Assessing the Suitability of Bamboo Fabrics for the Development of Sustainable Fitted Sheets

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Abstract

Sustainable and innovative materials that not only satisfy consumer demands but also enhance health and well-being are becoming more important to the textile industry. Bamboo has been brought into the spotlight as a replacement for petrochemical-based synthetic fibers, as it is obtained from a plant. Bamboo fiber offers a significant opportunity for sustainable textiles. The purpose of this study is to assess the suitability of bamboo fabrics for the development of sustainable fitted sheets. For this study, different blends of naturally dyed bamboo woven and knitted fabrics, bamboo woven (100%), bamboo cotton fleece (65.10/34.90), and bamboo cotton lycra (66.71/28.41/4.88) were assessed for their suitability for fitted sheets. The selected fabrics were dyed with natural plant dyes such as eupatorium and indigo dye. To assess the properties of the fabrics, a range of mechanical, chemical, and antibacterial tests was conducted. Specially, fabric thickness, weight, pilling resistance, abrasion resistance, bursting strength, water absorption, flammability, color fastness, stain resistance, and antibacterial activity tests were conducted by using ISO, AATCC, ATCC, and ASTM methods, and also the selected fabrics were evaluated visually by ten selected consumers. Knitted fabrics, in particular, are ideal for fitted sheets since they can tightly adjust to different mattress depths and stay tightly in place, and also should have good dimensional stability to maintain their shape after washing, and elasticity to fit snugly around the mattress. The evaluation results indicate that the knitted type of bamboo cotton lycra fabric exhibits superior performance across these metrics. The fabrics exhibited a thickness of 0.66 mm, a bursting strength of 383 kPa, and a color fastness rating of 3-4, and the wettability rate shows five seconds. Notably, the fabric demonstrated good antibacterial properties. The antibacterial test result shows the zones of inhibition of 17 mm against *Staphylococcus aureus* and 16 mm against *Escherichia coli* on the fabric. The findings of the visual evaluation among the fabrics evaluated, the bamboo cotton lycra fabric was perceived by consumers as soft and smooth with good elasticity and flexibility. The study results concluded that bamboo cotton lycra had excellent properties for developing fitted sheets for residential places.

Key Words: bamboo fabrics; sustainability; fitted sheets; *Staphylococcus aureus*; *Escherichia coli*