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The Effect of Fabric Density on the 2/2 Twill-Woven Kenaf Fabric's Properties

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Structured Abstract

Background: Natural fibres are becoming more popular as substitutes for synthetic ones in the textile and composite industries. However, the investigation into the kenaf itself was not thorough and complete. The researchers are more focused on the composite's physical and mechanical properties and on composite's overall the occurrence. Yet, the characteristics and properties of kenaf fabric should have been investigated and documented more. This study utilised the effect of fabric density on the 2/2 twill-woven kenaf fabric's properties. This study explored the issues in physical and mechanical properties of the woven kenaf fabric based on the different warp densities.

Methods: This research was conducted to investigate the effects of different fabric counts/densities of woven kenaf fabrics produced on the Leclerc handloom on physical properties, including fabric count, warp and weft crimps, weight, and fabric thickness. The characterisation was extended to determine mechanical properties, including tensile strength and breathability, specifically on the air and water vapor permeability. The investigation was further extended to determine their mechanical and permeability properties. All the tests were conducted according to specific standard methods (ASTM and ISO).

Results: The study found that the increase in warp density (16 to 24 /inch) leads to a decrease in weft densities (18 to 12 /inch) and yet, an increase in weft crimps (3 to 6%), fabric thickness (1.84 to 2.59 mm), and weights (398 to 483 g/m^2). The mechanical properties of the fabrics depend on their physical properties. The highest and lowest tensile strengths were recorded in the range of 90 MPa and 60 MPa for warp and weft directions. However, the strains of the manufactured fabrics were recorded as 0.39 to 0.82. Air permeability increased (107 to 177 cm^3/s/cm^2) due to a decrease in weft density, which opened the fabric, yet water vapour rate decreased (981 to 781 g/m^2 /day) due to an increase in thickness. This research also provides theoretical and experimental knowledge for other researchers on the effects of woven kenaf fabric properties on the fabric densities of woven kenaf fabric.

Conclusion: In conclusion, this study can be a crucial step in observing, investigating, comprehending, and summarising the physical, mechanical, and breathable features of woven kenaf fabric. Aside from that, the obtained results may serve as a bridge to the knowledge gap and return as a progressive development of textile products made using woven kenaf fabric.

Keywords: Kenaf Fabric, Fabric Density, Sustainability, Permeability, Mechanical

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