

Published on: 1st May 2011



TWELVE DIFFERENT SHADES FROM SINGAL TAXA *HAEMATOXYLON CAMPECHIANUM* L.

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ABSTRACT:

Herbal dyes have advantages as they are easily biodegradable. During present work cotton material dyed with heart wood dye of *Haematoxylonn campechianum* L. (Ceasalpineaceae) and obtained 12 different shades. Dyed cotton material tested for four types of fastness test. Observed that poor perspiration fastness and fair to excellent rubbing, washing and light fastness.

KEY WORDS: Dye, *Haematoxylonn campechianum*.

INTRODUCTION:

Natural dye can provide better alternative then synthetic. Natural dyes have advantages over manmade dyes as far as the health and safety, and ecologically are concerned. The processing of natural dyes do not pose the hazardous environmental and toxicity problems normally encountered in synthetic dyes. During 1940 year peoples of Gujarat were obtained shades were as black, red, yellow, green, blue, violate, red, etc. from different part of the plant. Red shade obtained from wood of *Haematoxylon campechianum* (Caesalpinaceae) (Bambhadai, 1940). It is the medium size tree with dark red coloured heart wood. It is distributed in India and tropical America (Kirtikar and Basu, 1993). This yields a dye used as biological stain in the biological laboratory. (Heame: Iron a pigment present in hemoglobin, Xylon: wood). Teli *et al.* (2001) had mentioned heart wood of *Haematoxylon compechianum* is source of black dye. During the present work the heartwood of *Haematoxylon compechianum* had been tried to dye cotton fabric with none of mordant and with mordant as alum, CuSO₄ and FeSO₄. Each of experiment was tried with three different electrolytes as NaCl, NaHCO₃ and Na₂SO₄. Shades were observed different with different mordants and an electrolyte also. Twelve different shades were obtained from one of the source.

MATERIALS & METHODS:

Heart wood of *Haematoxylon campechianum* L. was used as dye material. Unbleached 100% cotton fabric (weight 100g/m², 44 end/Inch and 44 picks/Inch) was used for the study.

Mordant:

Mordant selected were Alum, FeSO₄ & CuSO₄. One specimen was dyed without mordant.

Experimental method:

Extraction of the dye: Dry heart wood of *Haematoxylon campechianum* L. was soaked overnight. Boiled at 90°C for half an hour to yield an aqueous extract. pH were adjusted at 8 to 8.5 by adding Na₂CO₃. Filtrate was used as dye solution.

Pretreatment of cotton fabric: Unbleached cotton fabric was soaked in hot water over night. Then boiled in water having pH adjusted 9 using Na₂CO₃, for an hour. It was than washed with water and beaten on stone to remove starch, natural color and uncellulosic particles. Rewashed, squeezed and dried in sunlight. Fabric was processed further for dyeing.

Mordanting: Pre mordanting of cotton fabric was carried out at 90°C temperature for 30 min. Mordant were used 8 % (w/w) of the cotton fabric. Mordant is dissolved in a water to form mordant liquor. Fabric was then washed with water before dyeing. Textile material to liquor ratio used were 1:30(w/w).

Dyeing: Pre-mordanted cotton fabric entered in dye bath at 60°C temperature, gradually increased to 99°C for 30min.with continuous stirring. Dyeing pH was adjusted at 8 to 8.5 by Na₂CO₃. Remove the dyed specimen from a dye bath, dry it in shade. Aeration deepens the colour. Fabric is than washed with water followed by soap solution at 90°C for 15 min. to remove unfixed dye as well as hydrolyzed dye. Fabric was finally washed with water and dried in sunlight.

Electrolytes and pH: NaCl was used as electrolyte at the concentration of 20 gm/liter. The quantity of twenty gram was added in two equal installments. First in the beginning and excess amount added after half period of dyeing. NaCl was used in four specimens only. NaHCO₃, Na₂CO₃ were used for pH adjustment. They were used in eight specimens.

Fastness Test: Rubbing Fastness Test of the dyed fabric was measured using Crock meter (AATCC,1961).

Washing Fastness Test of the dyed fabric was measured using Launder-O-meter (Trotman,1970).

The perspiration fastness of the given fabric was measured using Perspirometer (Trotman, 1975).

Light Fastness Test is carried out in fade-o-meter (Trotman, 1970).

Assessed grade of Fastness (Trotman, 1970):Cc Grade: After completing the test, the tested sample and the control dyed specimen were kept side by side. Both the specimens than were

compared with Cc grey scales. Visual assessment was made as to the fading of colour with reference to the control and standard grey scale. **Cs Grade:** After completing the test these samples were also compared with respective Cs grey scales to test the colour staining as above (Table 3).

