

Title: Enhancement of Polyester Dyeing Performance Integrating Ecological and Cost-Effective Auxiliaries

Author Names: Md. Kamrul Islam , Zulhash Uddin, Md. Reazuddin Repon

Abstract: Disperse dyes, primarily used for dyeing synthetic fibres like polyester, are characterized by their poor solubility in water, which necessitates the use of dispersing agents; however, environmental concerns arise due to their low biodegradability and potential toxicity, thus posing significant challenges in waste management and pollution control. This study explores the dyeing performance of knitted polyester with dispersed dyes, employing natural auxiliaries as substitutes for conventional commercial chemicals to promote an environmentally friendly approach. Citric acid (derived from lemon), sodium citrate (prepared from citric acid and sodium bicarbonate), and glucose (extracted from date fruits) replace commercial acetic acid, dispersing agent, and hydrolyze. Dyeing is conducted using the high-temperature and high-pressure methods with consistent parameters. A comparative study of the dyeing performance of the natural auxiliaries with the existing commercial chemicals was assessed concerning colour strength, different fastness properties, and the FT-IR diagram. Proton NMR is utilized for the structural determination of date fruit and lemon components. UV-Vis spectral data show that adding sodium citrate to the dispersed dye solution drops the absorbance value from 1.1457 to 0.58916, confirming sodium citrate's efficacy as a dispersing agent. With lower recipe costs, the environmentally friendly approach using natural auxiliaries exhibits comparable dyeing performance and excellent fastness properties, providing a sustainable alternative to traditional methods.

Key words: knitted polyester, natural auxiliaries, disperse dye, colour strength, colour fastness

<https://doi.org/10.31881/TLR.2024.114>

<https://www.tlr-journal.com/tlr-2024-114-islam/>