Fastness Properties Analysis Between Levafix Blue CA and Levafix Fast Red CA During Jute-Cotton Union Fabric Dyeing

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Abstract: **Reactive dyes are extensibly used for dyeing and printing cellulosic fibre containing cellulosic portion. Levafix Blue CA & Levafix Fast Red CA both is Reactive dyes widely used in Jute and jute-cotton union fabric dyeing. From the experimental result, it has observed that the result of strength & fastness properties is different from Levafix Blue CA and Levafix Fast Red CA. Here we showed that Levafix Blue CA is better than Levafix Fast Red CA.**

Keywords: *Spectrophotometer, exhaustion, reflectance, fixation, strength.*

1. INTRODUCTION

The most important cash crops of Bangladesh is Jute [1], at past it was golden fibre in Bangladesh. Jute fibres contain remnants of plant bark, thick fibrous roots and some dust [2], as well as it has many impurities. Jute is second after cotton in the world's production of textile fibres [3], after cotton it was largest amount. The cheapest and the strongest of all natural fibres is Jute and considered as future's fibre [4], as like as before .Jute fibres has around 65-70% cellulose, 13.6-20.4% hemicellulose and 8% microfibril [5] lignin is one of the part that is very hard. Water is used extensively throughout textile processing operations [6], during jute dyeing huge amount of water is needed .Reactive dye is a famous and excellent dyestuff for cotton fabric dyeing because of its useful properties [7], for all cellulosic fibre its performance is best .Reactive dyes creates covalent bond with the substrate, mainly cotton on application [8] as well as all natural fibre .Reactive dye is very bright in color [9] and various kind of shade can be produced by using this dye. Reactive dye molecule contains specific functional groups [10], such as –Cl, -So_3Na etc. The most commonly used coloration method for cotton is Reactive dyeing [11], jute, ramie, sisal. Reactive dye, a dye which is capable of reacting chemically with a substrate to from a covalent dye-substrate linkage. The super dyes to apply on cotton fabric and other cellulose fibres are reactive dyes [12], at present its popularity is increasing day by day .Fabric was dye with reactive dye using the procedure recommended by the dye manufacturer [13]. Ideal dyeing depth after one dyeing in a water bath is difficult because indigo dye has low affinity to cotton fibre [14], dyeing is the treatment of color to whole textile material with color fastness in some degree. In other words, the process of coloring of textile materials is dyeing with immersion them in an aqueous solution of dye or dye liquor. With the types of dye the fastness of a colour can vary, the particular shade used, the depth of a shade and the dyeing process has been carried out how well [15]. A chromospheres contains in a reactive dye, a substituent that reacts with the substrate. Reactive dyes have good fastness properties for creating bonding that happens during dyeing. Reactive dyes are most commonly used in dyeing of cellulose fibre as like as cotton or flax, but also wool is dyeable with reactive dyes. The most important method for the coloration of cellulosic fibers is reactive dyeing. Reactive dyes can also be applied on wool and nylon; by weakly acidic conditions in latter case they are applied. Reactive dyes have a low utilization degree compared to other types of dyestuff, since the functional group also bonds to water, creating hydrolysis; this is a problem of reactive dye. Another disadvantage is salt required.

2. MATERIALS AND METHODS

2.1. Fabrics: Jute-cotton union fabric.

2.2. Collection of Dyes and Chemicals:

Dyes and Chemicals were collected from reputed Chemicals Company.

2.3. Experimental Procedure:

Fabric has been loaded on sample Jigger m/c and has taken necessary chemicals & auxiliaries. Here we have taken two types of dyestuff one is *Levafix Blue CA and another is Levafix Fast Red CA*. Jute-cotton union

fabric has dyed according to below mentioned recipe. Here M: L ratio was taken 1:10, strength was measured by Spectrophotometer. After circulating the dyestuff salt was added. The measured amount of Alkali was added in the bath after 10 to 15 minutes later. The temperature was raised to 60^0c and the dyeing was carried for 60 minutes. By using Spectrophotometer first recipe was formulated.

