EFFECT OF M: L RATIO ON DYEING OF JUTE FABRICS USING REMAZOL RR & DRIMAREN HF

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Abstract*: Reactive dyes are widely used for dyeing and printing cellulosic materials and blends containing cellulosic portion. Remazol RR & Drimaren HF both are Reactive dyes widely used in Jute dyeing .From the comparison result, it is also seen that due to low M: L ratio strength and hydrolysis% of both dyes increase & decrease respectively. The result of strength & Hydrolysis% is different from Drimaren HF & Remazol RR. Here we showed that Drimaren HF combination is better than Remazol RR combination.*

Keywords: *Spectrophotometer, hydrolysis, reflectance, chromatography, strength.*

1. Introduction

Reactive Dyes is a new class of dyes and form covalent bonds with those fibres which possess hydroxyl or amino groups. [1]. Remazol colours are intended primarily for use on cellouse. They can also be used on creslan, zefran, and acrilan where as the conditions have to be alkaline to dye cellulose, they have to be acid for creslan, zefran and acrilan [2]. Jute is the cheapest textile fiber and is used in great quantities. To select the proper dye for a fiber, it is necessary to know which dyes have an affinity for the vegetable, animal, or Man-made fibres [3].Here we use a spectrophotometer to know the concentration of the colorant of different Dyes. A spectrophotometer measures the spectral reflectance or transmission factors of objects. It compares light leaving from the object with that incident on it at each wavelength. The data are primarily related to the color of the object and are usually presented as curves in which percent reflectance or transmittance are plotted against wavelength at regular intervals 1nm or most commonly at intervals of 5nm, 10nm or 20nm. The shape of the spectrophotometric curves can give some indication of perceived color by comparison with those of known hues [4]. The textile material must be pure and absorbent for the best results, and the dyestuff must be completely dissolved; otherwise penetration will be poor, and the surface deposit will be liable to rub [5]. By this project we can probably say if hydrolysis% is less, the reaction of dyes and textile materials will be more that means we can get high depth without increase shade%. So we should select proper M: L ratio in case of dyeing. The calculation of the hydrolized dye content is based on the measurement of remaining dye content of the dye-bath together with that and the rinsing solutions. After dyeing the exhausted dye bath and the rinsing liquors are united before diluting the mixture to 2000ml by distilled water. The fixed dye concentration is calculated from the ab-sorbance of this mixture (A_{uf}) and that of the initial bath (A_0)

C_{fixed} [%] $=100(1-A_{uf}/A_0)$

Hydrolized Dye [%]$=(A_{uf}/A_0)*1oo$

As the temperature increases the rate of this hydrolysis becomes greater and for this reason, when dissolving the dyestuff and during its application in the dye bath, the temperature should not rise above 40^0C (104^0F). Dawson, Fern, and preston concluded that under dyeing conditions both the mono-and dihydroxy compounds were formed with a tendency for the formation of the letter to predominate as the time in alkaline solution increases [6].Spectrophotometer uses the reflectance or reflections from a coloured object throughout the visible spectrum. It results a curve showing the reflectance value at different point of

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wavelength of visible spectrum. These reflectance curves are converted to K/S value, the so called absorption and scattering co efficient, by the use of Kubelka-Munk theory, It has been also found that the concentration of colorant present in the substrate or solution is linearly proportional to the K/S value found from the reflectance value. Usually hydrolysis is a chemical process in which a molecule of water is added to a substance. Sometimes this addition causes both substance and water molecule to split into two parts. In such reactions, one fragment of the target molecule (or parent molecule) gains a hydrogen ion. Hydrolysis usually means the cleavage of chemical bonds by the addition of water. Generally, hydrolysis is a step in the degradation of a substance. Acid hydrolysis is a chemical process in which acid is used to convert cellulose or starch to sugar. It implies a chemical mechanism of hydrolysis catalyzed by a Bronsted-Lowry or Arrhenius acid. By contrast, it does not usually imply hydrolysis by direct electrophilic attack—as may originate from a Lewis acid. If strength of dye increases dyeing depth will be more, by this method we can get very good result.

After collecting of Jute fabric, was treated with different chemicals for scouring &bleaching. After scouring & bleaching Jute fabric was

2. Materials and Methods

2.1. Fabrics: 100% Jute fabric

2.2. Collection of Dyes and Chemicals

Dyes and Chemicals were collected from Clariant and other Chemicals Company.

2.3. Experimental Procedure

Fabric was loaded on sample Jigger m/c and took necessary chemicals & auxiliaries. Here we took two types of dyestuff one is Drimaren HF and another is Remazol RR. Jute fabric was dyed according to below mentioned recipe. Here M: L ratio was taken as standard is 1:10, after that hydrolysis % was measured by high pressure liquid chromatography and strength was measured by Spectrophotometer. Here M: L ratios were 1:06, 1:15, 1:20, after dyeing strength & hydrolysis% was observed. After circulating of dyestuff salt was added. The required amount of Alkali was added to the bath after 10 to 15 minutes later. The temperature was raised to 60^0c and the dyeing was continued for 60 minutes. By using Spectrophotometer first recipe was formulated for different parameters for dyes. Then after dyeing the shade difference was measured between samples and standard accordingly we got the pass/fail result by using the spectrophotometer. Liquid Chromatography was used to measure the hydrolysis% of different dye bath concentration and finally we measured the reflectance value of different coloured materials. Hydrolysed reactive dyes become inactive and do not contribute in dyeing. Hence, we had taken the strength of the standard dyed sample as reference, and other samples of producing was compared with it on basis of dye strength.

