

# EFFECT OF DETERGENTS AND COLOURFASTNESS OF VAT DYED COTTON FABRIC

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## ABSTRACT :

In textile chemical processing industries vat dye is one of the important dyes for coloration of cotton, when high fastness properties are required. But, Vat dye has the problem of insolubility in water. Hence, vatting is needed to reduce and solubilize the dye in water. Vat dye is normally dissolved in water using sodium hydrosulfite (hydrose) as a reducing agent and sodium hydroxide as a solubilizing agent suitable for dyeing. In this work, an attempt is made to reduce the vat dye using ferrous sulphate (2% owm) and its combination with hydrose as ferrous sulphate (1.5% owm) + hydrose (0.5% owm) and ferrous sulphate (1% owm) + hydrose (1% owm). The effect of ferrous sulphate as a reducing agent and its combination with hydrose is compared with the conventional reducing agent (hydrose). In the present study three different brands of detergent i.e. Ariel, Tide, and Rin and Vat dyed cotton fabric were used. The colorfastness to washing and rubbing was determined for the cotton fabric samples dyes with vat dyes (Navy Blue and Green colour). The other test parameters like the strength of the fabric, rubbing fastness, washing fastness, and light fastness, were also studied and compared.

**Keywords:** Cotton fabric, Detergents, Colour Fastness, Vat dye

## INTRODUCTION:

Vat dyes owe their name to the fact that the foremost member in this series, indigo, was applied to textiles using a fermentation process in wooden vessels commonly known as 'vats'. The dyes are among the oldest natural colouring matter derived from various origins like vegetables (plants, stems, etc.), insects, and animals. Vat dyes provide textile materials with the best colour-fastness of all the dyes in common use. The fibers most readily coloured by them are natural and man-made cellulosic fibers, like cotton, viscose rayon, etc. Vat dyes are the most important dyes for dyeing and printing on cotton fibers. They have excellent colorfastness properties which include washing, light, perspiration, and rubbing fastness. Besides, vat dye has very good stability developed in recent years during the improvements of the functional changes in the fiber of the functional processing, such as shape memory processing, morphological stability processing, deodorant processing, antibacterial processing, etc.

Currently, cotton is the world's most used fiber. Cotton is a natural fiber and is used in a wide variety of clothing and home furnishings. It is a natural fiber that is obtained from cotton linters. The cotton is a relatively pure and inexpensive source of cellulose. Cotton has a combination of desirable properties which makes it suitable for many uses. It has properties of low cost, low resiliency, launderability, and absorbency. The low cost is perhaps one factor that led to the wide use of cotton for textiles. Cotton is grown in all parts of the world where the climate is mild. The quality of cotton is based on the length and brightness of the fiber - the longer, brighter fibers being best. Cotton is easily washed and/or dry cleaned. Cotton is a good strong fabric that is absorbent, and easy to work with. Cotton's strength increases by approximately 25% when wet, which is important in washing and ironing. The strength of cotton is improved by treating it with caustic soda, the process called mercerization also increases its luster and affinity for dyes.

Apart from the cleaning properties of the detergents the other area of concern is color fastness, which is a term used in the dyeing of textile materials, meaning resistance of the material's colour to fading or running. Thus, the quality of a fabric is the function of colour fastness (for different dyes) and the reaction of detergents with the fabric and dyes (during the washing process). Detergents have been subject to constant improvements to increase their cleaning power, to better protect coloured clothing, and to have a lower environmental impact.

The endpoint for formulators for laundry detergents is consumer satisfaction. Thus, it is evident that the cleaning property of detergents as well as the nature of different dyes provides a dynamic situation that demands careful planning for the washing process for sustaining the quality of fabrics. Against the backdrop of the above information, this study was carried out to assess the impact of different commercially available laundry detergents and color fastness of dyed cotton fabrics. The researcher was motivated to carry out research in this domain as it offers significant potential benefits through a closer understanding of the effectiveness of detergents, which are an essential commodity of human life. The specific objectives of the study were as under.

## Objectives of the Study :

1. To standardize the dyeing procedure by using 100% branded cotton fabrics.
2. To test the effect of laundry detergents on dyed cotton fabrics.
3. To observe the effect of color fading of the dyed fabric in the process of laundering.
4. To suggest the most effective laundry detergent based on its property of color fastness.

