Available online at www.joac.info

ISSN: 2278-1862

Journal of Applicable Chemistry

2016, 5 (1): 185-190

(International Peer Reviewed Journal)

Optimisation Of Procedure For Dyeing of Wool And Cotton Fibers With Symplocos Racemosa Leaves

Pranjali Purohit and M.C.Purohit*

*Department of Chemistry, H.N.B.Garhwal Central University, Pauri Campus, Uttarakhand, **INDIA**

Email: mcpurohit123@gmail.com

Accepted on 18th January 2016

ABSTRACT

Symplocaceae family consists of a single genus Symplocos which occupies a significant place among the plants having medicinal value. Also, many of the plant of this genus find use as an effective source of dyes and mordants. The Symplocos racemosa roxb is an indigenous plant and important member of the family Symplocaceae has ample medicinal application. In India-China, Symplocos racemosa roxb is used as a mordant while in India its leaves and bark are used to prepare a yellow dye. This paper aims at finding the optimum conditions of concentration and time for dyeing of wool and cotton with Symplocos racemosa leaves.

Keywords: *Symplocos racemosa, natural* dye, wool, cotton, % absorbance.

INTRODUCTION

India shelters a wide variety of natural vegetation subjected to various geographical conditions like climate, soil type, topography and elevation. A considerable amount of interest has been shown by researchers in exploring this natural vegetation for use as natural dye. Symplocos racemosa leaves provide one such example. In India *Symplocos Racemosa Roxb.*, is distributed throughout the plains and hills of North and East India, up to 2500 ft.(1400 m), from the tarai of Kumaon to Assam, Bengal and Pegu, Chota Nagpur. It is also found in Burma, Pakistan (Azaad Kashmir and Abottabad) [1].

Symplocos racemosa is a small, evergreen tree with a broad crown attaining a height of 6m. The leaves are shining dark green above and pubescent beneath having elliptic-oblong or elliptic-lanceolate shape and dimensions of 9- 18 cm x 3-5 cm. The apex is acute, obtusely-acuminate or obtuse, serrulate or obscurely crenate.

It is a valuable plant from medicinal point of view. It has long been used traditionally against various diseases either as a single drug or in multicomponent preparations. The bark is useful in eye diseases (watery eyes and ophthalmia), blood purification, leprosy, dropsy and liver complaints [2]. The bark is also used in bowel complaints such as diarrhoea, dysentery, liver complaints, fever, ulcers, etc [3,4] The bark is commonly employed in preparing plasters and is supposed to promote maturation or resolution of stagnant tumors[2].

Apart from this, a yellow dye has been extracted from both the bark and the leaves of this plant. The bark is mainly employed as an auxiliary or mordant in dyeing with *Morinda tinctoria*, *Caesalpinia and Butea monosperma*. It is also a chief ingredient of the red powder- 'abir' used in Holi. The bark also finds use in calico-printing and dyeing leather. The yellow dye extracted from the leaves is used for dyeing silk in combination with other plants. Recently leaves of Symplocos resomus has been reported as a source of mordant Purohit et.al [5]. Use of leaves of the plant as mordant in combination with lemon juice has also been reported [6]. Many species in the genus Symplocos contain alum and can be used as mordants in dyeing [7]. Colour fastness properties of dye extracted from Symplocos species have been evaluated on wool fibers [8].

This paper deals with the process of extraction of natural dye from *Symplocos racemosa* leaves and optimization of the procedure of dyeing with wool and cotton fibers.

MATERIALS AND METHODS

Collection of Plant Material: The collection of **Symplocos racemosa leaves** was done in the month of October from Phalati (Mandakini Valley), Rudraprayag situated at a height of 1100m.

Textile Preparation for Dyeing: Wool and **cotton** fibers have been selected as the dyeing fibers for the present study which undergo the following processes before dyeing:

Skeining yarn: To avoid tangling and to allow even penetration of dye in the fiber proper skeining is essential. The skein of wool was made by wounding around the arm from the hand and over the elbow.

Soaking: As such, the skein was soaked in the tap water for about 12 h to get rid of the water soluble impurities. Similar process was adopted for cotton.

