EFFECT OF REACTIVE AND VAT DYES ON THE DYEABILITY OF MERCERIZED COTTON FABRIC

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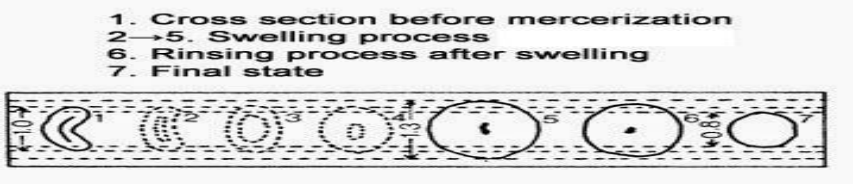
ABSTRACT

Existing studies aimed to evaluate the efficacy of blue dye based on the treatment of mercerization. This treatment is started in two ways i.e. slack mercerization and tension mercerization. The fabric samples are treated at temperatures i.e. 40 ° C at various concentrations i.e. 5%, 15% and 25% at different times such as 10 min, 20min and 30min. Samples of mercerized cotton white fabric are treated in 3% dye impregnation using reactive dye and Vat dye. Various parameters for the treatment of mercerization such as the variation of sodium hydroxide concentration and the duration of treatment were taken on the basis of previous studies. The dye depletion of the percent of dye samples was analyzed by comparing the slack samples and tensioned samples using a single UV-V Spectrophotometer beam. Both dyes have provided excellent results in tensioned as compared to slack mercerization across the range of treatment with increasing order. Vat dye provided excellent results in 3% dye concentration and 25% alkaline concentration for 30min using under stress treatment.

Keywords: Mercerized Cotton, Percentage Dye Output and Slack Mercerization

INTRODUCTION

Cotton, King of the fiber kingdom, is the pride of our nation and a gift to the world. Cotton called "white gold" was used in India up to 4000 B.C c otton worked in many different ways and the most widely used textile processing of fabrics uses the finest properties than any other fiber. This is a widely available natural fiber used in clothing. Cotton structures can also be increased by completing treatment8. There are many types of finishing treatments that can be applied to cotton cloth such as knitting, waterproofing, and mercerization etc. Another very important way to get rid of the value is to add cotton. This method is available in 1844 and is patented in 1850 by the English calico publisher John Mercer .Mercerization in textiles, chemical treatments used in cotton threads or fabrics to give permanent dyeing to the dye and dissolution of various chemicals. It is also used in the finishing of linen. The cloth is usually singed before the bleeding, but tenderness may follow or follow the bleeding. When cotton fibers are placed in alkaline solutions (sodium hydroxide or liquid ammonia) in a specified area, then stretched by Mercerization it results in a flat, parallel ribbon frame attached to a circular shape and connected to length. The fiber becomes much darker than the origin of the fiber and its strength is increased by 20%. When mercerization is done with tension fiber, the fibrous structure of the compressed cotton is changed: straight and marked, the lumen disappears completely



Strongly alkaline solution causes the fiber to swell and become gelatinous and transparent in its structure. It provides excellent decorative properties and improves dye absorption. Enables even more dyeing in addition to enhancing physical properties and higher luster rate, depending on the method used. Khadi is an Indian handicraft and hand woven

cloth. Khadi is an eco-friendly fabric. The raw materials can be cotton, silk and thread wool from a rotary wheel called charkha. Over time, the fabric has become a fashionable fabric. Khadi, Cloth of Freedom, has been a source of livelihood for people. The spherical fabric however has some delicate features such as hand woven n the hand cloth and therefore has little strength. Caustic soda for which mercerization Existing studies were designed to determine the effect of sensitivity on the strength of the dye-ability of the fabric. The main purpose of the present work was; study of the effect of various concentrations, duration and temperature of the treatment on the effect and effect of dye exhaustion on mercerized samples.

MATERIAL

This study was performed on cotton white fabric, weighing 1.50 gm (GSM). Reactive dye and Vat dyes are used to perform this experiment. Fabrics were pretreated to create final fabric for deying . Desizing and bleaching are done as per required recipes.

METHODS

Mercerization Process

After pretreatment, mercerization treatment was done on white fabric using two methods of slack and tension mercerization. This treatment was performed at concentrations of Sodium Hydroxide palates i.e. 5%, 15%, and 25% for a time interval of not less than 10min, 20min and 30min at 40o C. After this procedure the samples were washed with water and dry for all samples. The tension Mercerization treatment was done in an extended condition rather than in standing samples and under a condition of tension.

Fabrics were treated in stretched form in tension mercerization with the help of frames and dipped in NaoH solution under specified conditions.

Dyeing

Samples were segregated in mercerized and non-mercerized samples. All the samples are dyed at specified conditions with 2% dye concentration with vat and reactive dyes.

RESULTS

The effect of Sodium hydroxide improves dyeability of a fabric. Experiment was conducted at different concentrations of NAoH for different times and consistent temperature. Afterwards, dye ability of slack and tension mercerized fabric was compared.These fabric samples provided excellent results after the treatment of the cotton fabrics at different concentrations of NaOH i.e. 5%, 15% and 25% different time (10 minutes, 20 min and 30min), as are given in the Table.

