International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Application of basic dyes on Hessian jute fabrics and its fastness analyses

Neaz Morshed [1], Zakaria Ahmed [2,*], Ashraful Alam [2], Taslima Rahman [3], Pulak Talukder [2] and Mohammad Maniruzzaman [2]

[1] *Department of Yarn and Fabrics Production, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[2] *Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*
[3] *Department of Microbiology, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.*

International Journal of Science and Research Archive, 2022, 07(02), 234–237

Publication history: Received on 14 October 2022; revised on 21 November 2022; accepted on 23 November 2022

Article DOI: https://doi.org/10.30574/ijsra.2022.7.2.0272

Abstract

The object of this study is the application of basic dyes on jute fabrics at different temperature and fastness analyses of dyed jute fabric. Hessian jute fabric is collected from jute weaving mill then jute fabric is undergone pretreatment process. Pretreated jute fabric is dyed with basic dyes at various shade percentage such as- 5%, 2%, 4%,5% shade variation at different temperature. Then fastness property is analyses by color fastness to wash, color fastness to rubbing, color fastness to light. It showed that at 65oC temperature and 4% shade variation basic dyes gives good color fastness on hessian jute fabrics.

Keywords: Basic dyes; Jute; Fastness; Dyeing; Color; Shade

1. Introduction

Jute is a low-cost, naturally degradable fiber that is mostly made of cellulose (58–63%), hemicellulose (20–22%), lignin (12–14%), and very trace amounts of pectin and wax [1-2]. Jute is a bast fiber which can be used in clothing, as usual necessity of daily life. It is a good alternative of synthetic fiber. Though world is facing various pollution for using synthetic product jute can play vital role to reduce the pollution. The demand of ecofriendly product is growing day by day. By born nature jute is ecofriendly product for that jute is now used in value added diversified eco-friendly products. Jute has historically been used to create packaging materials. Due to its eco-friendliness, jute is currently utilized to create a variety of products with additional value, such as upholstery, home textiles, handicrafts, soft toys, and even clothing [3-5]. There is 58%-63% cellulose present in jute fibre for that jute has affinity to color. Jute may have to respond to reactive dye well because it is a cellulosic fiber. Reactive dyes provide a large variety of colors with different tints, fastness, and prices that have exceptional brilliance, simple reproducibility and application. But color fastness property of jute is very poor. Jute has strong affinity towards basic dyes. It has been observed that common salt is occasionally utilized to help jute fiber exhaust more quickly during the basic dyeing process [6-7]. In the whole process of study, basic dyes were used to dye jute fabric. Jute fabric was cut into 10g samples. Then jute fabric sample is treats with auxiliary chemicals. After that samples are dyed with basic dyes in different shade variation. Then dyed jute samples are undergone color fastness test in contrast of different property.

* Corresponding author: Zakaria Ahmed, Email: zakariaahmed70@gmail.com
Mechanical Processing Division, Bangladesh Jute Research Institute, Dhaka-1207, Bangladesh.

2. Material and methods

2.1. Collection of hessian jute fabrics

Hessian jute fabrics were collected from weaving department of Bangladesh jute research institute. Construction of the fabric was made using the following formula:

$$\frac{20 \times 16}{98 \times 54}$$

Where, warp count was 20, weft count was 16, ends per inch was 98, picks per inch was 54 and gsm of this fabrics was 212 g/m^2.

2.2. Pretreatment of samples

Hessian fabrics were cut into 10g sample and 5 pieces of sample were taken. Samples are undergone through scouring, bleaching, washing process. For scouring process samples were treated with Na_2CO_3, wetting + detergent agent, softening agent. NaOH remove the yellowish color and impurities of the samples. Here M : L was used 1:15, temperature was used 100^{o}C. The process takes time 1.30h. For bleaching process H_2O_2 was used to bleached the samples. In this process Hydrogen Peroxide turned fabrics into white color. Sodium silicate, sodium peroxide, custic soda, chelating agent, non ionic detergent was used at 85^{o}C temperature about 120min. Then washing was done to wash the fabric samples to reduce excess auxiliaries and chemicals. 1%g/lt acetic acid was used to reduce impurities. Pre-treated samples were then dyed with basic dyes at different temperature with different shade percentage to develop the color. Basic dye, sodium acetate, salt, acetic acid was used to dye the samples. Firstly pretreated samples dyes with basic day about 45 min. Then salt was given to fix the dye on fabrics (Figure 1).

