

Determination of physical and fastness properties of leather dyed using natural dye extract from beetroot peels with the help of biomordant

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Abstract

Leather dyeing is an essential process in the leather industry, where synthetic dyes are predominantly used. However, the environmental concerns associated with synthetic dyes have led to rising interest in natural dyes as sustainable alternatives. The use of biomordants however, is gaining attention due to their eco-friendly nature and potential to enhance dye fixation and colour fastness. This study aimed at determining the physical and fastness properties of leather dyed using natural dye extract from beetroot peels, with the assistance of biomordant derived from *Acacia nilotica* barks and banana pseudo stem sap. The dyeing process involved the immersion of leather samples in the dye bath, in the presence of the biomordant in a pre and post-mordanting technique. To determine the effect of the biomordant on the strength properties of the leather, the physical properties of the dyed leather were evaluated. The tensile and tear strength of the dyed leather were measured on an instron tester according to IUP 6. Various fastness properties of dyed leather were investigated to assess the quality and durability of the dyeing process including water spotting fastness according to ISO 15700, mild washing fastness according to ISO 15703, and rub fastness (dry and wet rub fastness) according to ISO 11640. The dye bath exhaustion was also measured using spectrophotometric analysis. All of the samples exceeded the minimum recommended values for tensile strength ($> 12\text{N/mm}^2$), percentage elongation at break ($> 40\%$), and tear strength ($> 20\text{N}$) for chrome tanned leather which was used in this study. On a grey scale of 5, the dyed leather's fastness properties were discovered to be good to excellent on a grey scale of 5. The samples dyed with *Acacia nilotica* bark as a biomordant had the highest dye bath exhaustion, followed by banana pseudo stem sap, and leather dyed without any mordant had the lowest dye bath exhaustion. According to the results obtained in this study, the use of biomordant in the dyeing of leather with

natural dye from beetroot peels improved the fastness properties of the dyed leather as well as the strength of the resulting leather. Furthermore, the biomordant promoted dye uptake.

Keywords: Biomordant, *Acacia nilotica*, Banana pseudo stem sap, Physical properties, Fastness properties, Leather