

Dyeing of Woollen Fabric with Bixa Orellana (Annato Seeds)

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Abstract: Nowadays the environment aspects of effluent treatment are too complicated problems in processing industries. So due to overcome this problem, Eco-friendly process is required. If we used the natural colouring matters with natural fabric ineco-friendly process, there is no need of effluent treatment. Natural dyes and natural fabrics are eco-friendly to the environment. All natural dyes are not having good fixation to material. So, some dyes require mordant for fixation. In this project, I chosen annatto for a colouring matter and will also analyze the antimicrobial property. It is a natural dye obtained from annatto tree. Annatto possess good substantive towards cotton and protein material and give orange colour. If we use mordant means there is a chance of getting colour from light orange to orange red. It gives pleasant odour to textile material. Natural herbal products can be used for antimicrobial composition to be the effective candidates in bringing out herbal textiles. The plants and plant products are traditionally used for healing of wounds, burn-injuries and antimicrobial activity against skin infections. The growing interest in herbs and economically useful plant is part of the movement towards green economical life style. Raw wool fabric does not have any aesthetic appeal but after dyeing with bright and fast colours the appearance enhanced to a greater extend. Dyeing makes an important contribution to fabric decoration by producing many beautiful colours and the colour harmonies obtained by a combination of various dyeing methods. Protease treatments can modify the surface of wool and silk fibers to provide new and unique finishes. Research has been carried out on the application of proteases to prevent wool felting. Hence there are lots of efforts being made to replace the synthetic dyes with the safe and eco-friendly dyes i.e. Natural dyes. There are several classes of natural dyes that are suitable for dyeing of wool fabric in bright and fast colour. Annato (*Bixa orellana*) is one of the best dye that produce bright and vibrant colours on wool found in this research.

Keywords: Natural Dye, BIXA ORELLANA, Wool, Dyeing

1. Introduction

The necessity of a safe environmental balance has resulted in a revival of natural dyes against the backdrop of impending ecological disasters. Natural dyes are aesthetically appealing, environment friendly, biodegradable and non-toxic. The study deals with the dyeing properties of the dye obtained from the pulp of *Bixa orellana*. Currently known that synthetic dyes have shown carcinogenic effects and produce allergies and damage to the skin, which seeks to replace them with natural dyes, such as annatto, which is exempt from certification and does not damage to health. The Annatto is a carotenoid which has pigment and dyestuff, hence their differentiation, a pigment is "a colored and finely divided substance that gives color to other materials, this does not dissolve but it is dispersed or suspended in the liquid", in change are the "colored substances that are dissolved in liquids and impart their color materials to be absorbed". Wool fabrics have been dyed employing extract of seeds of annato (*Bixa orellana*). Colour uptake for wool is found to be good in under all the conditions studied, Coloured protein fibres, in general, produce light and wash fastness ratings of 2-3. Ferrous sulphate, however, improves colour fastness properties and colour retention on washing of wool fibres. This research proposes establishing dyeing and fastness tests into the fabric 100% pure wool, using pigment and dyestuff (bixin and norbixin) extracted from the seeds of Annatto or annatto.



2. Review of Literature

The use of natural dyes in India for dyeing various commercial products like textile, handicraft etc. is not a new concept. Indians are quite familiar with natural dyes and their uses. Natural colours cover a wide range of chemical classes like flavonoids, quinones, carotenoids, indigoids and alkaloids.

Natural dyes, when used by themselves, have many limitations with respect to wide range of shades, fastness and brilliancy of shades and reproducibility. However, when used along with metallic mordant's, these dyes produce bright and fast colours. **Mishra et al. 1999**).

Gohl and Vilensky (2003) stated that wool is the fiber from domesticated sheep. It is natural protein multi-cellular staple fiber. The fiber density of wool is 1.31gm/cm^3 , which tends to make medium weight fiber. Wool, by definition, is the fiber made from the fleece of domestic sheep. Ancestors of the domestic sheep had long hair and a soft, downy undercoat. Over the years of domesticating the sheep through breeding, feed, climate and herding, wool was probably the first fiber to be woven into a textile.

As the demand for annatto and other natural colourants increases, more stringent specifications for these products are imposed and better understanding of their chemistry and biochemistry is warranted. Annatto extracts were obtained from the seeds of *Bixa orellana* L. fruits. *Bixa orellana* is a large, rapidly growing tree native to tropical America and is now grown in many tropical countries in South and Central America, Africa and Asia. The chemical name for the colour principle of annatto is bixin. Annatto dye is basically a red orange pigment known as Bixin, extracted from the seed coat of Sinduri, contains carotenoid of various types out of which cisbixin alone accounts for 82% chemistry and performance of annatto colors is essentially of the bixin **Siva et al. 2008**.