Scouring: This process involves cleaning of textile with hot water and neutral soap to allow uniform dyeing. Wool is scoured to remove the grease - '*lanolin*', a fatty substance present in the wool. On the

other hand, cotton is scoured to remove natural waxes and to soften the fibers. The cotton fabric and skein were boiled in a solution of soapy water and a little amount of washing soda and boiled for about two hours. After this the material was soaked in the soap bath overnight and then rinsed in hot water.

Determination of Rate of Exhaustion or Percentage Absorbance: The UV-Visible Shimadzu spectrophotometer (Model UV-1601) was used to determine the O.Ds (Optical Densities) or Absorbances of the dye bath before and after dyeing. Distilled water was used as the blank to calibrate the instrument to zero absorbance in each case. While using the instrument the wavelength was set to the maximum wavelength (i.e. wavelength of maximum absorbance λ_{max}) of the dye used at that point.
The Rate of Exhaustion or Percentage Absorbance was calculated using the following formula –

$$\textbf{Rate of Exhaustion (\%)} = \left[\frac{D1-D2}{D1}\right] x100$$

Where D1 = O.D. before dyeing, D2 = O.D. after dyeing; D1-D2 = amount of dye transferred into the fabric after dyeing.

Optimization of Dyeing Procedure

Optimization of Concentration: 10g *S.racemosa* leaves were soaked in 200 mL, 300 mL and 400 mL hot water each for 30 min and then heated for 30 min. After this the solutions(S-200, S-300 and S-400) were filtered and the selected fibers (wool and cotton) were dipped in the above dye-baths for 30 minutes. The optical densities of the solutions were recorded before and after dyeing by means of UV-Visible Spectrophotometer. The results are summarized in table 1. Graphs of Conc. vs %abs. shows in figs.1and2.

Table 1: Determination of optimum concentration (*S.racemosa* leaves)

Sample	V(mL)	C (g mL^{-1})	D1	D2		D1-D2		% abs	
				Wool	Cotton	Wool	Cotton	Wool	Cotton
S-200	200	0.05	3.311	1.739	1.421	1.572	1.89	47.48	57.08
S-300	300	0.0333	1.852	0.436	0.424	1.416	1.428	76.46	77.11
S-400	400	0.025	1.263	-0.439	-0.343	1.702	1.606	126	126.3
S-500	500	0.02	1.311	0.501	0.623	0.81	0.688	61.78	52.48

λ_{max} = 464 nm, Weight of sample (leaves) =W=10 g, Volume of hot water taken =V mL
Concentration of the dye =C = W/V (g mL^{-1})

