ANNEXURE

Patel et al., J Textile Sci Eng 2016, 6:4
DOI: 10.4172/2165-8064.1000268

Journal of Textile Science & Engineering

Research Article Open Access

Effect of Bleaching Agents on Colour Depth of Jute Fabric Dyed with Natural Dyes

Patel S[1], Sharan M[1] and Chattopadhyay DP[2*]

[1]Faculty of Family and Community Sciences, Department of Clothing and Textiles,The Maharaja Sayajirao University of Baroda, Vadodara, India
[2]Faculty of Technology and Engineering, Department of Textile Chemistry, The Maharaja Sayajirao University of Baroda, Vadodara, India

Abstract

Raw jute fabric was subjected to two bleaching agents namely hydrogen peroxide and peracetic acid. Bleached jute fabrics were pre mordanted with alum, copper sulphate and ferrous sulphate and then dyed with four natural dyes: madder, turmeric, eucalyptus leaves and Indian almond leaves. The effect of bleaching agents on various physical properties like weight loss, tensile strength, whiteness, yellowness and brightness indices were studied. The effect of bleaching on colour development using different natural dyes was examined. Peracetic acid bleached samples were found to have high degree of whiteness with very less damage compared to hydrogen peroxide bleached samples. Peracetic acid bleached samples were found to be relatively darker.

Keywords: Jute; Bleaching; Fabric; Natural dyes

Introduction

During the past decade, increasing environmental awareness, new global agreements and international governmental regulations have been driving forces behind the renewed interest in the natural fibres. The attractiveness of a plant-based fibre comes from its high-specific strength and stiffness, natural availability and environmental friendliness [1,2].

Jute is a natural biodegradable fiber with advantages such as high tensile strength, excellent thermal conductivity, coolness, ventilation function etc. Besides its traditional usages like sackings, hessian, carpet backing, etc. jute is now-a-days being used to produce various fancy and household products. Jute is a natural fibre, its environmental friendliness remains intact where dyed with natural dyes and colour effect on this fibre is enhanced by proper bleaching [3,4].

Bleaching holds the key for successful production of diversified jute products. The primary object of jute bleaching is to improve its whiteness and to have better look after dyeing [5].

Substantial research has been carried out on the effects of different bleaching agents on jute and dyeing of jute with natural dyes but the correlation between effects of bleaching agents on dyeing performance of jute using different natural dyes is hardly available in the literature. In the present investigation, therefore an attempt has been made to study the effect of various bleaching agents on the physical properties of jute fabric as well as its effect on the dyeing properties when dyed with natural dyes.

Materials and Methods

Material

Fabric: Locally available jute fabric with the following specifications was selected for this study (Table 1).

Dyes and chemicals: Natural dyes for the study were Madder, Turmeric, Eucalyptus Leaves and Indian almond leaves. The mordants for the study were used Alum, Copper Sulphate and Ferrous Sulphate. Sodium carbonate and detergent were used for the scouring of jute fabric. Glacial Acetic acid and Hydrogen Peroxide (30%) were taken for the preparation of Peracetic acid. All the chemicals used for the study were LR grade.

Methods

Scouring: The fabric was scoured using 2 g/L of soda ash and 2 g/L of detergent keeping material to liquor ratio 1:40 at 85°C for 30 minutes. The samples were then rinsed in water to remove traces of soap and dried in shade. The scoured fabric was subjected to two bleaching systems namely hydrogen peroxide and peracetic acid bleaching.

Bleaching systems

Hydrogen peroxide: The scoured fabric was bleached with 1% (v/v) of hydrogen peroxide using 2 g/l of sodium silicate as stabilizer maintaining the material liquor ratio 1:40. The fabric was treated in this solution for 30 minutes at 50°C. The samples were then neutralized using dilute acetic acid.

Peracetic acid: Peracetic acid is prepared by reacting hydrogen peroxide with acetic anhydride or acetic acid. The most widely used method for the preparation of peracetic acid is direct, acid catalyzed reaction of 30-98% hydrogen peroxide with acetic acid. For this study, peracetic acid was prepared by reacting hydrogen peroxide (30%) with glacial acetic acid in 1:2 molar ratio at room temperature for 24 hours using sulphuric acid as catalyst. The scoured jute fabric samples were treated with freshly prepared peracetic acid for 1 hr at room temperature.

