

IMPROVING THE WASH FASTNESS OF ANNATTO NATURAL DYE WITH DYE FIXING AGENTS ON COTTON: FULLY ECO-FRIENDLY FIXING AGENTS

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ABSTRACT

In this article, we review how to improve the colour fastness properties of natural dyes, with 5 dye fixing agents. Eco-friendly mordants, such as alum, stannous chloride and ferrous sulphate are used. Annatto dye is selected because; this source produces fugitive colors on cotton. A pre-treatment with myrobalan has been given, for better dye uptake. After dyeing, the sample is post treated with 5 dye fixing agents such as alum, ammonia, lime juice and calcium chloride, for better colourfastness of natural dyes on cotton.

KEYWORDS: Annatto Seeds, Wash Fastness, Myrobalan, Natural Dyes, Fixing Agents

INTRODUCTION

Textile materials (Natural or Synthetic), used to be the colour for value addition, the look and desire of the customers. Anciently, this purpose of coloring textile was initiated using colors of natural source, until synthetic colors/dyes were invented and commercialized. For ready availability of pure synthetic dyes of different types/classes and its cost advantages, most of textile dyers/ manufacturers shifted towards the use of synthetic colorant. Almost, all the synthetic colorants being synthesized from petrochemical sources, through hazardous chemical processes, pose threat towards its eco-friendliness. Hence, worldwide, growing consciousness about the organic value of eco-friendly products has generated renewed interest of consumers, towards the use of textiles (preferably natural fibre product), dyed with eco-friendly natural dyes.

The use of non-allergic, non-toxic and eco-friendly natural dyes on textiles, has become a matter of significant importance, due to the increased environmental awareness, in order to avoid some hazardous synthetic dyes. But, there is a one drawback with natural dyes is poor color fastness. So, in this article, results were shown in the improvement of wash fastness of innate natural dye, with dye fixing agents.

MATERIALS AND METHODS

It deals with the selection of materials, preparation and implementation of experimental procedures. The cotton fabric was selected, due to its easy availability and popularity in use. Then, the fabric is dyed with natural dye i.e, is Annatto seeds, using different eco-friendly mordants. To improve the colour fastness of the shades, fixing agents are employed. The treated samples are evaluated for colourfastness

The dye extracts and treating procedures are standardized, based on the procedures suggested by AICRP- Home science (1997). Treatment was given to the cotton samples and evaluation of treated samples, in terms of colour fastness to

washing, before and after treatment was undertaken by following the standard procedures laid down by the Bureau of India Standard Test Series IS 768-1956 for colour change. The result is 769-1956 for staining using geometric gray scale. The results were analyzed based on the colour fastness of control samples to find out the impact of the treatments.

Alkaline method is suitable for the extraction of dye from Annatto. The optimum time for extraction of dye liquor from the seeds was 60 minutes. A dye material concentration of 4 percent (2g/g of fabric) was selected. The optimum time for dyeing was 45 minutes for both the dyes. Cotton fabric was pre-treated with 20 per cent myrobalan concentration to 9in cease the tannin deposition, which in turn increased the depth of the shade obtained.

To improve the colour fastness 5 per cent solution of fixing was selected. Depending on the absorption values, depth of the shade and appearance, three concentrations for each mordant was selected. In case of alum, 5, 10, and 15 per cent and 1, 2, and 3 percent concentrations of stannous chloride and ferrous sulphate mordants for cotton, were selected for pre-mordanting cotton fabric.

RESULTS

Natural dyes have emerged as prime colorants for textiles, globally. Very few studies have been conducted to improve the colourfastness of these natural dye sources. Therefore, an attempt has been made in this study to improve the colour fastness of natural dye source i.e. annatto seeds by using five fixing agents.

