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Optimization of Printing Condition of Oak Tasar/Wool Blended Fabrics with Reactive Blue 21 Dye

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ABSTRACT

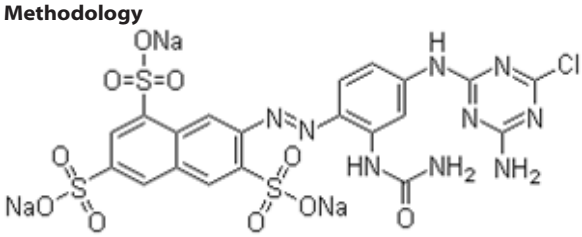
The oak tasar/wool blended fabric was printed with Reactive blue 21 dye using optimized conditions of printing. The optimized conditions included dye concentration at (4%), steaming time (20 minutes), steaming temperature (95°C). The optimization of printing condition was recorded on the basis of wash-fastness and percent dye fixation. The washing fastness grade in term of colour change was good and no staining on wool fabric and slight staining was observed on cotton fabric. Perspiration and rubbing fastness grades for all the printing parameter was good. Fabric printed with reactive blue 21 dye gave a excellent light fastness good.

KEYWORDS : Reactive dye, Optimized condition, Fastness properties

Introduction

Printing involves the production of a predetermined coloured pattern on a fabric, usually with a definite repeat. It can be described as a localised form of dyeing, applying colorant to selected areas of the fabric to build up the design. However, instead of coloring the whole substrate (cloth, carpet or yarn) as in dyeing, print color is applied only to defined areas to obtain the desired pattern. Reactive dyes have proven to be one of the most successful classes of synthetic dyes. The reasons for this success lie in their shade versatility, their flexibility in application, and the all-round good fastness properties obtained from printing produced with reactive dyes on wool and silk. Reactive dyes are good choice for protein fibers. Thus oak tasar/ wool blended fabric was printed using reactive dye.

Methodology



Thickening agent: Sodium alginate was used as thickening agent supplied by Thames chemicals.

Printing recipe content:

Dye	:	2% (Reactive Blue 21)
Sodium alginate	:	3-5%
Urea	:	10%
Sodium bicarbonate	:	2%
Diethylene glycol	:	2%
Soda tripolyphosphate	:	2%
Water	:	y %
Temperature	:	90°C-100° C
Time	:	10-20 minutes

Fastness testing: The colour fastness to washing, light fastness, perspiration and rubbing fastness were determined accordance to IS: 3361-1979, IS:2454-1985, IS971-1983 and IS:766-1988 respectively Indian standard. Colour flex spectrophotometer was used for determining CIE Lab and K/S values.

Statistical method: Statistical analyses was conducted using Tukey test.

Result and Discussion:

Sodium alginate is essential ingredient in printing paste. Sodium alginate is used as active dyestuff, with unique properties. The printed textiles are featured by bright decorative patterns, clear line, high colour yield, uniform colour yield, and good permeability and plasticity. As the best pulp in the modern printing and dyeing industry, sodium alginate is now widely used for printing of wool and silk. During the experiment sodium alginate as a thickening agent was taken using three concentrations 3%, 4% and 5% as shown in table 1. Before washing the highest K/S value (11.39) was observed at 5% concentration of sodium alginate, but the value changed to 4% concentration (12.02) after washing, indicating the value. A significant difference in mean value at 5% level of significant was also noticed at 4% concentration for dye fixation (129.66). The dye dissolves and diffuses through the sodium alginate film to reach the surface of the fiber. Sodium alginate can control the penetration of dye into fabric. Although the condensed steam might cause the outline to bleed due to the presence of urea in printing paste, on the other hand sodium alginate can reduces the bleeding of dye.

Table 1: Optimization of thickening concentration for Reactive Blue 21dye

Sodium alginate conc.	Before washing K/S	After washing K/S	Percent dye fixation
3	10.27	10.15	98.83^{c}
4	9.27	12.02	129.66^{a}
5	11.39	11.02	114.31^{b}
CD			12.45

The mean value with different notation shows significant difference at 5percent level of significance

Table 2 shows the effect of steaming time on colour strength and percent dye fixation rate. It is evident from the table 2 that prolong steaming time up to 20 minutes improved K/S value of the obtained prints. It may be the plasticizing action of urea which facilitate diffusion of large amount of the dye inside the substrate, thereby increasing dye uptake, as observed Fathallah, 2012 in his study the observed dye fixation for 20 minutes time duration was significantly highest (119.86 %).

