International Journal of Multidisciplinary Research and Development
Online ISSN: 2349-4182, Print ISSN: 2349-5979, Impact Factor: RJIF 5.72
www.allsubjectjournal.com
Volume 4; Issue 4; April 2017; Page No. 274-275

Effect of natural mordants on cotton dyed with onion peel extract

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Abstract
The study was undertaken to explore the use of natural mordants on cotton fibres with an unconventional natural substance i.e., onion peel as dyeing material. Dye was extracted from onion peel in aqueous medium and dyeing was done in neutral and alkaline medium. Pre and post mordanting techniques were adopted at room temperature. All the dyed samples were evaluated for their colour value and colour fastness properties. According to results obtained, it was found that dyeing in neutral medium gave the better results in terms of dye absorption and brightness as compared to the samples dyed in alkaline medium. Samples showed good to excellent colour fastness properties against washing, perspiration, crocking and light fastness.

Keywords: dyeing material, room temperature, dye absorption, alkaline medium

1. Introduction
Textile industry has a major contribution in hazardous waste generation. The sources of hazardous waste generation could be effluent treatment plant sludge, synthetic dyes, used oil, and other chemicals etc. During the past few decades use of non-toxic and eco-friendly natural dyes on textiles has become a matter of significant importance because of the increased environmental awareness in order to avoid some hazardous synthetic dyes [3].
India is rich in natural wealth and there is ample scope to explore and revive application of natural dyes on textiles, having more and more scientific knowledge base available, as is evidenced from the studies reported with varied objectives. For successful commercial use of natural dyes, the appropriate and standardized dyeing techniques need to be adopted without sacrifying required quality of dyed textiles materials [6].
In the study, dry outer skins of onions were used for colouring natural textile material i.e, cotton. Also, mordanting was done with cheap and easily available natural mordants. It was an effort to utilize the waste material in an efficient manner which could minimize the cost of dyeing. The colour value of the dyed samples and colour fastness with respect to wash, perspiration, crock and light was assessed.

2. Methodology and Materials
The source of natural dye used was dry outer skins of onions. Cotton (GSM: 98, Thread Count: 83x70, Cambric, Plain Weave) was used as a substrate on which dyeing was done. Sodium carbonate was used to maintain the pH of dye bath. Natural mordants like *Harad*, *Supari* and Eucalyptus were used for mordanting the fabric samples. Wash fastness tester, Light fastness tester, Crock meter and Perspirometer were used to assess the colour fastness properties of the dyed samples.
Dye extraction was carried out in neutral medium at pH 7. Fabric samples were pre and post mordanted with natural mordants and then dyed in neutral and alkaline medium. For mordanting, samples were entered into the solution of mordant (10% owf) at room temperature for 1 hour. The dye bath was prepared with MLR of 1:50 with 1/2 volume of water and 1/2 volume of the extracted dye solution. The pH of dyeing bath was kept at 10 and 7. The fabric was entered into the dye bath at temperature of 45° C. Then, the temperature was raised to 100°C in 30 minutes and maintained for half an hour. After dyeing samples were rinsed and dried. All the samples were evaluated for their colour values and colour fastness properties with respect to wash, perspiration, crock and light fastness.

3. Results & Discussion
3.1 Effect of mordanting methods and pH of dyeing on colour value of samples
The cotton samples dyed in neutral medium were darker than the samples dyed in alkaline medium in both pre and post mordanting techniques. This indicates that the dye exhaustion was more in neutral medium. All the natural mordants gave the natural colour of onion with little variation, which is clearly evident from the table 1.

Table 1: Effect of natural mordants on samples dyed in neutral and alkaline medium

Mordants	Medium of dyeing	Shades obtained on pre mordanting	Shades obtained on post mordanting
Supari	Neutral		
	Alkaline		
Harad	Neutral		

	Alkaline		
Eucalyptus	Neutral		
	Alkaline		

3.2 Effect of mordanting methods and pHof dyeing on colour fastness of samples

Wash fastness

The pre and post mordanted samples dyed in alkaline medium had better wash fastness properties with grey scale rating ranging from 3 to 4 [tables 2(a) and 2(b)]. On an average, pre mordanted samples exhibited little more colour fastness than post mordanted samples.

Perspiration fastness

The pre and post mordanted cotton samples dyed in both neutral and alkaline mediums had good to excellent perspiration fastness properties ranging from 4 to 5 [tables 2(a) and 2(b)]. Pre mordanted samples exhibited more colour fastness than post mordanted samples.

Crock fastness

On an average, all the samples exhibited good to excellent fastness to crocking. Samples dyed in alkaline medium in both pre and post mordanting techniques showed excellent crock fastness and rated as 5on grey scale as shown in tables 2(a) and 2(b).

Light fastness

Light fastness results of the cotton samples exhibited fairly good fastness properties under all application conditions. The light fastness of dyed cotton samples ranged from 5 – 6, which is clearly evident from the tables 2(a) and 2(b). On an average, all pre mordanted cotton samples dyed in alkaline medium exhibited best results and were rated as 6.

Table 2(a): Fastness ratings of pre mordanted samples dyed in neutral and alkaline medium

Mordants	Wash Fastness		Perspiration Fastness		Crock Fastness		Light Fastness	
	neutral	alkaline	neutral	alkaline	neutral	alkaline	neutral	alkaline
Supari	3/4	4	5	4	4/5	5	6	6
Harad	3/4	4	5	4/5	5	5	6	6
Eucalyptus	4	4	5	4	5	5	5	6

Table 2(b): Fastness ratings of post mordanted samples dyed in neutral and alkaline medium

Mordants	Wash Fastness		Perspiration Fastness		Crock Fastness		Light Fastness	
	neutral	alkaline	neutral	alkaline	neutral	alkaline	neutral	alkaline
Supari	3/4	3/4	4/5	4/5	4/5	5	6	6
Harad	4	4	4/5	4	5	5	5	6
Eucalyptus	3/4	4	4/5	4	4/5	5	5	5

4. Conclusion

In the study, dry outer skins of onions were used for colouring pre and post mordanted cotton samples with natural mordants. At the time of extraction and mordanting, care was taken not to use chemical which is an eco-friendly technique. Also, mordanting was done at the room temperature which would result in energy savings. Thus, it can be concluded that dyeing with onion peel extract can make the dyeing process cheaper and sustainable.

5. References

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