

Title: Bio Dyeing of Nylon 6 Fabrics Using Beetroot and Natural Mordants

Author Names: Fatemeh Shahmoradi Ghaheh, Dr. Aminoddin Haji, Elaheh Daneshvar, Dr. Md. Reazuddin Repon

Abstract: In this paper, the potential of beetroot as a natural source to dye a synthetic fiber that is, nylon 6 fabric, has been examined. We analyzed the impact of the most important dyeing parameters, such as dyeing temperature, dyeing time, pH of the dye bath, and dye concentration, on the dyeing efficiency of the nylon 6 fabric. We achieved the optimal conditions for nylon dyeing by beetroot at the boiling temperature for 60 min using 100% on the fabric weight (owf) dye under acidic conditions. Also, to attain suitable color fastness, we used four different natural mordants (pomegranate peel, walnut husk, pistachio hull, and Terminalia Chebula) before the dyeing process. We also examined the effect of four commonly used metal mordants on the dyeing efficiency. FTIR, SEM, EDX and TGA were then conducted to justify the presence of mordants and dyes on the substrate. We discovered that pre-mordanting generated colorful fabrics based on the type of mordants used. Also, various natural mordants could produce different color strengths, such that the walnut husk had the highest color strength among the used mordants. The obtained color fastness against washing of all bio-mordants was rated as excellent and the light fastness of Terminalia Chebula was surprisingly excellent. Bio-mordants also exhibited equivalent washing fastness to metal mordants, even surpassing them in terms of light fastness. The EDX spectra also showed peaks corresponding to carbon (C), nitrogen (N), and oxygen (O). Finally, the fabric mordanted with pomegranate peel exhibited very less mass loss, thus indicating thermal stability..

Keywords: Beetroot dye Nylon 6 fabric Natural mordants Dyeing parameters Color fastness FTIR analysis SEM–EDX characterization Thermal stability

<https://doi.org/10.1002/slct.202402783>

<https://chemistry-europe.onlinelibrary.wiley.com/doi/10.1002/slct.202402783>