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:

Levafix Blue CA----------1%	Levafix Fast Red CA----------1%
Glauber salt ----------40g/L	Glauber salt ----------40g/L
Soda ash ----------10g/L	Soda ash ----------10g/L
Temperature ----------60^0C	Temperature ----------60^0C
Time ----------60min	Time ----------60min

Before dyeing exhaustion and fixation% has measured in proper system. After dyeing various types of fastness properties rubbing, wash, perspiration, light and color strength has measured by following standard method. After dyeing fabric has washed with hot water as well as also cold water and dried [16]. I have followed ISO-3 in case of wash fastness.

Wash fastness procedure:

The tested sample has prepared as below:

- ☑ A 10 × 4 cm^2 dyed sample to be tested has taken.
- ☑ Another two pieces of fabric sample which are scoured, bleached but undyed sample of 5 × 4 cm^2 sample has also taken.
- ☑ One of the two pieces of undyed sample is a multifibre fabric. This fabric has different fibres side by side. Next the tested sample has placed between the unfinished samples covering 5 × 4 cm^2 area and stitched at the four edges, leaving 5x4 cm^2 exposed.

Light fastness procedure:

In case of light fastness the sample and standards have mounted half covered and half exposed to daylight. The sample has protected from rain by a glass sheet not less than 5cm away (well ventilation due to moisture and heat). The specimen and standards kept under sun and continue 24hrs until sufficient fading. 8- Reference sample and the tested sample has cut at same size and those are accommodated on the template.

- ☑ The specimens have mounted in a frame facing south in northern hemisphere and facing north in southern hemisphere at an angel equal to the latitude of the place.
- ☑ The way of carrying out the test have to mount the standards and specimens as-
- ☑ The sample has protected from rain by glass sheet.
- ☑ One quarter of the sample and standards are covered with opaque fabric. Thus it was exposed until standard-1 will be fade and equivalent to standard-4 on change in color grey scale.
- ☑ Then cover up one quarter of previously exposed portion of the sample and standards by an opaque sheet. Thus it has exposed until standard-7 will be fade and equivalent to standard-4 on change in color grey scale.
- ☑ Result will be terminated and opaque will be taken out, three stripes have found in specimen and standards.
- ☑ The zones of specimen have compared with zones of standards. The light fastness of a dyed sample is the number of the wool standard that has faded to same extent as the exposed area of the sample.

Rubbing fastness Procedure:

Rubbing fastness is the resistance to fading of dyed textiles when rubbed against a rough surface.

This test determines the fastness of dyestuff to either wet or dry rubbing.

Procedure:

- ☑ Test specimen 15cm x 5cm has placed on the base of the Crockmeter.
- ☑ Square of white test cloth (5cm x 5cm) of cotton desized, bleached but without finish (as ready to dye)
- ☑ Specimen has attached to the finger of the crockmeter.
- ☑ This finger has used in rubbing action on the sample specimen i.e. rubbing 10cm long to and fro 10 times at 10seconds.
- ☑ 20 rubs in 10s and finger pressure on the specimen was 9N.
- ☑ For testing dry and wet rubbing, separate sample have used.
- ☑ Rubbing test was both for warp way and weft way.

- ☑ For wet rubbing, sample was dry but standard cloth was wet.
- ☑ Change in color in the specimen and staining in the white cloth has determined by grey scale.

In both cases, for both dry and wet rub test, the fastness to rubbing was rated 1-5.

Perspiration fastness Procedure:

- ☑ Sample size (10cm x 4cm) has taken.
- ☑ The sample (10cm x 4cm) has placed between two undyed fabric pieces (5cm x 4cm).
- ☑ One of the two pieces of undyed sample one was a multifibre fabric. This fabric has different fibres side by side. One of the compositions from multi-fibres should be considered three pieces have hold together by stitching round edges, leaving 5cm x 4cm exposed.
- ☑ Now the composite specimen has wetted in perspiration solution A and is kept for 30mins at room temperature.
- ☑ The liquor has poured off (sample should not squeezed).
- ☑ The specimen was then placed between two glass plate (acrylic glass plate→11.5cm x 6.0cm x 0.15cm) and 4.5kg (10 lb) pressure had applied by and weight for 4hrs at oven (Incubator) temperature(37^0 C ± 2^0C).
- ☑ Then the undyed and specimens have separated, then dried in air at temperature ≤ 60^0C.
- ☑ The procedure has repeated with solution B.
- ☑ The change of color and staining has then assessed with grey scales for each test.