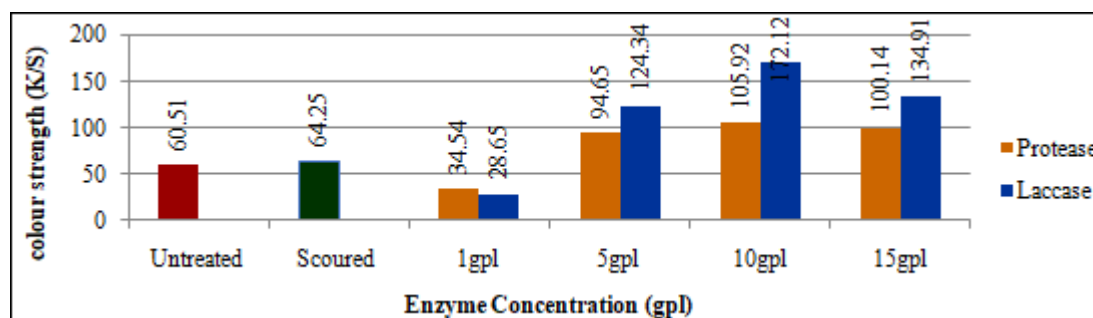
3. Material and Method

Dyeing of woollen fabric with natural dye To determine the effect of enzymatic treatment on dyeing of knitted woollen fabric, the control, enzymatic treated fabrics were dyed with natural dyes using standardized dyeing recipes was used for dyeing of control, scoured and enzymatic treated fabric using natural dye. Natural dye : 6g Weight of fabric : 5g Sodium Carbonate : 1g Time : 60 minutes Temperature : 80 OC Water : 100 ml pH : 4, Materials and Methods 76 Dye solution was prepared by using 6g of annatto seeds per 100 ml of water at slight alkaline pH. solution was prepared by

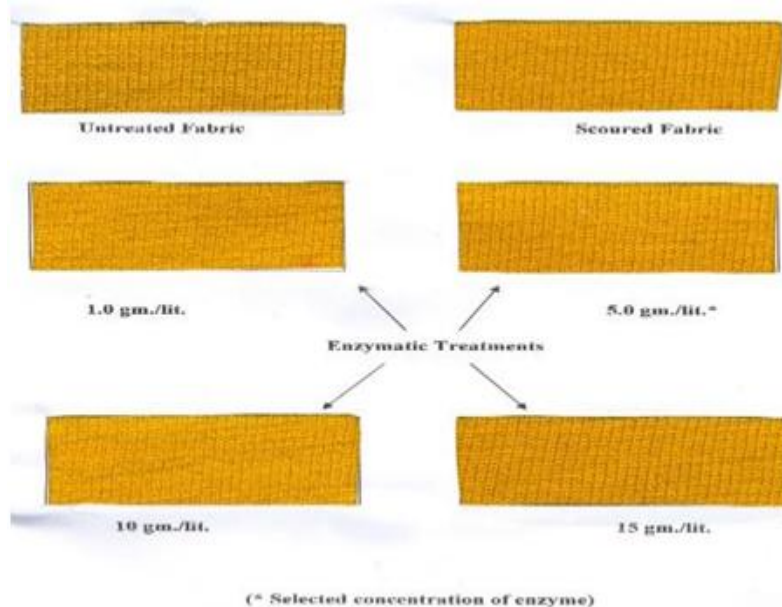
adding 1g of Sodium Carbonate in 100 ml of water. The dye material was entered into a medium ie alkaline solution and boiled at 80 OC for 60 minutes. After that the solution was filtered used for dyeing of the fabric. The woollen samples were immediately added to the prepared stock solution that was kept at room temperature for 15-20 minutes. The dye bath temperature was increased to 60OC for 45 minutes, at the end of the dyeing, the sample was removed from the dye bath and boiled for 2 minutes in a soap solution in order to remove hydrolysis products. Then the samples was rinsed well under tap water and then dried.