**MATERIALS AND METHODS :****Selection of detergent:**

Three different brands of detergents, Ariel (Ar), Tide(Td), and Rin(Rn) were used in this study. These washing powders are manufactured and sold by the retail company. Each detergent is a well-known detergent, available at most supermarkets and retail shops.

**Experimental Fabrics :**

100% Cotton (Poplin) fabric was used in this study. The fabric was scoured and subjected to drying.

**Dyes :**

For this study Vat dye, a) Navy Blue Colour and b) Green Colour was selected.

**Methods Followed :**

The cotton fabrics were dyed in different colours, namely Vat dyes- Navy Blue and Green colour. In assessing the colorfastness of experimental fabrics to laundering, tests for colour change as well as staining are important (Merke I, 1991). Greyscales were used during laundering treatments to indicate its possible staining due to colour loss of experimental fabrics.

**Colour fastness of dyed samples :** The final dyed samples were subjected to colour fastness tests. The tests conducted were.

- 1) Colour fastness to washing - related standards: ISO:105, BS: 1006:1990
- 2) Colour fastness to crocking – related standard: IS: 776:1988 and ISO:105/x-1984
- 3) Grey Scale for assessing change in shade/colour: ISO 105-A02
- 4) Grey Scale for assessing Staining: ISO 105-A03

**RESULT AND DISCUSSION:**

**Fastness to washing Test Report:** Vat dyed Navy Blue and Green colour

**Vat Green and Navy Blue: :** The study results about grayscale rating for change in the colour shade (for vat dyes green and navy blue) did not indicate any color running or bleeding, which was evident from the higher grayscale scores i.e. 5. Furthermore, this robust colour fastness was consistent at all the setting temperatures selected (room temperature, 40°C, and 60°C) in this study. Thus, it may be concluded from the study results that the Vat dyes green and navy blue dyed cotton fabrics were good in colorfastness.

In addition to the above, the result of the staining of the above-mentioned dyes on the white cotton was also assessed using grayscale for the stain on white cotton. The tests indicated that the -

- The colourfastness of the vat (green and navy blue) dyed cotton fabrics was strong, there was no stain of these dyes on the white cotton fabric.

**Colour Fastness to Rubbing Test Results:**

Vat dye Green and Navy Blue indicated a rating of 4.0 for dry rubbing fastness. In wet rubbing fastness of cotton fabrics dyed with vat dye Navy blue and green colour indicated a rating of 4.17.

**Color Fastness to Light Test Results:**

Illustrates information regarding colour fastness to light test of cotton fabrics dyed with vat dye green indicated rating of 4.5 and vat dye navy blue color showing a rating of 3.60 for colour fastness to light test.

**CONCLUSION:**

The study results about the grayscale rating for change in colour shade did not indicate any colour bleeding, hence, it can be concluded that the vat dyes Navy Blue and Green dyed cotton fabrics are good in colorfastness. On the rubbing fastness study results it can be concluded that the result of dry rubbing fastness was found to be good as compared to wet rubbing fastness.

**BIBLIOGRAPHY:**

1. Ahmad I, Jamil N.A., Athar A., Comparative study of washing fastness of Vat and Reactive Dyed Fabric Samples, Pakistan Journal of Applied Sciences 2001;1 (3):413-416.
2. Iftikhar Ahmad, Comparative study of washing fastness of vat and reactive dyed fabric samples (2001).
3. The story of the importance of cotton.
4. Santhi P, Moses J.J. The study on the reduction process of Vat dye on cotton fabric using ferrous sulphate and its effect on the effluent load. Curr World Environ 2008;3(2):239-244 DOI:http://dx.doi.org/10.12944/CWE.3.2.05
5. Padole H., The effect of different detergents of colourfastness properties of reactive dyed cotton fabric.
6. Monroe Ben and William Ms. Rebecca., Which laundry detergent is best at removing stains from clothes, 2013.
7. Daniela C., Vilarem, G., Improving light fastness of natural dyes on cotton yarn. Dyes and Pigments, 70(3), 2006. p. 238-245.