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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