Valuation of Colour Fastness Test

Wash fastness properties of Annatto (Bixa Orellana) dye on cotton

Table 1: Wash Fastness Properties of Annatto (Bixa Orellana) Dye on Cotton

| Mordant | Mordant conc. G/100g of fabric | Control | | | T1 | | | T2 | | | T3 | | | T4 | | | T5 | | |
|-------------------|--------------------------------|---------|----|-----|----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|---|
| | | CC | CS | | CC | CS | | CC | CS | | CC | CS | | CC | CS | | CC | CS | |
| | | | C | S | | C | S | | C | S | | C | S | | C | S | | C | S |
| Alum | 5 | 3 | 3 | 3/4 | 4 | 3/4 | 3/4 | 4 | 2/3 | 4 | 3 | 2 | 4 | 3/4 | 1/2 | 4 | 3/4 | 2 | 4 |
| | 10 | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 4/5 | 3 | 3 | 4 | 3/4 | 2 | 3/4 | 3/4 | 2 | 4 |
| | 15 | 3 | 3 | 3 | 4 | 3 | 4 | 4 | 3 | 4/5 | 3 | 2 | 3 | 3 | 1/2 | 3/4 | 3/4 | 2 | 4 |
| Stannous chloride | 1 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 4/5 | 5 | 4 | 3 | 4 | 3 | 1/2 | 3/4 | 3 | 1/2 | 4 |
| | 2 | 3 | 2 | 3 | 4 | 3 | 4 | 2/3 | 4 | 5 | 3/4 | 2 | 4 | 3 | 2 | 3/4 | 3 | 1/2 | 4 |
| | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 4 | 5 | 3/4 | 2 | 4/5 | 3 | 2 | 3/4 | 3 | 1/2 | 4 |
| Ferrous sulphate | 1 | 3 | 3 | 2 | 4 | 3/4 | 4 | 4 | 4 | 4/5 | 3 | 3 | 4/5 | 3 | 2 | 4 | 3 | 2 | 4 |
| | 2 | 3 | 3 | 2 | 4 | 3/4 | 4 | 4 | 4 | 4/5 | 3 | 3 | 4/5 | 3 | 2 | 4 | 3 | 2 | 4 |
| | 3 | 3 | 2 | 2 | 4 | 2/3 | 4 | 4 | 4 | 4/5 | 3 | 3 | 4/5 | 3 | 2 | 4 | 3 | 2 | 4 |

Note: Vinegar, CH₃COOH), T2-Alum AlK(SO₄)₂, T3-ammonia (NH₃), T4- Lime juice, T5- calcium chloride (CaCl₂).

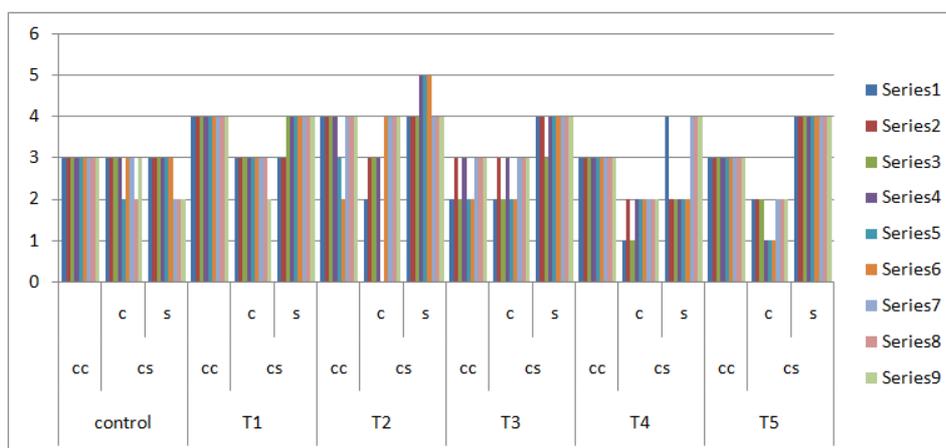


Figure 1: Wash Fastness Properties of Annatto (Bixa Orellana) Dye on Cotton

Series 1 (Alum 5%), Series 2 (Alum 10%), Series 3 (Alum 15%), Series 4 (Stannous chloride1%), Series 5 (Stannous chloride2%), Series 6 (Stannous chloride3%), Series 7 (Ferrous Sulfate 1%), Series 8 (Ferrous Sulfate 2%) and Series9 (Ferrous Sulphate3%).