2.3. Color fastness analyses of dyed samples

After dyeing process dyed samples were undergone Color fastness analysis test. Color fastness to light, color fastness to wash, color fastness to rubbing. X-Rite spectrophotometer was used to measure color differences among dyed samples. Multi fibre was used to measure the value of color fastness to wash in contact of dyed samples at 60^{o}C temperature for 30min. Crock meter was used to rub the dyed samples to measure the value of color fastness to rubbing.

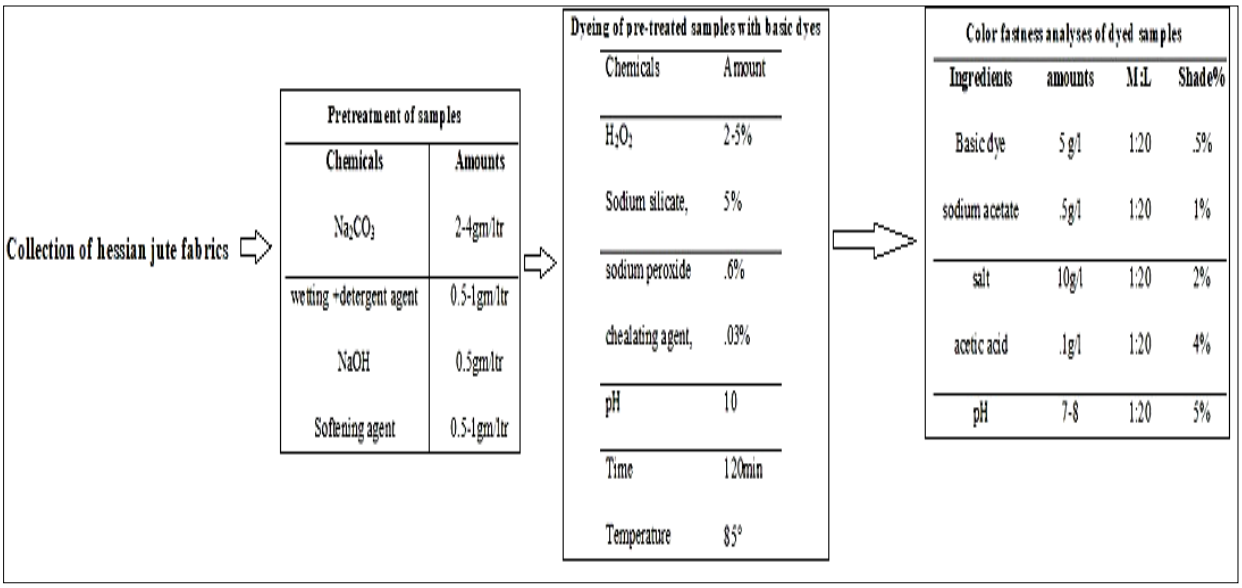

Figure 1 The whole process can be clarified below flowchart

3. Results and discussion

Table shows results of spectrophotometric value of dyed samples at various shade percentage. It showed that CMC overall color difference value of dyed samples in different light was very small and it was less than 1. So color fastness to light was good for dyed sample (Table 1).

Table 1 Spectrophotometric results of fabric sample dyed with basic dyes

Shade%	Illuminate	Dl* Lightness difference	Da* Red/green difference	Db* Yellow/blue difference	Dc* Chroma difference	DH* Hue difference	CMC DF overall
0.5%	D65	-0.21	0.19	-0.11	-0.41	-0.21	0.31
1%	D65	0.52	-0.53	-0.42	0.25	0.27	0.42
2%	D65	-1.10	-0.70	-0.71	-0.61	-1.10	0.68
4%	D65	0.05	-1.01	-0.79	-0.47	0.36	0.55
5%	D65	0.70	0.50	0.60	0.77	0.79	0.56
0.5%	F02	-0.19	0.15	-0.13	-0.16	-0.19	0.11
1%	F02	0.55	-0.45	-0.57	0.55	0.25	0.35
2%	F02	-1.30	-1.10	-.83	-0.93	-0.73	0.43
4%	F02	-0.02	-0.05	-0.12	-0.16	0.52	0.62
5%	F02	0.90	0.60	0.50	0.77	0.35	0.57

3.1. Color fastness to wash

The changed of color of after wash showed grey scale rating were found almost same for all multi fibres, So color fastness to wash in contract of multi fiber for different shade% is moderate (Table 2).

