

We're Dyeing to Know: How Do Changes in Temperature, Mordant Additives, and pH During the Dyeing Process Impact the Color-Fastness of Natural Substantive Dyes?

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This study investigated the effects of temperature, mordant additives, and pH on the colorfastness of natural substantive dyes. The hypothesis proposed that alum would enhance colorfastness, as its aluminum ions can strengthen the bond between a fabric and dye, while lye would reduce colorfastness by making fibers more water-resistant. Cotton squares were dyed using yellow onion skins under varying conditions, including different temperatures (hot and cold) and additives (alum, vinegar, lye). After dyeing, fabric samples were subjected to a colorfastness test which replicated regular washing conditions using water immersion and agitation at 40°C. Color retention was quantified using grayscale comparisons. The results indicated that dyeing at higher temperatures improved color retention, with the hot-dyed sample exhibiting the highest initial color strength (115.0) and the lowest percentage of color loss (6.5%). Conversely, the lye-treated sample had the lowest initial color strength (17.50) and the highest percentage of color loss (42.9%). The alum-treated sample demonstrated increased colorfastness but still exhibited significant fading (38.7% color loss). These findings suggest that temperature plays a critical role in dye retention, while mordant choice significantly influences long-term color stability. The study highlights the potential for optimizing natural dyeing methods to achieve greater durability, providing an environmentally friendly alternative to synthetic dyes.

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