3. RESULTS AND DISCUSSION

All the tests have 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 Levafix Blue CA and Levafix Fast Red CA.

Table 1: Exhaustion% & Fixation%

Name of dyes	Exhaustion%	Fixation%
Levafix Blue CA	94%	90%
Levafix Fast Red CA	93%	88%

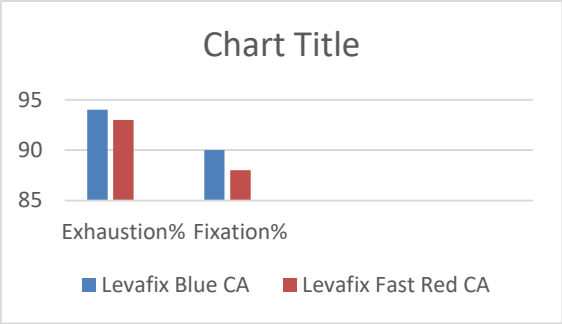

Figure 1: Exhaustion% & Fixation% of Levafix Blue CA and Levafix Fast Red CA

Table 2: Different fastness properties and color strength

Name of dyes	Wash fastness	Rubbing fastness	Perspiration fastness	Light fastness	Color strength
Levafix Blue CA	4	4-5	4-5	6	97%
Levafix Fast Red CA	3-4	4	4	6	93%

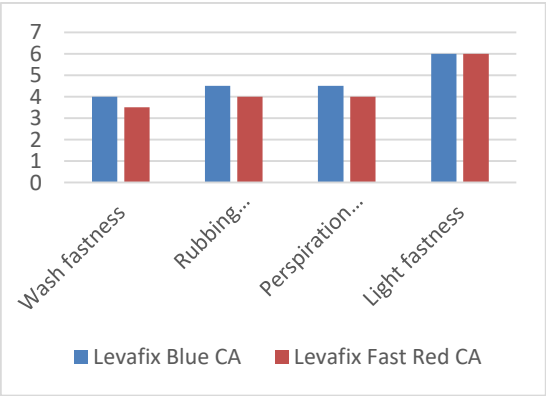

Figure 2: fastness properties of Levafix Blue CA and Levafix Fast Red CA

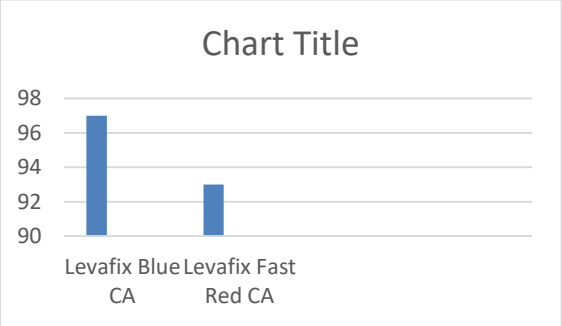

Figure 3: color strength of Levafix Blue CA and Levafix Fast Red CA

In fig. 1, the horizontal line & vertical line indicate exhaustion & fixation and two types of dyestuff respectively.
In case of Levafix Blue CA exhaustion% 94 and fixation % 90.
In case of Levafix Fast Red CA exhaustion% 93 and fixation % 88.
In fig.2 fastness properties & In fig.3 strength of two types of dyestuff respectively. Spectrophotometer has used to measure color strength. In case of Levafix Blue CA wash fastness 4, rubbing fastness 4-5, perspiration fastness 4-5, and light fastness 6and color strength 97%. In case of Levafix Fast Red CA wash fastness 3-4, rubbing fastness 4, perspiration fastness 4, light fastness 6 and color strength 93%.

4. Conclusion

Test result reveled that Levafix Blue CA gives better result than Levafix Fast Red CA in terms of exhaustion, fixation, all types of fastness and color strength, which is the best method of jute-cotton union fabric dyeing. Reactive dye is really excellent to dye not only cotton but also jute-cotton blended fabric dyeing that means all cellulosic fibre as well as vegetable fibre.

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