Table 2 Optimization of steaming time for Reactive Blue 21 dye

Steaming time (min.)	Before washing K/S	After washing K/S	Percent dye fixation
10	11.27	11.89	105.50[b]
15	9.65	11.24	116.47[a]
20	10.02	12.01	119.86[a]
CD			6.42

The mean value with different notation shows significant difference at 5 percent level of significance

The data for optimization of steaming temperature for printing with Reactive Blue 21 dye have been presented in table 3. It can be elicited from the table that increasing the steaming temperature from 90°C up to 95°C resulted in an increase in the K/S values of the prints from 23.51 to 24.51 after washing. When steaming temperature was further increased to 100°C the K/S value decreased to 23.88. Enhancing the color strength by increasing the temperature to 95°C can be associated with increasing the solubility of dyes in printing paste, enhancing their diffusion from the paste film to the fabric, proving the swelling of fabric components and supplying the system with enough energy to overcome the activation energy barrier of dye fixation onto active sites of fabric components (El-Zairy,2006; Ibrahim *et al*, 1994).

Table 3: Optimization of steaming temperature for Reactive Blue 21 dye

Steaming temp.°C	Before washing K/S	After washing K/S	Percent dye fixation
90	22.13	23.51	106.23[c]
95	20.88	24.51	117.38[a]
100	21.38	23.88	111.69[b]
CD			5.12

The mean value with different notation shows significant difference at 5percent level of significance

Table 4: Fastness properties of oak tasar/wool blend printing with Reactive Blue 21 dye

Printing parameter	Wa			Per				Rub		Li
	CC	CS		Ac		Al		D	We	
		W	C	CC	CS	CC	CS			
Dye conc. (4%)	4	4	3	4	4	4	4	4	3	6
Steaming time (20 min.) 4 4			3	4	4	4	4	4	3	6
Steaming temp. (95°C)	4	4	3	4	4	4	4	4	3	6

Wa=washing, Per=perspiration, Rub=rubbing fastness, Li=light fastness, Ac=acidic, Al=alkaline, D=dry, We=wet, W=wool, CC=colour change, CS =colour stain,C=cotton

The oak tasar/wool blended fabrics was evaluated for fastness properties after applying the optimized printing condition of reactive blue 21 dye. The washfastness condition of reactive blue 21 was good at 4% concentration, for 20 minutes of steaming time and at 95°C steaming temperature. Perspiration and rubbing fastness properties for all the parameter was good and lightfastness properties was excellent.

Conclusion

This paper offers optimized condition of printing for oak tasar/wool blended fabric using Reactive Blue 21 dye. The experiment work indicated that using 4% sodium alginate concentration for printing at 20 minute time duration at 95°C steaming temperature has a positive effect on increasing colour K/S value (colour yield value). The use of 2% sodium bicarbonate and diethylene glycol used as a fixing agent in the printing paste brings an improvement in the colour yield and fixation of dye percent. Urea presence in the printing paste enhances the colour strength of the RB21dye on the blended fabrics. The washfastness grades for colour change was good and no staining was observed on wool and slight staining on cotton fabric, perspiration and rubbing fastness grade was good and light fastness property was excellent.

REFERENCES

Ibrahim, N A, El- Zairy, M R & AboShasha, M H (1994) Novel synthetic thickeners for printing cotton fabric with reactive dyes. Dyes Pigments. 25: 1-5. | 2. El-Zairy, E.M.R. (2006) New Thickening Agents for Printing of Proteinic and Polyamide Fabrics, PhD Thesis, Faculty of applied arts, Helwan University, Cairo. | 3. Fathallah AI (2012) An easy all-in printing process for printing acrylic/wool blended fabrics with reactive dyes. International Design J 4: 25-32. |