Title: Sustainable coloration and analysis of cellulosic viscose fabric incorporating *Rosa rubiginosa* extraction and pre-mordanting approaches.

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Abstract: Dyeing with natural ingredients has gained popularity as a sustainable option because of its numerous useful applications and favorable environmental impacts. The purpose of this study was to determine the optimal conditions for extracting natural dyestuff from the red rose flower (Rosa rubiginosa) by observing the coloring of viscose fabric. The parameters examined were the M:L ratio (1:3), temperature (80 °C), and duration (30 min). Infrared dyeing procedures were conducted on viscose fabric, employing a diverse range of mordants, both natural and synthetic, which included materials such as orange and lemon peels, tannic acid, copper sulfate, and ferrous sulfate, at different mordanting ratios. The highest results of the mordants were achieved by a single mordanting process called pre-mordanting, and their performances were compared for the first time. Here, utilizing orange peel as a natural mordant in a pre-mordanting procedure for dyeing viscose fabrics yields better results and enhanced performance than using any of the other mordants used. The CIELab results were calculated using a variety of measurement conditions, and the ideal value was determined by an experiment on the color strength (K/S) properties. The FTIR spectra confirmed the interaction of colored particles with viscose fabrics, and the SEM investigation confirmed the dye's ability to be absorbed into the fabric's surface. Elemental mapping and EDX spectroscopy both showed that there were dye particles floating about the surface of the colored fabric. The colorfastness ratings, including a rating of 4 for rubbing, 4–5 for washing, and 4 for lightfastness, were found to be satisfactory when the fabric was treated with metal mordants. Hence, Rosa rubiginosa used as a coloration of viscose fabric is a very promising alternative option to synthetic dyestuff, which can be used to satisfy the actual need for coloring and functionality of viscose fabric in the dyeing and finishing industry.

Keyword: Eco-Friendly, Viscose Fabric, Rosa Rubiginosa, Natural Dye, Bio-Mordant, Sustainable.

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