Colour strength (K/S) of dyed samples

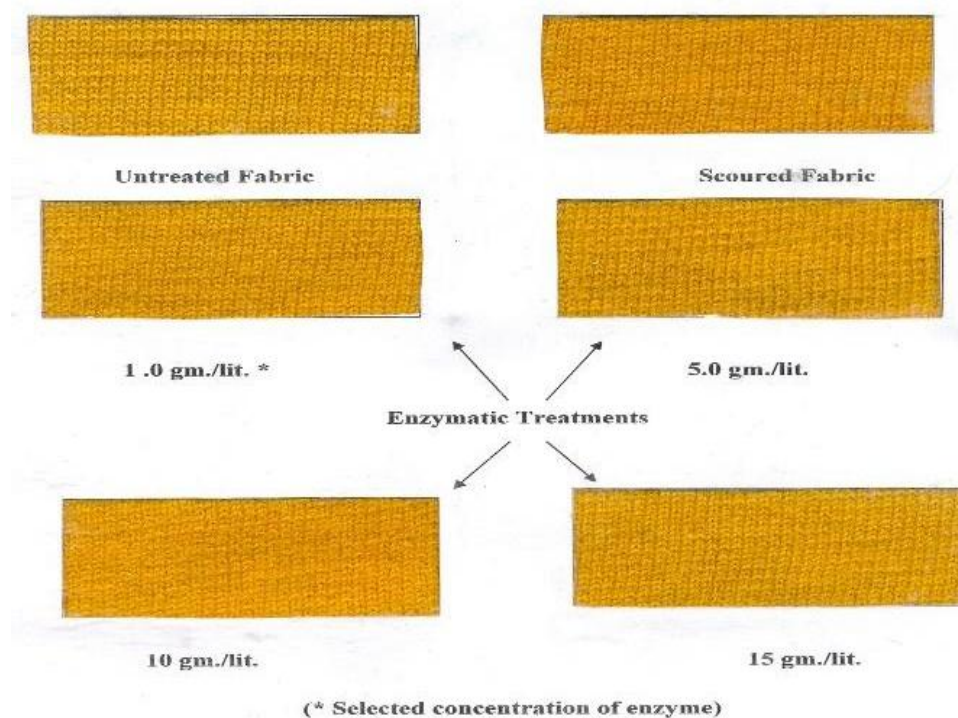
All the samples (control, scoured and enzyme treated) were dyed with annatto dye (natural dye). The K/S values and reflectance values were measured and the results are reported in Table 4.11 It was found that control sample showed less K/S (60.51) value as compared to scoured sample (64.25) K/S. The more K/S value of scoured sample may be due to the fact that after scouring all the impurities that cause the hindrances in dye absorption get removed. Further it was observed that treatment with various concentration of protease enzyme improved the K/S value and the maximum (105.92) K/S value was observed for the sample treated with 10 gpl concentration of protease enzyme concentration that showed 105.92 gpl K/S value, while comparing the various concentration of protease enzyme. In case of laccase treated it was found that 1 gpl showed less K/S (28.65) value as compared to 5 g/l (124.34) K/S. The more K/S value of 10 gpl of concentration sample may be due to the fact that after scouring all the impurities that cause the hindrances in dye absorption get removed. Further it was observed that treatment with various concentration of laccase enzyme improved the K/S value and the maximum 10 gpl (172.12) while comparing the various concentration of protease enzyme.



Effect of various concentrations of enzyme treatments on colour strength (K/S) of woollen fabric



Effect of various concentration of laccase enzyme on dyeing of woolen fabric using annato dyeing (Natural Dye)



Effect of various concentration of laccase enzyme on dyeing of woolen fabric using Annato dyeing (Natural Dye)

4. Result and Discussion

Test of colourfastness to light, washing, crocking and perspiration for woollen sample, sample treated with various concentrations of protease enzyme were found to be good. When increase the concentration of enzymes the colourfastness of the fabric was also increased. Sample treated with 15.0 g/l concentration of protease enzyme showed best colourfastness properties, same result followed by laccase enzyme with 15.0gm.lit, concentration of laccase enzyme showed best colourfastness properties for natural dye While comparing both the enzymes were found very good to excellent washing fastness but laccase enzyme was found very good washing fastness than Protease enzymatic treated samples.

5. Conclusion

Dyeing of wool fabric with annatodye is found to be effectively accomplished commonly at pH 8. Annatto has appreciable affinity for protein fibres. dyeing with annatto produces most balanced improvements in colour uptake, light and wash fastness and colour retention on repeated washing of such proteinfibres.it gives such a brilliant orange colour on the wool fabric.(*Maurya Srishiti 2015*)

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