# Effect of Varying Concentration of Soda Ash on Fastness Properties of Reactive Dyed Cotton Fabric

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## Abstract

In this study, it was observed that the effect of soda ash on fastness properties of reactive dyed cotton fabric was compared with the varying concentration of soda ash. Here, five different concentration of soda ash (10g/l, 15g/l, 20g/l, 25g/land 30g/l) were used to compare the fastness. Different fastness properties of cotton dyed fabric were investigated such as washing fastness, perspiration fastness, rubbing fastness, and light fastness. Most of the cases, the fabric fastness properties such as washing, rubbing, perspiration, and light were improved at soda 20gm/L after further increasing the amount of soda, the fastness properties were same. So, the result of fastness properties at 20gm/L concentration of soda ash was excellent.

***Index terms***— reactive dye, soda ash, cotton knitted fabric, fastness properties

## 1 Introduction

otton fiber is the most popular textile fiber in the world for their comfort and it is renowned for its breathability, strength and versatility. [1]Cellulosic fiber dyeing with reactive dyes is one of the most convenient and popular method. Cotton also favorable to dye with reactive dyes due to it' s hydroxyl group (-OH). Dyeing is the process of adding colour to textile products like fibers, yarns, and fabrics. Dyeing is normally done in a solution, containing dyes and required chemicals. Dyeing of cotton with direct dye has poor wash fastness due to weak bond between dyefiber molecules. [2] A dye, which is capable of reacting chemically with a substrate to form a covalent bond, is known as reactive dye. After dyeing, dye molecules have strong chemical bond with cellulosic fiber molecules. Here the dye contains a reactive group and these reactive groups make the covalent bond with the cellulosic fiber polymer and act as an integral part of fiber and give good wash fastness. [3] During the application of reactive dyes to cellulose (cotton) fibers under highly alkaline condition, a hydrolysis reaction takes place, originating the non-reactive oxi-dye form and those dye (oxi-dye) stay on fabric surface. As a result, most of the cases it is seen that fastness properties of reactive dyed cotton fabric is not good. Therefore, fixing agent is applied on reactive dyed fabric to develop the different fastness properties in after treatment process. [4] The salt is associate in nursing exhausting agent to push the color towards polysaccharide molecules and therefore the alkali (soda ash) is hydrolyzing/fixing agent for the reactive colors. Sohel et. al Studied the effect of soda on dyeing of woven cotton fabric with reactive dye. They were found good result on colour fastness to wash, water, and Rubbing. They were used in this thesis 100% cotton woven fabric, 140 gsm, Reactive dye (Procion red H-3B, Reactive black B), soda percentage (5%,10%,15%). [5] Paul et. al study on the effect of alkali on dyeing of cotton fabric with reactive dye (shade 1%) and they found in their study the wash and rubbing fastness was good to excellent. [6] Now our paper deals with the Effect of Varying Concentration of Soda (other parameters was kept same) on Fastness Properties in Dyeing of Cotton Fabric with Reactive Dye. The aim of this paper is to examine the effect of varying of soda on different fastness properties. So the color fastness to washing, rubbing, perspiration, and light are tested and evaluated.

# 2 II.

# 3 Materials and Methods

100% bleached cotton knitted single jersey (160 GSM) were used in this research.

# 4 b) Chemicals used

Reactive dyes, Soda ash (Na 2 CO 3 ), anhydrous Glauber salt (Na 2 SO 4 ), Sequestering agent, leveling agent, and anti-creasing agent were used. Different standard testing procedures were followed for the assessment of the color fastness properties.

# 5 ( ) Volume

Color fastness to washing was assessed by following the standard method of ISO-105-C06-C2S. [7] Color fastness to rubbing was evaluated by following the standard method of ISO-105X12 From the above table, it is shown that, the color fastness is increased with the increased of soda at a level of 20 gm/L and a further increasing of soda ash does not effect on the color fastness. So it is concluding that, soda 20gm/L concentration result is best in case of color fastness. The results of the above tables show that, the properties of color fastness to perspiration (acid & alkali) are poor. Among this poor fastness property the 20 gm/L soda ash concentration has a comparatively better result. .Although fastness property to perspiration in all concentration is poor; 20 gm/L soda ash concentration has relatively better than other concentration. Fastness Rating The above graphs show that, the color fastness to wet rubbing is same for all concentration of soda ash, whereas color fastness to dry rubbing is disparate in different concentration. In wet rubbing optimum fastness properties found in 20, 25 & 30 gm/L soda ash concentration.

# 6 J

Figure 10 shows that, color fastness to light for red shade is best at 20 gm/L soda ash concentration.

IV.