RESULT AND DISCUSSION:

During the present work the heartwood of *Haematoxylon campechianum* had been tried to dye cotton fabric with none of mordant and with mordant as alum, CuSO_4 and FeSO_4 . Each of experiment was tried with three different electrolytes as NaCl, NaHCO_3 and Na_2SO_4 . Shades were observed different with different mordants and electrolytes also. Twelve different shades were obtained from one of the source (Table1). Grey to cream with none of mordant, navy blue to very light navy blue with alum mordant, blackish green to very light blackish green with CuSO_4 and black to grey with FeSO_4 . Obtained deeper color with NaCl salt then other electrolytes from heart wood of *Haematoxylon campechianum*. Obtained grey, navy blue, blackish green and black with NaCl salt using without mordanted fabric, alum, CuSO_4 and FeSO_4 mordanted fabric respectively. It is imparted light grey, light navy blue, light blackish green and light black with NaHCO_3 using without mordanted fabric, alum, CuSO_4 , FeSO_4 mordanted fabric respectively. On usage of Na_2SO_4 as electrolytes it imparted cream, very light navy blue, very light blackish green and grey using without mordanting fabric, alum, CuSO_4 . These experiments are showing that not only mordant but also an electrolytes could change the shades. Excellent fastness properties for all parameters were observed with FeSO_4 with NaCl and alum with NaCl and NaHCO_3 , but acidic perspiration fastness was found to be only good. Very good to excellent washing and perspiration fastness was found in case of CuSO_4 with NaCl. Fastness decreases with Na_2SO_4 and NaHCO_3 . All the dyed specimens fastness decreases in order of $\text{Na}_2\text{SO}_4 > \text{NaHCO}_3 > \text{NaCl}$. NaCl is a suitable electrolyte and FeSO_4 and alum are suitable mordants for the heartwood of it.

CONCLUSION:

Important role of herbal dyes are as the shades are gentle, soft, subtle and create a restful effect, the color is enhanced with age and mellows to increasing beauty, there is charm and challenge due to the uncertainty of the dyeing results, they are used in the conservation and repair of historic textiles, better biodegradability and generally higher compatibility with the environment, they also act as manure, enriching the soil. They have lower toxicity, are non-allergic and non-carcinogenic.

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TABLE 1: TWELVE SHADES OF HEART WOOD OF HAEMATOXYLONN CAMPECHIANUM L.

No.	Mordant	Electrolytes	pH	Shades
1	Nil	NaCl	6	Grey
2	Nil	NaHCO ₃	7.5	Light grey
3	Nil	Na ₂ SO ₄	8	Cream
4	Alum	NaCl	6	Navy blue
5	Alum	NaHCO ₃	7.5	Light navy blue
6	Alum	Na ₂ SO ₄	8	Very light navy blue
7	CuSO ₄	NaCl	6	Blackish green
8	CuSO ₄	NaHCO ₃	7.5	Light blackish green
9	CuSO ₄	Na ₂ SO ₄	8	Very light blackish green
10	FeSO ₄	NaCl	6	Black
11	FeSO ₄	NaHCO ₃	7.5	Light black
12	FeSO ₄	Na ₂ SO ₄	8	Grey

TABLE 2:Fastness Properties

Specimen No.	Rubbing				Washing		Perspiration				Light Cc
	Dry		Wet		Acidic		Alkaline				
	Cc	Cs	Cc	Cs							
1	3	3	3	2-3	3	3-4	2	4	2	4	4
2	3-4	3	3	3	3	3	3	3	3	2	4
3	3	3-4	3	2	3	2-3	2	4	2	4	4
4	5	5	5	5	5	5	3	3-4	5	5	6
5	5	4-5	5	4-5	5	5	4-5	4	4-5	5	6
6	3-4	3	3	3	3-4	4	3	3	3-4	3-4	4
7	3	3-4	3	3	4-5	4	5	5	4	3-4	6
8	3	2-3	2	2	3	2	1	1	1	1	3
9	2-3	2	2	2	2-3	2-3	1	1	1	1	3
10	5	5	5	5	5	5	4	4	5	5	6-7
11	4-5	4	5	4-5	3-4	4	3-4	4	5	5	6
12	4	4	5	4	3-4	3	3	5	5	5	6

TABLE 3:Gradation of Perspiration Fastness

Observation of tested White material	Observation of tested Dyed material	Grade No.	Qualitative assessment
No stain	No lighter	5	Excellent
Slight stain	Slight lighter	4	Very good
Moderate stain	Moderate lighter	3	Good
Distinct stain	Distinct lighter	2	Fair
Very much stain	Very much lighter	1	Poor