Wash fastness of Annatto dye on cotton

The wash fastness grades of vinegar post-treated cottons showed good resistance to colour change in all mordanted samples. Almost all samples showed good resistance to staining on silk. Post-treatment with alum produced shades that showed varied fastness as per the mordant used. While, alum and ferrous sulphate mordanted samples, exhibited good resistance to colour change, stannous chloride samples showed only fairly poor to fair resistance. Ferrous sulphate mordanted cotton showed good resistance, to staining on cotton and very good resistance of silk fabric over control.

Ammonia post-treatment did not show much effect on the wash fastness of the Annatto dye on mordanted cotton. Alum and ferrous sulphate mordanted cottons showed only fair resistance to colour change, due to washing over control. Lime juice post-treated cottons did not register much improved wash fastness, over its control. Very fair to fair resistance to colour change was shown in stannous chloride mordanted sample.

Post-treatment with calcium chloride had not exhibited much improvement. Slight increases in resistance to colour change was observed, in alum mordanted cottons. The improved resistance to staining was observed, on both cotton and silk in all mordanted cottons, due to washing fastness over control.

CONCLUSIONS

Among the mordanted and post-treated cottons, vinegar post-treated samples showed the increased depth of the shade on cotton mordanted with alum, stannous chloride and ferrous sulphate, besides providing levelled shades over control. Resistance to colour change and colour staining on silk was improved due to the washing over control. Increased wash fastness in majority of the samples due to alum post-treatment, when compared to control. The lime juice post-treated samples exhibited an increase in depth of the shade and contributed for level dyeing, in all mordanted samples with wash fastness. Calcium chloride post-treated cottons had registered the same as fairly good, especially, in case of stannous chloride mordanted samples on cotton over control.

REFERENCES

1. Agarwal A, Goel A. Gupta K.C. 1992, optimization of dyeing process of wool with natural dyes obtained from turmeric (*curcuma longa*), *Textile dyer and printer* 25 (22):28-30
2. Binitha kali and Gogai N 1998, Cationic fixing agent. *The Indian textile journal* 108(9-12):42-46
3. Dedhia EM 1998 natural dyes colour age XLV (3):45-49.
4. Mairal A K and shah JC 2001, role of some Eco-friendly chemicals in pre- and after treatments of textiles. *Manmade textile in India XLIV N (4):* 136-138.
5. Paul S Sharma A and Grover E, 2002, colour fastness of wool dyed with eco dye Hemelia. *Man made textiles in India XLV (4):* 324-328.
6. Rathi D and Krishnan K 1997, use of sequestering agents to improve the fastness properties of natural dyes. Unpublished master's dissertations, university of Mumbai.
7. Rette and Lemin 1949, *Chemistry of textile auxiliaries Vol. VIII:* 80-81.
8. Saito M 1988, *textile research journal* 58 (8):450.
9. Saito M 1988, *textile research journal* 58 (8):450. [14]. Sharma B and Kalitha B, 1999, after treatment of direct dye on cotton fabric. *The Indian textile journal* 109(1-4):64-68.
10. Singh S, jatin S and Gupta Kc, 1993, a optimization of procedure for dyeing of silk with natural dye madder routes (*Rubia Cordi Folia*). *Colourage* 40 (8):33-36.
11. Manal A. Seif & Muna M. Hiji, Evaluating the Effect of Seams on Colour Fastness Properties of Textile Fabrics, *International Journal of Textile and Fashion Technology (IJTFT)*, Volume 6, Issue 1, January-February 2016, pp. 1-14
12. Sharma B and Kalitha B, 1999, after treatment of direct dye on cotton fabric. *The Indian Textile Journal* 109(1-4):64-68.
13. Udayini S and jacob M 1988 development of new vegetable dyes for kalamkari painting and to assess their colour fastness property. *Colourage* 35 (21):19.
14. Vineeth K and Bharthi 1998 eucalyptus yields dye. *The Indian textile journal XVIII:* 18-2
15. WWW.ang.k.fungigrass.ac.at/-katzer/engl/bixa_ore.html [19].
16. www.pburch.net/dyeing/dyelog.
17. <http://textilelearner.blogspot.in/search?q=natural+dyes+>