal garments. It also includes the manufacturing of table linens, mats, bags, shoes, belts, cords, transmission cloths, airbag tying cords, and carpets. This comprehensive review delves into the wealth of research conducted on PALF modifications, shedding light on the potential of PALF as a sustainable and high-performance material in the textile industry, contributing to further eco-friendly and innovative future.

Keywords: Pineapple Leaf Fibres (PALF), Textile Industry, Sustainability, Greener environment