Extraction of dyes: As a natural dye source, four dyes namely Madder, Turmeric, Eucalyptus leaves and Indian Almond leaves were collected. Madder and Turmeric were taken in powdered form. Eucalyptus Leaves and Indian Almond leaves were dried in shade and then powdered. In order to extract the dye, 3% (wt/vol) of the natural source of the dye was immersed in water and was boiled for 30 minutes and then filtered. The dye extract thus obtained was directly used for dyeing of the bleached samples.

***Corresponding author:** Chattopadhyay DP, Faculty of Technology and Engineering, Dept. of Textile Chemistry, The Maharaja Sayajirao University of Baroda, Vadodara, India, Tel: 912652434188; E-mail: dpchat6@gmail.com

Received July 18, 2016; **Accepted** August 19, 2016; **Published** August 26, 2016

Citation: Patel S, Sharan M, Chattopadhyay DP (2016) Effect of Bleaching Agents on Colour Depth of Jute Fabric Dyed with Natural Dyes. J Textile Sci Eng 6: 268. doi: 10.4172/2165-8064.1000268

Mordanting: The mordants used for the study were alum (10% owf), copper sulphate (4% owf) and ferrous sulphate (4% owf). The fabric samples were treated in the aqueous solution of the mordant for 30 minutes keeping material to liquior ratio 1:40. After treatment samples were squeezed and directly taken for dyeing.

Dyeing: The dyebath was prepared with the requisite amount of dye. The pre mordanted samples were dyed using exhaust method at room temperature for 10 minutes maintaining material to liquor ratio 1:40. The temperature of the dyebath was then gradually increased to boil and the dyeing was continued for 1 hour. After dyeing, the samples were thoroughly washed, rinsed and dried.

Determination of K/S: The K/S values of the dyed jute fabric samples were determined by computer colour matching system using Spectrascan 500, Premier Colour Scan, India.

Results and Discussion

Effect of bleaching agents on physical properties

After scouring the jute fabric samples were bleached with two bleaching agents namely Hydrogen Peroxide and Peracetic acid. The effect of bleaching on various physical properties like tensile strength, weight loss, whiteness, yellowness and brightness indices were investigated, the results of which are presented in Table 2. It is clear from the results that whiteness and brightness of the sample bleached using peracetic acid was better compared with the sample bleached using hydrogen peroxide. The result of whiteness is also supported by the yellowness indices which show a reversed effect. The higher weight loss of Hydrogen peroxide bleached sample caused higher loss in tensile strength compared to peracetic acid bleached sample. Similar effect was also observed by Chattopadhyay et al. [3].

The higher weight loss in case of hydrogen peroxide is because of alkaline bleaching condition. The alkaline condition causes partial removal of hemicelluloses which is a cementing material for the ultimate cells of jute fibre. The loss in hemicelluloses weakens the fibres and causes reduction in tensile strength as a consequence leads to loss in weight. Peracetic acid bleaching was conducted in neutral condition; hence there was no major damage to the fibre which was reflected in tensile strength also after bleaching.

Fabric	Fiber content	Weave	Fabric count (yards/sq. cm)		Weight per unit area (gms/sq.mt)
			Ends	Picks	
Jute	100% jute	Plain	25	27	875.5

Table 1: Specification of the fabrics.

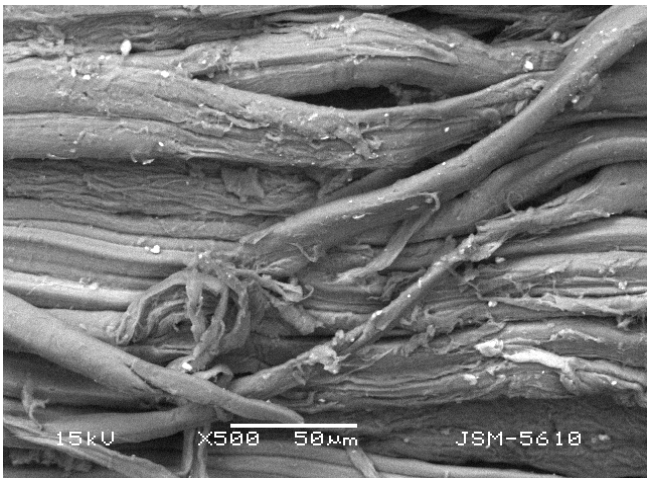


Figure 1: Scanning electron micro photograph of sample bleached with Hydrogen peroxide.

