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A Study on the Mordant Activity of *Emblica officinalis* (Indian Goosberry) in Dyeing of Cotton Fabrics with Direct Dye

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This study was carried out to determine the mordant activity of *Emblica officinalis* in dyeing of cotton fabrics with direct dye. For this purpose dried fruits of *Emblica officinalis* (Indian Goosberry) cultivated at 5 different places were collected. To find best quality sample which were subjected to qualitative analysis of phytochemicals such as alkaloids, carbohydrates fixed oil and fats, saponin, tannin and phenols, gums and mucilages and quantitative analysis of one of the phytochemical present in it. In the five samples, tannin was estimated by colorimetric method. Best quality sample was used as mordant at different concentrations, different pH and temperatures in dyeing process of cotton with direct dye. It was concluded that *Emblica officinalis* acts as good mordant in equal concentration with water, in neutral condition and at higher temperature in dyeing of cotton with ATUL direct sky blue.

Key Words: Mordant activity, *Emblica officinalis*, Direct dye, Cotton.

INTRODUCTION

Although some fabrics such as silk and wool can be coloured simply by diping in the dye, others such as cotton require a mordant. Most of the natural dyes are applied by mordanity with metal salts such as salts of aluminium, chromium, iron and tin. Literature survey offers phytochemical such as tannin used as mordants in place of tannic acid on account of their lower price and some oils are used as mordants[1,2]. Further, *Emblica officinalis* fruit is rich in vitamin C. Apart from that it also contains fixed oil (16 %) and tannin[3,4] in distribution of more or less 5 %. The uses of chemicals as mordants produce environmental pollution[5] and also they are costly.

In view of this, the present work was aimed to evaluate the mordant activity of *Emblica officinalis* in dyeing of cotton with direct dye.

EXPERIMENTAL

All the reagents used were AR grade and the water used was double distilled. Dried fruit of *Emblica officinalis* which were cultivated at 5 different places were collected and 100 g of each sample was ground to a fine powder in a mill.

Extraction: 50 g of shade dried powder of each sample was extracted by cold extraction method using the solvents *viz.*, petroleum ether, benzene, chloroform, ethyl alcohol and water. In this method 50 g powdered sample was soaked in 150 mL solvent for 48 h with constant shaking, then the extract was filtered and concentrated by evaporating the solvent and dried, weighed and its colour, consistency and odour were noted and then subjected to qualitative analysis of phytochemicals as per the procedure Kokate[6,7]. Estimation of tannin was carried out as per the available procedure[8].

Preparation of sample solution: 1 g of powdered *Emblica officinalis* was boiled with 75 mL of water for 0.5 h, the extract was cooled and transferred to 100 mL flask and made up to the volume.

Preparation of standard solution: 100 mg of tannic acid dissolved in 1 L distilled water from which 10 mL was made up to 100 mL with water, 1-10 mL aliquots were taken in test tubes. 0.5 mL folin dennis reagent and 1 mL of sodium carbonate was added to each tube. Each tube was made up to 10 mL with water. All the reagents in each tube were mixed and kept undisturbed for about 0.5 h and read at 760 nm in colorimeter against blank reagent. From the OD values standard curve was prepared.

An aliquot of sample containing not more than 0.1 mg of tannic acid was used and the percentage of tannin was calculated by using the formula:

$$\text{Percentage of tannin as tannic acid} = \frac{\text{Mg of tannic acid} \times \text{Dilution}}{\text{Mg of sample taken for colour development} \times \frac{\text{Weight of sample taken}}{\times 1000}} \times 100$$

As per the above procedure, quantity of tannin was estimated in all the samples.

Dyeing of cotton using *Emblica officinalis* as mordant: The procedure followed was as per Shenai[9].

Preparation of dye solution: 200 mg of ATUL direct sky blue made up into 100 mL SM flask with water, was used for dyeing.

Preparation of mordant solution: 200 g best quality *Emblica officinalis* sample was soaked in 400 mL water for 48 h, then the extract was filtered and used as mordant.

For the dyeing process the dyeing baths were set up with the 1:30 ratio where 1 refers to 1 g of cotton cloth and 30 refers to 30 mL mixture of dye solution, water, mordant, NaCl and Na_2CO_3 (electrolytes).

Dyeing without mordant: 10 mL of dye solution, 15 mL of water, 2.5 mL of NaCl and 2.5 mL of Na_2CO_3 were taken in dye bath and 1 g of cotton cloth was dipped into the solution. The dye bath was then heated for 15 min. The cloth was taken out from the solution and washed with water and soap water and dried. Up take of dye on the cloth was noted.

