# Dyeing Properties of a Mixed Bi-functional Reactive Dye on Hemp

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## Abstract

A mixed bi-functional reactive dye has been applied to the cotton and the hemp, their dyeing and fastness were properties compared. Hemp exhibited better dyeability than cotton and this result was explained by the differences in the supramolecular structure of these two fibers.

## 1. Introduction

Hemp fiber is one of the strongest and most durable natural textile fibers. Not only is it strong, but it also holds its shape having one of the lowest percent elongation of any natural fiber. In fact, its combination of ruggedness and comfort were utilized by Levi Strauss as a lightweight duck canvas for the very first pair of jeans made in California. Furthermore hemp has the best ratio of heat capacity of all fibers giving it superior insulation properties. As a fabric, hemp provides all the warmth and softness of other natural textiles but with a superior durability seldom found in other materials. Natural organic hemp fiber 'breathes' and is biodegradable. Hemp blended with other fibers easily incorporate the desirable qualities of both textiles. When combined with the natural strength of hemp, the soft elasticity of cotton or the smooth texture of silk create a whole new genre of fashion design.

In this study, a mixed bi-functional reactive dye has been applied to the cotton and the hemp, their dyeing and fastness were properties compared.

## 2. Experiment

### 2.1 Materials

Circular knitted(single jersey) cotton fabric and cotton/hemp blends(80:20) fabric were supplied by HEMPLEE KOREA(Korea). The bi-functional reactive dye (Sunfix Supra Red S3B 150%, C.I. Reactive Red 195) was supplied by Oh young industry.

## 2.2 Dyeing

A 40 ml dyebath, suitable for a 2.0 g sample of cellulose fabric (material-to-liquor ratio 1:20), containing a reactive dye and Glauber's salt was prepared. Dyeing was performed under each appropriate condition in a IR Laboratory Dyeing Machine (Starlet-2, DaeLim Starlet Co.,Ltd., Korea). The dyed fabric was rinsed and then treated with soaping agent (1g/L) for 10 min at 95˚C.

The cellulose fabrics was dyed at various dyebath conditions using salt concentration, alkali concentration, and dye concentration to investigate their effects on the dyeing properties. Exhaustion behaviour of reactive dyes on the fabric was also investigated by monitoring the exhaustion values of dyed fabrics as the dyeing proceeds.

The cellulosic fabrics were dyed (1/1 standard depth), treated with soaping agent and then heat set (170C, 40 s) in order to test the colour fastness. The colour fastness was determined according to International Standards: ISO 105 C06/C2S (colour fastness to washing), ISO 105 E04 (colour fastness to perspiration) and ISO 105 X12 (colour fastness to rubbing). Staining and change in colour were assessed using grey scales.

# 3. Conclusions

The dyeing properties of a hemp are found be excellent in comparison to cotton. Careful comparison of the dye yield on two cellulose fabrics with the mixed bi-functional reactive dye confirms that there is a correlation between supramolecular structures and dyeing properties; hemp exhibits higher exhaustion values and better build-up properties than cotton, presumably due to the lower crystallinity and degree of orientation. Hence, the reproducibility of dyeing of hemp is expected to be excellent. Fastness properties of reactive dyes on hemp and cotton are found to be almost identical. The results obtained suggest that hemp in cellulose fabric could be used as an important alternative to universal cotton in cellulose fabrics although more detailed studies on the hemp is necessary before any definite conclusions can be drawn.

# 4. Reference

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