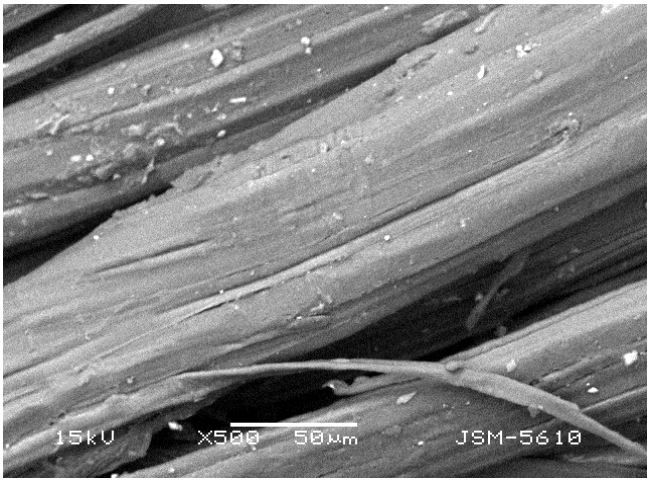


Figure 2: Scanning electron micro photograph of sample bleached with Peracetic acid bleached sample.

The damage to the fibre in hydrogen peroxide bleaching compared to peracetic acid bleaching can be clearly seen from the SEM photographs for these two bleached sample represented in Figures 1 and 2. The surface of peracetic acid bleached sample shows lesser physical damage compared to hydrogen peroxide bleached sample.

Effect of bleaching agents on the colour depth

The bleached samples were pre- mordanted with alum, copper sulphate and ferrous sulphate and then dyed with various natural dyes like madder, turmeric, Eucalyptus leaves and Indian almond leaves. The K/S values of the dyed samples were examined after dyeing. The results of this investigation are presented in Tables 3-5.

The values in the parenthesis indicate per cent improvement in K/S values compared to hydrogen peroxide bleaching: Peracetic acid bleached samples were darker compared to hydrogen peroxide bleached counter parts for all the natural dyes used in this study which can be attributed to better whiteness achieved in case of peracetic acid bleaching. The colour depth of Indian almond leaves was found to be much darker compared to Turmeric, Madder and Eucalyptus leaves.

The values in the parenthesis indicate per cent improvement in K/S values compared to hydrogen peroxide bleaching: The results of colour depth obtained for all the dyes using copper sulphate as a mordant are shown in Table 4. Here also the colour depths of peracetic acid bleached samples were higher for all the dyes. Samples dyed with Indian almond leaves were found to be the darkest samples among all the four dyes.

The values in the parenthesis indicate per cent improvement in K/S values compared to hydrogen peroxide bleaching: Table 5 indicates the effect of ferrous sulphate as a mordant on K/S for different natural dyes. Peracetic bleaching in general was resulted higher K/S for all the dyes. The per cent improvement in K/S values of turmeric was much higher followed by madder, Indian almond leaves and eucalyptus leaves. Like copper sulphate, in case of ferrous sulphate mordant also, the sample dyed with Indian almond leaves generated comparatively darker shade.

Sr. No.	Bleaching Agents	Physical Properties					
		Loss in weight (%)	Loss in Breaking Load (kg) (%)	Breaking Extension (mm)	Whiteness Index	Yellowness Index	Brightness Index
1.	Hydrogen Peroxide	4.5	15.1	18.4	63.22	31.92	33.79
2.	Peracetic Acid	1.7	6.5	10.7	64.15	30.87	34.81

Table 2: Effect of bleaching agents on physical properties of jute fabric.

Sr. No.	Bleaching Agents	Natural Dye			
		Madder	Turmeric	Eucalyptus Leaves	Indian Almond Leaves
1.	Hydrogen Peroxide	10.38	12.63	6.21	25.63
2.	Peracetic Acid	11.35 (9.3%)	13.43 (6.3%)	7.32 (17.8%)	27.65 (7.9%)

Table 3: Effect of bleaching agents on K/S values of Jute fabric dyed with different natural dyes for samples pre mordanted with alum.

Sr. No.	Bleaching Agents	Natural Dye			
		Madder	Turmeric	Eucalyptus Leaves	Indian Almond Leaves
1.	Hydrogen Peroxide	7.66	7.80	7.66	18.66
2.	Peracetic Acid	8.25 (7.7%)	7.84 (0.5%)	7.75 (1.2%)	18.69 (0.2%)

Table 4: Effect of bleaching agents on the K/S values of Jute fabric dyed with different natural dyes for samples pre mordanted with Copper Sulphate.