TABLE-I
DYEING AT DIFFERENT CONCENTRATIONS

Sample no.	Volume of dye solution (mL)	Volume of mordant (mL)	Volume of water (mL)	Volume of 5 % NaCl (mL)	Volume of 5 % Na_2CO_3 (mL)
1	5	5	15	2.5	2.5
2	5	10	10	2.5	2.5
3	5	15	5	2.5	2.5
4	10	10	5	2.5	2.5
5	15	10	0	2.5	2.5

As shown in the Table-1, the dye baths were set up at different concentrations. Then 1 g of cotton cloth was dipped into each dye bath and heated for 15 min. Finally cloth was taken out and washed with water, soap water and then dried. Up take of dye on the cloth was noted.

Dyeing at different pH and temperatures: The best result was obtained in concentration 2 as shown in the Table-1 for dyeing at different pH and temperature, the dye bath was set up as in the concentration 2.

Dyeing in neutral: There were three dye baths set up in the concentration 2. 1 g of cotton cloth was dipped in each bath. One dye bath kept at room temperature for 0.5 h, one dye bath heated to 40 °C, another one was heated to 50 °C and up take of dye was noted.

Dyeing in acidic solution: The same procedure is followed as in the above case but in the presence of acetic acid. Up take of dye was noted.

Dyeing in basic solution: Same procedure as in the above case. NaOH was added to each bath till the solution became basic in nature.

RESULTS AND DISCUSSION

The quality of plant material depends on its quantity of active component that is phytochemical present in it[10,11]. It was concluded that the sample having higher yield of tannin was considered as best quality and so sample-3 is best quality among the five samples (Table-2).

Sample 3 has high extractive value than other samples, which indicates the quantity of phytochemical may be high in the sample 3 (Table-3).

Qualitative analysis of phyto chemicals showed the presence of carbohydrates, alkaloids, tannins and phenols, fixed oil and fats. There was no significant difference in presence of phytochemicals in 5 samples.

TABLE-2
EXTRACTIVE VALUES OF SAMPLE

Solvents used	Weight of extracts (g)				
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Pet ether	0.045	0.020	0.050	0.032	0.035
Benzene	0.086	0.087	0.089	0.070	0.081
Chloroform	0.061	0.086	0.090	0.065	0.071
Alcohol	9.583	4.872	10.011	8.561	3.321
Water	8.212	7.421	8.412	7.528	6.639

TABLE-3
QUANTITATIVE ESTIMATION OF TANNIN

Samples	Percentage of Tannin
1	4.58
2	4.25
3	4.95
4	4.52
5	3.59

Up take of dye was noted and the following results obtained. Up take of dye on the cloth was very less in dyeing without mordant. In dyeing at different concentrations best result was obtained in concentration 2 as shown in Table-1. In dyeing at different pH and temperatures, up take of dye on the cotton cloth was best in neutral condition and at high temperature than in acidic, basic and low temperatures.

From all the results, it was concluded that *Emblica officinalis* acts as good mordant in equal concentration with water, in neutral condition and at higher temperature in dyeing of cotton fabrics with ATUL direct sky blue.

REFERENCES

10. Anonymous, Indian Herbal Pharmacopiea, Vol. 1 and 2 (1966, 1985, 1996).
8. Anonymous, Official Methods of Analysis of the AOAC, Washington (1980).
1. A. Bhattacharya, S.K. Bhattacharya, A. Sairam and K. Ghosal, Effect of Bioactive Tannoid Principles of *Emblica officinalis* on Ischemia-Reperfusion Induced Oxidative Stress in Rat Heart Induced Phyto Medicine, pp. 171-174 (2002).
2. R.K. Crowden and V.H. Heywood, *Phytochemistry*, **3**, 1963 (1969).
4. J.D. Hooker, Flora of British India, International Book Distributor, Dehdradun, India Vol. 2 (1875).
3. G.W. Ivia and J.E. Casida, *J. Agric. Food Chem.*, **19**, 410 (1971).
6. K. Kokate, Pharmacogonasy, Vallabh Prakashan, New Delhi, India (1995).
7. M.F. Lockelt, Pharmacology of Plant Phenolic, Academic Press, London (1950).
5. A.C. Metha, T.R. Seshadri, *J. Sci. Ind. Res.*, **25**, 183, 1959 (1993).
9. V.A. Shenai, Chemistry of Dyes and Principles of Dyeing, Sevak Publications, Bombay, Vol. 2, pp. 175-192 (1993).
11. The Wealth of India, CSIR Publications, New Delhi, India, Vol. 2 and 3, p. 401, 169.

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