Table 2 Color fastness to wash analysis

For sample dyed with basic dyes at different shade %					
Samples	**0.5%**	**1%**	**2%**	**4%**	**5%**
Change in color	2	2	3	2	3
Cotton(stain)	4	4	4	4	4-5
Acrylic(stain)	5	5	5	4-5	4-5
Wool (stain)	2-3	2-3	2-3	2-3	3
polyester(stain)	5	5	5	5	5

3.2. Color fastness to rubbing

Different shade % dyed sample when contacted with rubbing crock meter with white fabric, the value of rubbing was slightly changed. So result of rubbing to color fastness is good for basic dyed hessian samples (Table 3).

So, all results It was verified that basic dyed hessian fabrics have good color fastness to light. It shows that in spectrophotometer shade fade analysis for different shade % hessian fabric samples give almost same amount of deviation and their total CMC value is less than 1 which is significant. For color fastness to wash analysis basic dyed samples give good result and these samples have marginal value difference. And for rubbing fastness these basic dyed samples in wet and dry condition the value is almost similar for different shade%.

Table 3 Color fastness to rubbing analysis

Shade%	For dyed samples	
	Dry	Wet
1%	5	3.5
2%	5	4
4%	5	4.5
5%	5	4

4. Conclusion

We can conclude jute has strong affinity towards basic dyes. Jute fabrics dyed with basic dyes create good coloration at different shade %, in this case lower the shade %affinity to jute is lower. But at 4%shade it gives good result of coloration. For color fastness to wash dyed sample with basic dyes in contact of multi-fibres gives good value. In color fastness to rubbing the result showed slight fading of color but it is moderate value. So jute fabrics dyeing with basic dyes are appropriate. It can be said that basic dye of jute can replace the excessive amount of use of reactive dyes on fabrics. It is cost effective and have less impact on environment pollution.

Compliance with ethical standards

Acknowledgments

Authors thank their colleagues from Bangladesh Jute Research Institute for sharing their pearls of wisdom with us during the course of this research.

Disclosure of conflict of interest

All authors declare that they have no competing interests.

References

[1] Das S, Deka AC, Sarker M, Basu T, Das A, Mitra BC. Development of jute-bamboo composites for applications in rural areas. Project Final Report, Indian Jute Industries Research Association, Kolkata, 2010, pp.4.

[2] Arju SN, Afsar AM, Das DK, Khan AM. (2015) A new technique for reactive dye uptake by jute fabrics and their physico-mechanical properties. J Tex Appar Tech Manag, 2015, 9 (2):1-13.

[3] Chattopadhyay SN, Pan NC, Roy AK, Khan A. Sustainable coloration of jute fabric using natural dyes with improved color yield and functional properties. AATCC J Res., 2015, 2(2): 28-36.

[4] Roul C. The International Jute Commodity System. ISBN 81-7211-274-2, Part-III, Northern Book Centre, New Delhi, 2009, pp 197.

[5] Bhattacharya B. Advances in Jute Agronomy, Processing and Marketing. ISBN 978-81-203- 4670-3, Chapter 3, PHI Learning Private Limited, New Delhi, 2013, pp 14.

[6] Salam MA, Sheik RK, Farouique FI. Effect of salts on dyeing into jute with reactive, direct, basic and mordant dyes. J Tex Appar Tech Manag, 2009, 6(2): 1-6.

[7] Hossain MF. Practice of Textile Coloration, Volume-I, ISBN: 978-984-8776-02-5 Chapter 5, Books Fair Publications, Dhaka, 2009, pp. 155