Sr. No.	Bleaching agents	Natural Dye			
		Madder	Turmeric	Eucalyptus leaves	Indian almond leaves
1.	Hydrogen Peroxide	7.22	7.65	17.33	23.75
2.	Peracetic acid	7.56 (4.7%)	8.75 (14.4%)	17.47 (0.8%)	24.56 (3.4%)

Table 5: Effect of bleaching agents on the K/S values of Jute fabric dyed with different natural dyes pre mordanted with Ferrous Sulphate.

Sr. No.	Bleaching Agents	Natural Dye											
		Madder			Turmeric			Eucalyptus Leaves			Indian Almond Leaves		
		M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
1.	Hydrogen Peroxide	10.3	7.6	7.2	12.6	7.8	7.6	6.2	7.6	17.3	25.6	18.6	23.7
2.	Peracetic Acid	11.3	8.2	7.6	13.4	7.8	8.7	7.3	7.7	17.4	27.6	18.6	24.5
M1: Alum; M2: Copper Sulphate and M3: Ferrous Sulphate.													

Table 6: Effect of the bleaching agents on K/S values of Jute fabric dyed with natural dyes using different mordants.

Table 6 summaries the effect of different mordants on color depth of all the natural dyes used as well as the effect of bleaching agents. Different dye sources exhibited different effects for the three types of mordants. For madder, turmeric and Indian almond leaves alum was found to be a better choice so far as colour depth is concerned. Ferrous sulphate mordanting exhibited much enhanced depth for the eucalyptus leaves and was found to be quite ahead compared to the other two mordants.

When the samples dyed with natural dyes were assessed visually it was found that the sample mordanted with alum and dyed with madder was brighter and redder in colour while the sample mordanted with ferrous sulphate was duller and was maroon in colour. Alum mordanted samples for turmeric dye were brighter and yellower compared to the rest of the mordants. The ferrous mordanted sample showed a greenish tint when compared to the alum mordanted sample. The samples dyed with Indian almond leaves were of greener tint.

Conclusion

Bleaching holds the key for successful production of diversified jute products. The primary object of jute bleaching is to improve its whiteness and to have better look after dyeing. This study was aimed at investigating the effect of bleaching agents on dyeing performance of jute using natural dyes.

- The whiteness and brightness of the sample bleached using peracetic acid was found to be better compared with the sample bleached using hydrogen peroxide.
- The higher loss in weight for hydrogen peroxide bleaching may be attributed to the alkaline bleaching condition which causes partial removal of hemicelluloses. However, peracetic acid bleaching was conducted in neutral condition; hence there was no major damage to the fibre which was also reflected in tensile strength.
- The relatively higher damage to the fibre in hydrogen peroxide was also manifested by the SEM microphotograph.
- For all the natural dyes used peracetic acid bleached samples were found to develop darker shades and were found to be a better choice over hydrogen peroxide.
- Different mordants exhibited different results for all the four natural dyes used. Ferrous sulphate mordanting resulted much enhanced depth for the eucalyptus leaves and was found to be quite ahead compared to alum and copper sulphate mordants, whereas for madder, turmeric and Indian almond leaves, alum was found to lead the other mordants used, so far as K/S value is concerned.

References

1. Bhattacharya N, Doshi BA, Shasrabudhe AS (1998) Dyeing jute fibers with natural dyes. American Dyestuff Reporter 87: 26-29.
2. Chattopadhyay DP, Sharma JK, Chavan RB (2003) In-situ peracetic acid bleaching of jute. Indian Journal of Fibre and Textile Research 28: 456-461.
3. Chattopadhyay DP, Sharma JK, Chavan RB (1999) Sequential bleaching of Jute with Eco-friendly peracetic acid and Hydrogen peroxide. Indian Journal of Fibre and Textile Research 24: 120-125.

4. Wang W, Cai Z, Yu J (2008) Electrospun Fibrinogen-Polydioxanone Composite Matrix: Potential for In Situ Urologic Tissue Engineering. Journal of Engineered Fibers and Fabrics 3: 12-21.

5. Sinha E, Rout S (2008) Influence of fibre-surface treatment on structural, thermal and mechanical properties of jute. Journal of Mater Science 43: 2590-2601.

