

Colour Characteristics and Colourfastness of Bamboo Fabrics Dyed with Avocado (*Persea Americana*) Pit and Skins Extracts using Different Mordants

Balqis 'Alam Bakar Shah^a, Mohd Rozi Ahmad^{ab*}, Muhammad Ismail Ab. Kadir^{ab}

Structured Abstract

Background: The application of synthetic dyes has often been criticised for being environmentally friendly. In contrast, natural dyes are considered less harmful to the environment and pose fewer health risks. Since there are many sources of natural dyes, efforts are also taken to use underutilised natural wastes particularly from fruits. This study explores the extraction of natural dyes from avocado (*Persea Americana*) pits and skins and their application on bamboo fabrics using a bio-mordant, pomegranate tannins, and a synthetic mordant, iron (II) sulfate.

Methods: The experimental work focused on colour properties and colourfastness aspects to gauge the 100% bamboo dyed fabrics' performances. The avocado pit and skins were washed and dried before extracting the colours using the Boiling Water Extraction method. The dyeing procedure was carried out using pre-mordanting method before the bamboo-treated fabric was immersed in the dye bath solution for an hour at temperature of 85°C. The fabric samples were removed from the dye solution after 30 minutes, rinsed, cleansed and air-dried at room temperature. The Spectrophotometer was used to measure the K/S values and colour strength of the dyed samples. The dyed samples were also observed for their colourfastness to washing, light, perspiration and rubbing using standard methods.

Results: The results revealed that the mordant concentrations significantly influenced colour depth and fastness. Higher concentrations of the pomegranate tannin mordant enhanced the colour intensity of the dyes derived from avocado pits and skins, producing richer and more stable colours. Samples dyed with pomegranate tannins produced a much darker and more to brownish shades, while samples dyed with iron sulfate gave a light pink colour. With regards to colourfastness, samples with iron sulfate gave better overall performance in enhancing fastness to washing, light, perspiration and crocking (rubbing) in comparisons with pomegranate tannins.

Conclusion: This study highlights the potential of avocado waste as an eco-friendly dye source and aligns with global efforts to use agricultural by-products promoting sustainability, minimizing textile industry waste, and reducing environmental pollution. The results support practical applications of natural dyes in creating sustainable, vibrant and eco-friendly textiles but it also provides a basis for enhancing mordanting techniques and dyeing formulations.

Keywords: Natural dyes, avocado pit & skin extracts, bamboo fabrics, colour properties, colourfastness

*Correspondence: rozitex@uitm.edu.my

^a School of Industrial Technology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia

^b Textile Research Group, Universiti Teknologi MARA, Shah Alam, Malaysia