2.4. After-treatment of dyed fabrics was done by the following sequence

1. Cold rinse
2. Neutralization by Acetic Acid
3. Hot rinse
4. Cold rinse

Dyeing Recipe

Remazol RR combination	Drimaren HF combination
Remazol yellow RR-------0.3%	Drimaren yellow HF-CD-------0.3%
Remazol Red RR-------0.2%	Drimaren Red HF-CD ------0.2%
Remazol Blue RR-------0.2%	Drimaren Blue HF-RL ------0.2%
Glauber salt ----------60g/L	Glauber salt ----------60g/L
Soda ash ----------14g/L	Soda ash ----------14g/L
Temperature ----------60^0C	Temperature ----------60^0C
Time ----------60min	Time ----------60min

3. Results and Discussion

All the tests were performed in the standard testing atmosphere and the results are shown in the table:In this project we dyed the scoured bleached jute fabric with Remazol RR combination and Drimaren HF combination.

Experimental Procedure

S. L	Changed parameter	Condition of M: L	RR Combination	HF Combination		
			% Strength	% Hydrolysis(increased+/Decreased-)	%Strength	%Hydrolysis(increased+/Decreased-)
1	M :L	1:06	102.7	0.35	102.1	0.12
2		1:15	94.7	5.3	95.4	4.6
3		1:20	91.2	8.8	93.3	6.7

The relation among M: L ratio, strength and hydrolysis of jute fabric are shown in fig1, fig2, fig3, fig4.

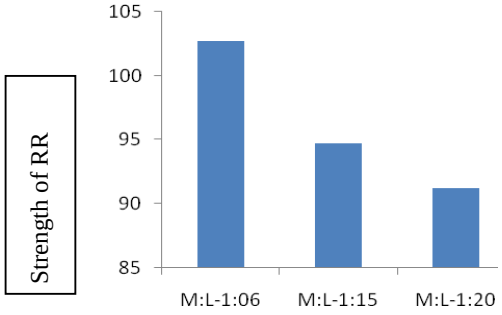

Figure 1: Relation between M: L and Strength of RR

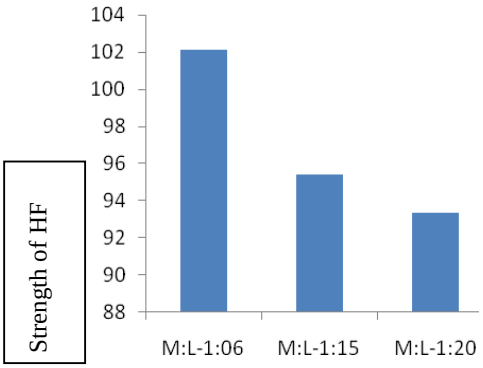

Figure 2: Relation between M: L and Strength of HF

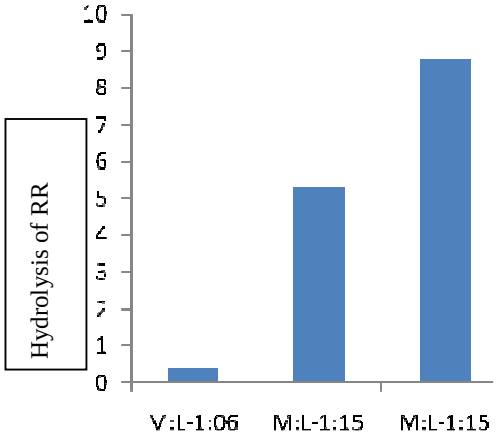

Figure 3: Relation between M: L and Hydrolysis of RR

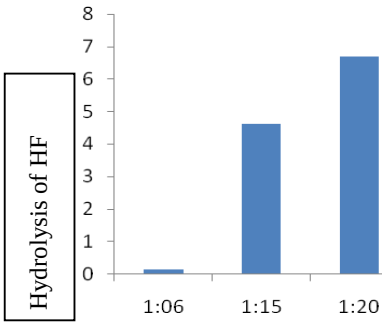

Figure 4: Relation between M: L and Hydrolysis of HF

In fig.1, fig.2, fig.3, & fig.4 the horizontal line and vertical line indicate M: L ratio & strength/hydrolysis% respectively. Liquid chromatography and Spectrophotometer was used to measure hydrolysis% and strength.
In case of drimareen HF combination M: L ratio were 1:06, 1:15, 1:20, for this strength were 102.1, 95 4, 93.3 & hydrolysis% were 0.12,4.6, 6.7.Remazol RR 102.1, 95.4, 93.3and hydrolysis% are 0.12, 4.6, 6.7. In case of Remazol RR combination the strength for M: L ratio are 1:06, 1:15, 1:20 were Remazol RR 102.7, 94.7, 91.2and hydrolysis% are 0.35, 5.3, 8.8.

5. Conclusion

At low M: L ratio dye take up percentage would be high [7]. So test result reveled that better result would be achieved at low M: L ratio that would direct impact on cost effective benefit. Strength and hydrolysis is an important issue for jute dyeing, in case of Drimaren HF we got superior value than Remazol RR due to low M: L strength is high and hydrolysis% is low. Remazol RR combination may be the best replacement of Drimareen HF combination and this will help, which is the best method of Jute dyeing.

6. References

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