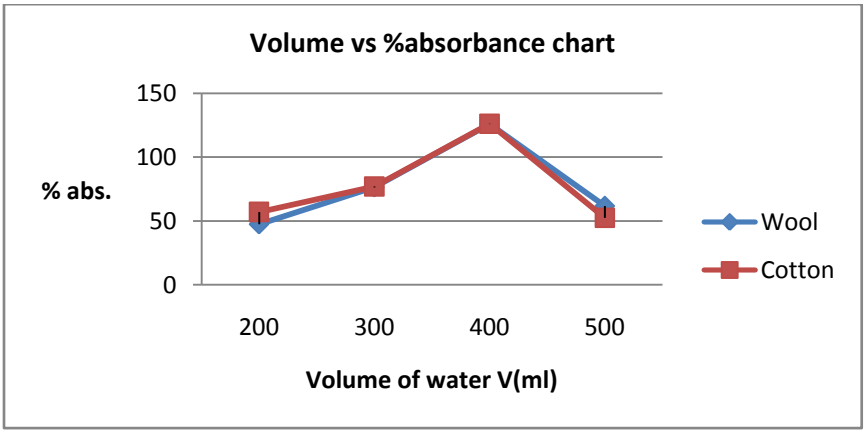

Fig 1

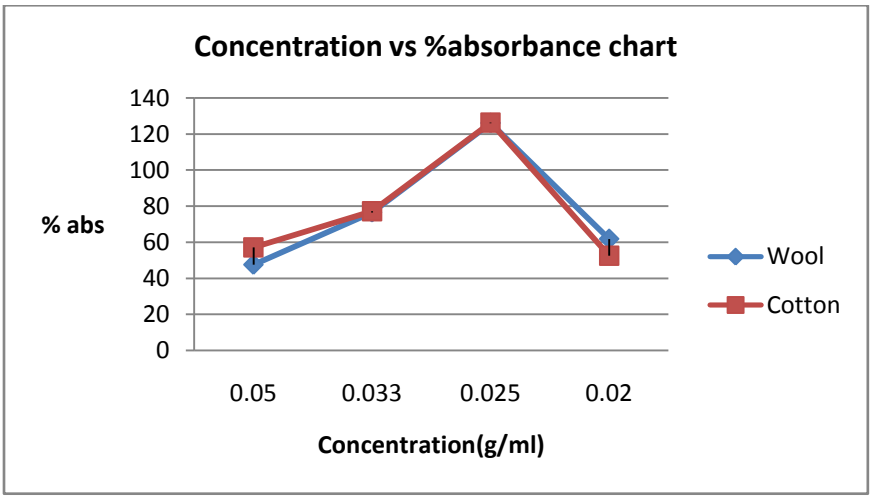

Fig 2

Optimization of Time: The wool and cotton samples(S-400) were heated for 15, 30, 45 and 60 min each and then dyed for 30 min. O.D.s was measured in each case to get the optimum time for dyeing wool and cotton sample. The results are presented in table 2, graph (Fig.3) and S.racemosa (leaves) pics.4&5.

Table 2: Determination of optimum time (S.racemosa leaves)

Sample	D1	D2		D1-D2		% abs	
		Wool	Cotton	Wool	Cotton	Wool	Cotton
S-15	1.192	0.239	0.347	0.953	0.845	79.95	70.89
S-30	1.263	-0.439	-0.343	1.702	1.606	126	126.3
S-45	1.676	0.439	0.515	1.237	1.161	73.80	69.7
S-60	1.790	0.556	0.532	1.234	1.258	68.93	70.28