Studies On Peracetic Acid Bleaching And Dyeing Of Jute With Turmeric

Sukriti Patel[1] , Dr. Madhu Sharan[2] , D P Chattopadhyay[3]
[1]Ph.D Scholar- SRF, [2]Head of the Department, [3]Professor
[1, 2,] Dept. of Clothing and Textiles, Faculty of Family and Community Sciences,
[3] Dept. of Textile Chemistry, Faculty of Technology and Engineering,
[1, 2, 3] The Maharaja Sayajirao University of Baroda, Vadodara, India.
Email - Sukriti.dutta18@gmail.com, Madhusharan@yahoo.co.in, dpchat6@gmail.com

Abstract: *Due to the stringent environmental regulations, peracetic acid is now being considered as an alternative to conventional sodium hypochlorite bleaching. Jute fabric was bleached with peracetic acid at varying pH conditions viz pH 2, pH 6 and pH 7 and varying time of treatment viz 60, 90 and 120 minutes. These bleached samples were pre mordanted with alum and then dyed with turmeric. The samples were tested for different appearance indices viz. whiteness, yellowness and brightness. The surface morphology of bleached samples was examined using SEM. The effect of varying bleaching conditions on dyeing with natural dye was also evaluated. From various analysis it was found that pH 7 and 90 minutes peracetic acid bleaching treatment gave best result.*

Key Words: *Paracetic acid, bleaching, Jute, turmeric, analysis, treatment.*

1. INTRODUCTION:

During the past decade, increasing environmental awareness, new global agreements and international governmental policies and regulations have been driving forces behind the renewed interest in the natural fibres and its processes which includes selection of chemicals, dyes and materials. The attractiveness of a plant-based fibre comes from its high strength, natural availability and environmental friendliness and jute falls under this category (1). As jute has its inherent yellowish colour, it is difficult to obtain proper shade while dyeing. Destruction of surface colour of jute by bleaching is expected to provide better colour effect. Jute can be dyed with various classes of dyes namely, direct, reactive, vat, azoic etc. It also exhibits strong affinity towards many non-cotton dyes like basic, 1:2 metal complex and mordant dyes. This affinity is due to the presence of non-cellulosic constituents in jute and its structural peculiarities (2).

The popularity of hypochlorite is because of its low cost and excellent bleaching power at room temperature. However, the formation of highly toxic chlorinated organic byproduct (AOX) during the conventional sodium hypochlorite bleaching has restricted its use over the last few years (3-4). On the other hand, peracetic acid is environmentally safe. The commercial peracetic acid is an equilibrium solution of hydrogen peroxide, acetic acid, peracetic acid and water (5).

The present work was aimed at investigating the effect of pH and treatment time of bleaching jute with peracetic acid on its dyeing behaviour using turmeric dye. The fabric was bleached with peracetic acid at varying treatment conditions and then dyed with turmeric dye. The effect of bleaching on whiteness, yellowness and tensile strength were examined whereas the effect of bleaching on colour development was assessed by K/S values. Effect of different bleaching conditions on micro structure was investigated using scanning electron microphotography.

2. MATERIALS AND METHODS:

2.1Material:

2.1.1. Fabric:

100% raw jute fabric was kindly supplied by the Department of Jute and Fibre Technology, Kolkata.

TABLE 1 Specification of the fabric

Fabric	Weave	Ends/cms	Picks/cms	Weight per unit area (gms/sq.mt)
Jute	Plain	30	15	632.33

2.1.2 Dyes and Chemicals

Turmeric was used as a natural dye and alum as mordant for the study. Sodium carbonate and detergent were used for the scouring of jute fabric. Peracetic acid was prepared by reacting glacial acetic acid and hydrogen peroxide as reported elsewhere. (2) All the chemicals used for the study were LR grade.

2.2 Methods:

2.2.1 Scouring

The fabric was scoured using 2g/L soda ash and 2g/L detergent keeping material to liquor ratio 1:40 at boiling temperature for 30 minutes. The samples were then rinsed thoroughly in water to remove traces of soap and dried in shade. The scoured fabric was bleached with peracetic acid.

2.2.2 Bleaching with peracetic acid

The scoured fabric was bleached with in-house synthesized peracetic acid. For this treatment jute fabric sample was dipped into peracetic acid at room temperature for varying time and pH conditions. Three pH and three bleaching time were chosen which were pH 2, 6 and 7 and 60, 90 and 120 minutes respectively.

2.2.3 Extraction of Dyes

In order to extract the dye, 3% (wt/vol) of raw turmeric was immersed in water and was boiled for 30 minutes and the extract was filtered and stored in refrigerator and used for dyeing without further purification. The dye extract thus obtained was directly used for dyeing of the bleached sample.

2.2.4 Mordanting

The mordant used for the study was alum (10% owf). The fabric samples were treated in the aqueous solution of the mordant for 30 minutes keeping material to liquor ratio 1:40. After treatment samples were squeezed and taken for dyeing.