Table 1: Reactive Dye Absorbancy

Time (mins)	Dye Concentration	Slack Mercerization		Tension Mercerization	
		Before	After	Before	After
Control Sample		8.3	7.04	16.3	14.04
10	5%	11.28	9.6	11.68	9.36
10	15%	8.6	7.52	13.32	12.12
10	25%	10.68	9.68	10.48	9.44
20	5%	13.08	12.86	11.12	10.08
20	15%	11.6	10.8	12.88	10.88
20	25%	14.44	10.6	11.88	9.8
30	5%	12.4	10.92	9.88	8.8

30	15%	10.18	9.6	11	8.1
30	25%	12	11.36	12.84	7.89

The effect of reactive dye absorbency, before dyeing and after dyeing under the slack and tension mercerized fabric samples showing the cotton treatment is shown in Table 1 using the reactive dye.The sample has the properties to absorb the dye and give a very good color effect on the surface of the fabric. The reactive dye suffered from a control sample of around 1%. With regard to slack treatment, as time and concentrations are increased from 10 minutes to 30 minutes with 5% to 25% concentration respectively. According to Tension Mercerization , the dye solution before dyeing was 11.86 and after dyeing the dye solution was reduced to 9.36 which means the dye dyed samples were more than 2% in the fabric process where 5% NaOH concentration time of 10 minutes, as the duration of treatment and concentration of NaOH was increased, the intake of the treated samples was also increased.

As compared to the control samples the slack mercerized sample samples showed good absorption of the reactive dye there under the sample concentration with the ability to detect sensitive color properties. However, it was increased in all dye samples of tension mercerised the same condition as compared with slack mercerized samples using reactive dye. The results are supported by a study by Goldthwait, C. Et al. (1952) t hat an indication of the swelling behavior of cotton is expected to add to the general observation of the rate of rot i.e. luster, strength and dyeing capacity. Functional dyes can also be combined with more than one fiber and therefore increase the amount of energy.

Table 2: Absorbancy of mercerized and dyed samples

Time (mins)	Dye Concentration	Slack Mercerization		Tension Mercerization	
		Before	After	Before	After
Control Sample		7.98	7.32	7.98	7.32
10	5%	8.3	7.8	9.75	8.15
10	15%	9.15	9.13	9.95	6.66
10	25%	7.18	7.3	9.2	6.98
20	5%	7.8	8.2	8.8	6.44
20	15%	7.3	7.8	10.02	6.56
20	25%	7.33	6.9	10.1	6.1
30	5%	6.22	6.3	10.8	6.32
30	15%	7.1	6.9	12.8	7.28
30	25%	8.8	7.6	9.95	6.15

Table 2 . Depending on the control sample, before dyeing the absorbancy is 7.98% and after dye the absorbancy is reduced i.e. 7.32, means; the sample has the properties to absorb the dye and provide fine colors. With regard to the treatment of slack mercerization, before dyeing, the color solution was 8.3 at the edge of 600nm, after dye absorption was 7.8. It means a generous sample of less than 1% color -5% NaOH concentration for 10 minutes duration, at the same time of NaOH concentration the pre-color recovery of the dye solution was 9.75 and after the dyeing it was 8.15 and gained more than 1%. That is, tension mercerized sample give good results as compared to slack mercerization.

If 25% concentrated NaoH was kept for 30 minutes, before dyeing the absorbancy of vat dye solution was 8.8 and after dyeing it was 7.6 by using slack mercerized cotton samples. In tension mercerized cotton samples before dyeing solution with dye showed 9.95 while after dye was reduced to 6.16. It means tension mercerized cotton gets the best

absorbancy i.e. more than 3% with increasing concentration of NaOH and time. With increasing time and concentration, i.e. from 10 minutes to 30 minutes and from 5% to 25% overlap, showing the increase respectively.

Table 3 : Vat Dye and Reactive Dye Exhaustion

Time (mins)	Dye Concentration	Vat dye		Reactive dye	
		SM	TM	SM	TM
Control Sample		8.27	8.27	11.06	11.06
10	5%	9.9	16.41	12.19	13.72
10	15%	10.1	24.06	12.58	13.95
10	25%	14.8	32.5	12.36	18.61
20	5%	11.9	30.09	13.02	15.02
20	15%	12.5	33.5	13.52	19.86
20	25%	17.9	36.8	14.01	27.81
30	5%	12.8	34.8	15.3	20.59
30	15%	13.59	39.91	16.2	29.36
30	25%	27.35	45.8	22.4	38.55

Percentage of Dye Energy for Active Dye and Vat Dye

It can be seen from Table 3 that the percent dye penetration in the cotton fabric was 8.27 and 11.06 for Vat and effective dye respectively. The dye penetration of the mercerised samples was 9.9, 10.1, and 14.8 by 5%, 15% and 25% of the dye concentration of only 10min, at the same time as the NaOH concentration, the dye absorption by the sample of mild cotton increased by 16.41, 24.06, and 32.5. Dye absorption of tension mercerised has been increased using the reactive dye compared to slack mercerized samples. As time and time for the NaOH reactivity was increased, the dye absorptions also increased. The percent dyeing, of the slack samples, was 15.3, 16.2, and 22.4 while the tensioned sample samples were 20.59, 29.36 and 38.55 using the reactive dye with 5% to 25% concentration of NaOH for 10-30 minutes.

Slack mercerization yielded the best result in 25% NaoH for a 30-minute period. Dye uptake was increased in slack and tension mercerized samples as compared to the control sample

CONCL USION

Commercially available cotton cloth was treated with NaoH solution at 5%, 15%, 25% caustic soda concentration and varied at 10min, 20min, 30min. It can be concluded from the results that as time and concentration increase, the percent dye increase is also increased in the case of tension mercerized compared with the control samples. However, it can be concluded that the vat dye gave better dye affinity as compared to reactive dye. Thus, changes were observed between treatments i.e. the tension mercerized samples received better results over time, concentration and Tensile strength & ability to lower Shrinkage

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