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Developing Effective Sustainable Sizing Formulation for Natural Bast Fibre Yarn

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Structured Abstract

Background: Yarn sizing is an important preparatory process in weaving to improve the strength and abrasion resistance of yarns. Conventional sizing agents, which are composed of gasoline, are not biodegradable and are environmentally harmful. Although natural bark fibers such as kenaf have poor mechanical performance and weaveability, they are a safe alternative to synthetic fibers. Therefore, to improve the processing performance of bark fiber yarns while reducing environmental impact, environmentally friendly sizing formulations using biodegradable materials need to be developed.

Methods: Cassava starch was used as the main film-forming agent, and it was combined with aloe vera, natural oil, water and a sustainable sizing formulation. Various formulations were produced by varying the oil and aloe vera concentrations while maintaining the same starch content. Before the test was conducted, the sizing solution was uniformly applied to the kenaf yarn under controlled conditions. The untreated and sized yarns were tested with flexural stiffness, rewet test, and tensile strength test to evaluate their performance. To determine the effect of formulation composition on yarn performance, statistical analysis was used.

Results: The physical and mechanical properties of kenaf yarns are strongly influenced by their sustainable size. Due to film formation, starch-sized yarns have the highest flexural stiffness (5.65), while untreated yarns have the lowest flexural stiffness (1.72). The aloe vera-based formula improves flexibility, with flexural values of 2.80 for AV6g and 2.59 for AV7.5g. Between 3.94% and 7.91% moisture recovery, higher aloe vera content increases fat absorption. The optimized formulation maintains sufficient yarn strength for weaving applications while improving flexibility and moisture control. Statistical analysis shows that the formula composition has a significant effect on yarn performance.

Conclusion: Natural-based sizing formulations can improve the performance of kenaf yarns while being a sustainable alternative to synthetic sizing agents, according to the study. The use of tapioca starch, aloe vera, and natural oils helps to condition the yarns, make them flexible, and control moisture well without making them too stiff, supporting the use of sustainable sizing in eco-friendly garment manufacturing.

Keywords: Sustainable Sizing, Kenaf Yarn, Natural Bast Fibre, Tapioca Starch, Eco-friendly Textile Processing.

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