2.2.5 Dyeing

The dyebath was prepared with 10% turmeric dye. The concentration of the dye in the extracted liquor was estimated from the pre-calibrated concentration v/s absorbance graph of turmeric powder. The pre-mordanted samples were dyed using 10% turmeric dye at room temperature for 10 minutes maintaining material to liquor ratio 1:40. The temperature of the dyebath was then gradually increased to boil and the dyeing was continued for 1 hour. After dyeing, the samples were thoroughly rinsed and dried.

2.2.6 Testing of the bleached samples

2.2.6.1 Optical Indices:

The whiteness, yellowness and brightness indices of the bleached fabric samples were assessed using Spectrascan 5100 spectrometer, manufactured by Premier Colourscan. Three readings were recorded for each sample.

2.2.6.2 Tensile Strength:

The tensile strength of the scoured and bleached fabric samples were determined as per ASTM D5035 test method using Instron, Model 1121, 10 KN Testing Instrument.

2.2.6.3 SEM Analysis*:*

The surface morphology of the scoured and bleached fabric samples were assessed and recorded using scanning electron microphotography.

2.2.6.4 K/S measurement:

The effect of bleaching treatment on colour depth of dyed jute fabric was examined in terms of K/S using Spectra Scan 5100 spectrophotometer interphased with computer colour matching system.

3. RESULTS AND DISCUSSION:

3.1 Effect of pH on whiteness for bleaching at different time intervals

The scoured jute fabric was subjected to peracetic acid bleaching. The time and pH were varied. The time was varied for 60, 90 and 120 minutes whereas the pH was varied to 2, 6 and 7. The effect of pH on the whiteness index at different time interval is shown in Table 1, 2 and 3. It is seen from Table 1 that whiteness increases with the increase in pH from 2 to 7 for the time interval of 60 minutes. The whiteness at pH 2 for 60 minutes treatment was very poor but improved as pH was raised. At lower pH level peracetic acid remains stable and starts working as pH goes towards neutral side.

TABLE 1: Effect of pH on whiteness index of bleached fabric for 60 minutes bleaching

pH	Whiteness Index (Hunter lab)
pH 2	9.21 (27.51)
pH 6	16.31 (31.71)
pH 7	18.24 (42.60)

Note: Values in the parenthesis indicate corresponding value for brightness

TABLE 2: Effect of pH on whiteness index of bleached fabric for 90 minutes bleaching

Note: Values in the parenthesis indicate corresponding value for brightness

pH	Whiteness Index (Hunter Lab)
pH 2	17.67 (21.45)
pH 6	19.65 (36.88)
pH 7	20.29 (43.54)

Table 2 shows the results of whiteness index for varying pH levels for 90 minutes treatment time. From the table it is seen that with the rise in pH level the whiteness was improved. There is an uniform improvement in whiteness while it goes from pH 2 to pH 7.

TABLE 3: Effect of pH on whiteness index of bleached fabric for 120 minutes bleaching

pH	Whiteness Index (Hunter Lab)
pH 2	19.25 (23.06)
pH 6	20.47 (29.82)
pH 7	21.35 (44.53)

Note: Values in the parenthesis indicate corresponding value for brightness

When bleaching time was doubled from 60 to 120 minutes the whiteness was only marginally improved for all the values of pH (Table 3). It shows that there was no reasonable benefit obtained for prolonged bleaching for 120 minutes. Thus 60 minutes bleaching was found to be sufficient.