# 7 Conclusion

In this research work finally it is conclude that, the varying of soda ash concentration has effects on fastness properties of reactive dyed cotton fabric with various shades. With the increase of soda ash, fastness properties increased due to much amount of dye fixation into the fiber. But it was also shown that 20gm/L soda ash concentration provides the best results rather than other concentration of soda ash. Over 20 gm/L concentration of soda ash also give, similar result so it is unwise to use more soda ash as it is one kind of wastage of soda ash. Soda gm/L

# 8 References références referencias

Figure 1: Figure 1 :

[1] [2]

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Figure 2: Figure 2 :

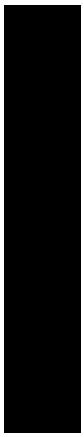

Figure 3: J


Figure 4: Figure 4 :

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Figure 5: Figure 3 :

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Figure 6: Figure 5 :Figure 6 :

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Figure 7: Figure 7 :

Figure 8: Figure 9 :

Figure 9: Figure 10 :

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Figure 10: Table 1 :

**2**

| Materials Name | Recipe 01 | Recipe 02 | Recipe 03 | Recipe 04 | Recipe 05 |
|---|---|---|---|---|---|
| Nova. Turq. Blue GN | 0.10% | 0.10% | 0.10% | 0.10% | 0.10% |
| Nova. Blue TS3G | 0.56% | 0.56% | 0.56% | 0.56% | 0.56% |
| Avi. Brill. Yellow SE | 0.02% | 0.02% | 0.02% | 0.02% | 0.02% |
| Soda Ash | 10 gm/L | 15 gm/L | 20 gm/L | 25 gm/L | 30 gm/L |
| Salt | 40 gm/L | 40 gm/L | 40 gm/L | 40 gm/L | 40 gm/L |
| Time | 60 min | 60 min | 60 min | 60 min | 60 min |
| Temperature | 60 ? C | 60 ? C | 60 ? C | 60 ? C | 60 ? C |
| M:L | 1:10 | 1:10 | 1:10 | 1:10 | 1:10 |

Figure 11: Table 2 :

**3**

| Materials Name | Recipe 01 | Recipe 02 | Recipe 03 | Recipe 04 | Recipe 05 |
|---|---|---|---|---|---|
| Nova. Blue TS3G | 0.02% | 0.02% | 0.02% | 0.02% | 0.02% |
| Nova. Ruby S3B | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% |
| Nova. Yellow S3R | 1.0% | 1.0% | 1.0% | 1.0% | 1.0% |
| Soda Ash | 5 gm/L | 10 gm/L | 15 gm/L | 20 gm/L | 25 gm/L |
| Temp. | 60 0 cX20' | 60 0 cX60' | | 90 0 cX10' | |
| Soda dosing | | | | | Washing |
| 40 0 c | Cooling at 40 0 c | | | | Cooling at 40 0 c |
| | Time | | | | |

Color fastness to perspiration was assessed by following the standard method of ISO-105-E04. [9] Color fastness to light was evaluated assessed by following the standard method of ISO-105-B02. [10]

. [8]

Figure 12: Table 3 :

**5**

| Soda gm/L | Change in Color | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| | | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 13: Table 5 :

**6**

| Soda gm/L | Change in Color | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| | | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 14: Table 6 :

**4**

| Soda gm/L | Change in Color | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| | | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 15: Table 4 :

**7**

| Soda gm/L | Change in Color | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| | | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 16: Table 7 :

**9**

| Soda gm/L | Change in Color | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| | | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 17: Table 9 :

**8**

| | | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| Soda gm/L | Change in Color | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |
| 10 | 4 | 4 | 2 | 3-4 | 4 | 3-4 | 3-4 |
| 15 | 4 | 4 | 2 | 3 | 3-4 | 3 | 3-4 |
| 20 | 4 | 4-5 | 2 | 3-4 | 4 | 3-4 | 3-4 |
| 25 | 4 | 4-5 | 2 | 3-4 | 4 | 3-4 | 3-4 |
| 30 | 4 | 4-5 | 2 | 3-4 | 4 | 3-4 | 3-4 |

Figure 18: Table 8 :

**11**

| | | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| Soda gm/L | Change in Color | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |
| 10 | 4 | 4 | 2 | 4 | 4 | 3 | 3 |
| 15 | 4 | 4 | 2 | 3-4 | 4 | 3 | 3 |
| 20 | 4 | 4 | 2 | 3 | 4 | 3 | 3 |
| 25 | 4 | 4 | 2 | 3-4 | 4 | 3 | 3 |
| 30 | 4 | 4 | 2 | 3-4 | 4 | 3 | 3 |

Figure 19: Table 11 :

**10**

| | Color Staining | | | | | |
|---|---|---|---|---|---|---|
| Soda gm/L | Change in Color | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |

Figure 20: Table 10 :

**12**

| | | Color Staining | | | | | |
|---|---|---|---|---|---|---|---|
| Soda gm/L | Change in Color | Acetate | Cotton | Nylon | Polyester | Acrylic | Wool |
| 10 | 4 | 4 | 2 | 3 | 4 | 3 | 3 |
| 15 | 4 | 4 | 2 | 3 | 4 | 3 | 3 |
| 20 | 4 | 4 | 2 | 4 | 4 | 3 | 3 |
| 25 | 4 | 4 | 2 | 4 | 4 | 3 | 3 |
| 30 | 4 | 4 | 2 | 4 | 4 | 3 | 3 |

Figure 21: Table 12 :

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