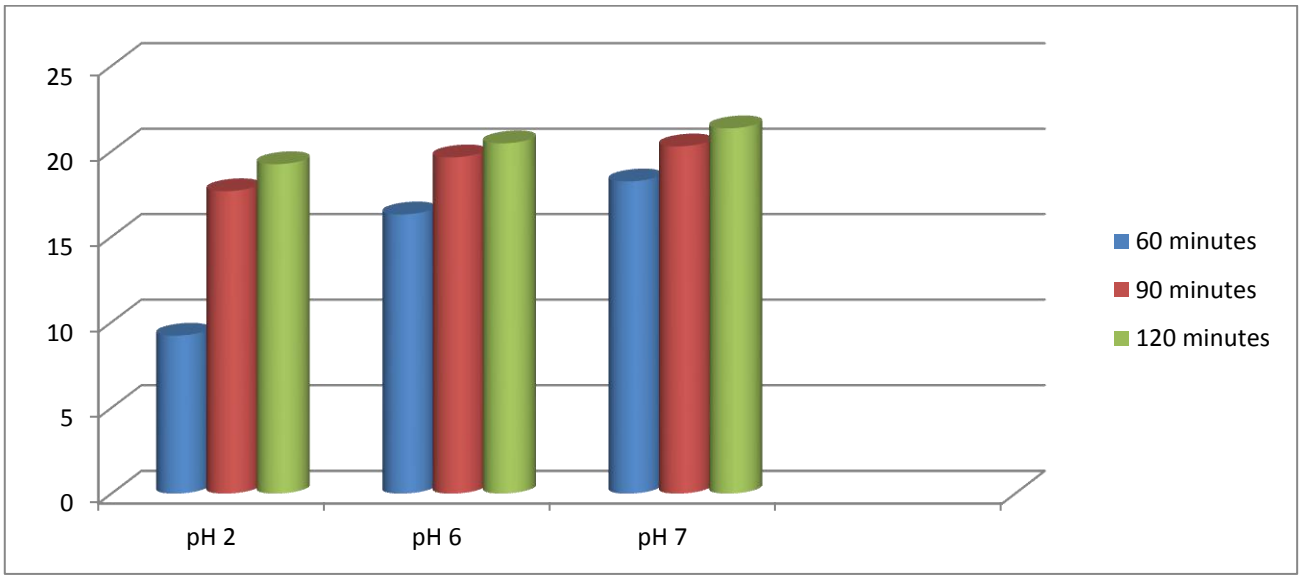


Figure 1: Effect of whiteness index on different time interval and pH

3.2 Effect of pH on the yellowness index at different time interval and pH

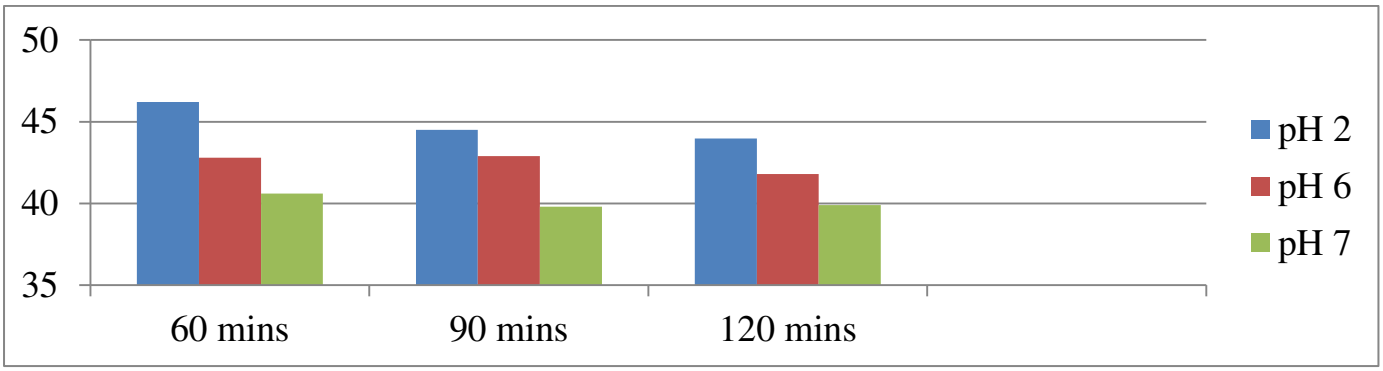


Figure 2: Effect of pH and time on Yellowness Index of the Bleached Sample

It is seen from figure 2 that the yellowness of jute fabric bleached with peracetic acid was reduced for rise in pH value and bleaching time. The reduction in yellowness indicates higher whiteness which supports the results of whiteness. The maximum yellowness was observed for 60 minutes bleaching whereas the lowest value was observed for 120 minutes bleaching.

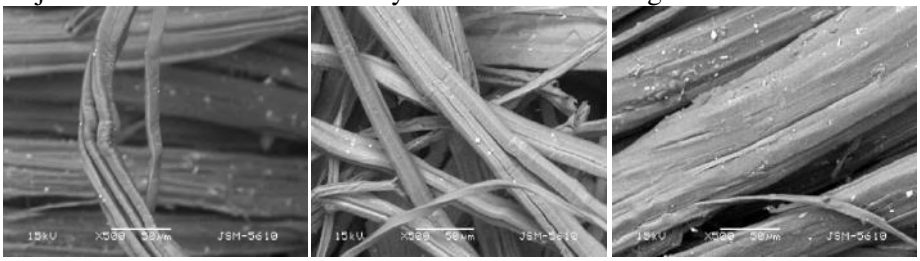
3.3 Effect of different time intervals on tensile strength of bleached jute fabric

The peracetic acid bleaching at varying treatment conditions caused very little loss in tensile strength of jute as seen from Table 4. Since the treatment conditions were acidic to neutral it did not damage the fibre. So, peracetic acid bleaching can be a suitable alternative to alkaline bleaching of jute as the latter causes significant damage.

Table 4: Effect of treatment Time and pH on loss in Tensile Strength of jute fabric

Treatment	% Loss in tensile strength
Scoured	-
Treated for 60 minutes at pH 2	9.72
Treated for 90 minutes at pH 2	10.24
Treated for 120 minutes at pH 2	10.97
Treated for 60 minutes at pH 6	10.46
Treated for 90 minutes at pH 6	10.78
Treated for 120 minutes at pH 6	11.09
Treated for 60 minutes at pH 7	11.76
Treated for 90 minutes at pH 7	10.02
Treated for 120 minutes at pH 7	10.05

Figure 3 shows the scanning electron microphotographs of samples bleached at different pH for 90 minutes treatment time. The clarity of the jute fibre surface can be clearly noticed for bleaching at neutral conditions.



pH 2 pH 6 pH 7

Figure 3: SEM images of treated jute fabric

3.4 Effect of different time interval on colour strength of turmeric dyed jute fabric

The bleached jute fabric sample were first premordanted as discussed in section 2.2.4 and dyed using 15% turmeric dye as described in section 2.2.5. From table 5 it is seen that as pH was increased from 2 to 7; the depth of the dyed samples were also increased for all the treatment conditions. The sample bleached at neutral pH manifested better colour depth since they had better whiteness and brightness indicies. Though the colour depth of the samples bleached for 120 minutes were found to be maximum for all the pH values but found to be marginally improved compared with the colour depth obtained for 90 minutes treatment.

From all the results of peracetic acid bleaching and subsequent dyeing it may be concluded that pH 7 and bleaching time of 90 minutes may be ideal for jute fabric.

Table 5: Effect of time on the colour strength (K/S) values of turmeric dyed jute fabric

Time	K/S
Treated for 60 minutes at pH 2	22.0
Treated for 90 minutes at pH 2	23.6
Treated for 120 minutes at pH 2	23.8
Treated for 60 minutes at pH 6	23.5
Treated for 90 minutes at pH 6	25.8
Treated for 120 minutes at pH 6	26.7
Treated for 60 minutes at pH 7	25.6
Treated for 90 minutes at pH 7	26.9
Treated for 120 minutes at pH 7	27.1

4. CONCLUSIONS:

The scoured jute fabric was subjected to peracetic acid bleaching. The time and pH of bleaching treatment were varied. The time was varied for 60, 90 and 120 minutes whereas the pH was varied to 2, 6 and 7. The bleached jute fabric sample were first pre-mordanted as discussed in section 2.2.4 and dyed using 15% turmeric dye as described in section 2.2.5. The results revealed that

- The whiteness of jute fabric was improved steadily as pH was increased from 2 to 7.
- The improvement in whiteness and reduction of yellowness followed similar trend as pH was increased from 2 to 7 and time of treatment increased from 60 to 120 minutes.
- The peracetic acid bleaching at varying treatment conditions caused a little loss in tensile strength of jute. So, peracetic acid bleaching can be a suitable alternative to alkaline bleaching of jute which causes significant damage.
- From the results of peracetic acid bleaching and subsequent dyeing it may be concluded that pH 7 and bleaching time of 90 minutes may be ideal for jute fabric.

REFERENCES:

1. Teli M.D., Adivarekar R.V., Bhagat M., & Manjrekar S.G., : “Response of jute of the dyes of synthetic and natural origin”, Journal of the Textile Association, 129-134. (2002)
2. Chattopadhyay D. P: “Introduction, chemistry and preparatory processes of jute”, Colourage, 23-36. (1998)
3. Chattopadhyay D.P., Sharma J.K., & Chavan R.B. : “Sequential bleaching of jute with eco-friendly peracetic acid and hydrogen peroxide”, Indian Journal of Fibre & Textile Research, 120-125. (1999)
4. Chattopadhyay D.P., Sharma J.K., & Chavan R.B. : “In-situ peracetic acid bleaching of jute”, Indian Journal of Fibre & Textile Research, 456-461. (2003)
5. Pandey, S., Chattopadhyay, S. & Pan, N. : “Recent developments in bleaching of jute and allied fibres”, Colourage, 29-34. (1993)