λ_{max} = 464 nm

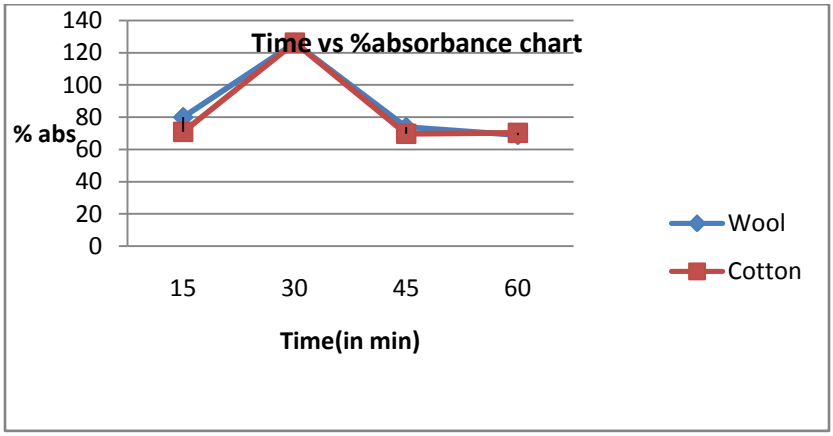

Fig.3

Fig 4 : S.racemosa (leaves) : 400 mL, 30 min

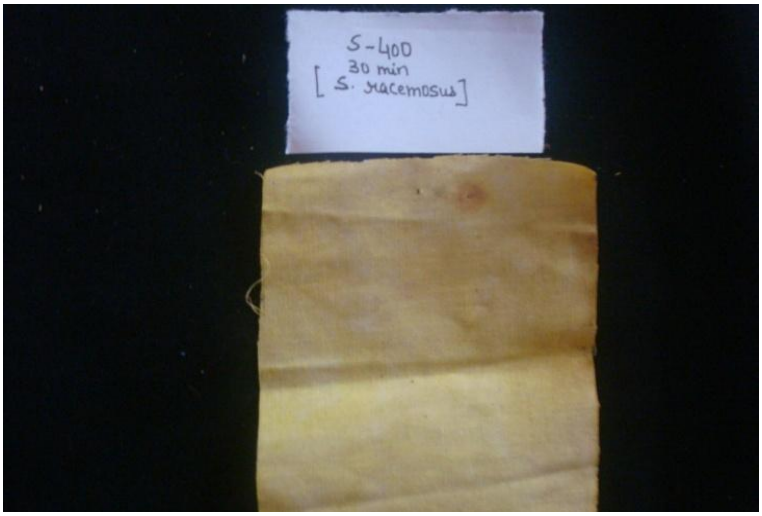

Fig 5. S.racemosa (leaves) : 400 mL, 30 min

RESULTS AND DISCUSSION

Shades of yellow were produced on wool and cotton using *Symplocos racemosa* leaves as dyeing material. It is evident from Table 1 that the wool and cotton fibers both corresponding to S-400 gave maximum percentage absorbance. It implies that the optimum concentration of Symplocos racemosa leaves for dyeing wool and cotton is 10 g per 400 mL hot water or 0.025 g mL^{-1}. (Figs.4&5).Table 2 shows that sample S-30 shows maximum percentage absorbance. Thus, for dyeing wool and cotton 10g of leaves per 400mL hot water extracted for 30 min gave the best result (Figs.4,5). Thus, the optimum concentration of *S.racemosa* leaves for dyeing wool and cotton is 0.025 g mL^{-1} while the optimum time for dyeing is 30 min.

APPLICATIONS

The isolated Natural dye from the leaves of Symplocos racemosa can be applied for dyeing of wool to obtain a wide range of soft and light color by using some mordants.

CONCLUSIONS

It was found from the study that isolated dye from the leaves of *Symplocos racemosa* can be successfully used for dyeing of wool to obtain a wide range of soft and light color by using natural and synthetic mordants. These results can be helped in the best utilization of natural resources.

ACKNOWLEDGEMENT

Authors are thankful to University Grant Commission, New Delhi for financial support. Thanks are also due to Forest Research Institute Dehradun for providing lab facilities.

REFERENCES

[1] Y.R. Chadha, (Ed.), *The Wealth of India: Raw materials,*Vol.10, Publications & Information Directorate, CSIR, New Delhi, **1976**.
[2] K.K. Bhutani, A.N. Jadhav, V. Kalia, **'**Effect of Symplocos racemosa Roxb on gonadotropin release in immature female rats and ovarian histology', *J. Ethnopharmacol,* **2004,** 94, 197-200.
[3] S. Khalid, C.H. Gopalakrishna, D.V. Kature, K.B. Shaikh, D.K. Suresh, P. Loya, **'**Gastro protective and antiulcer activity of mixture of Symplocos racemosa bark and Asarum europaeum root', *Journal of Pharmacy Research,* **2010,** 3(7), 1502-1505.
[4] R. Dhaon, G.K. Jain, J.P.S. Sarin, N.M. Khanna, 'Symposide: a new anti-fibrinolytic glycoside from Symplocos racemosa Roxb', *Ind. J. Chem,* **1989,** 28B, 982-983.
[5] Pranjali Purohit, Jyoti Kundal and M.C. Purohit, Optimization of procedure for dyeing of cotton fibers with *Rhododendron arboretum* flowers using *Symplocos racemosa* leaves as mordants, *J. Applicable Chem,* **2015,** 4(6), 1852-1857.
[6] Joshi Rakesh, M.C. Purohit, P. Joshi Shanti, Improvement of the traditional system of dyeing on wool fibers using eco-friendly natural dye, *J. Applicable Chem,* **2013,** 2(4), 841-849.
[7] I. Grae, Nature's colour: Dyes from plants, Pub: Mcmillan Publishing Co, **1974**.
[8] Shym vir Singh, M.C. Purohit, Evaluation of colour fastness properties of natural dye extracted from *Symplocos Sps o*n wool fibers using combination of natural and synthetic mordants, *Indian Journal of Fiber & Textile Research*, **2014,** 39, 97-101.

AUTHORS' ADDRESSES

1. **Dr. M.C. Purohit**
Associate Professor, Department of Chemistry
H.N.B. Garhwal University, Pauri Campus
Pauri (Garhwal) Uttarakhand, India
Email: mcpurohit123@gmail.com, Mobile No: 09410925970
2. **Pranjali Purohit**
Research Scholar, Department of Chemistry
H.N.B. Garhwal University, Pauri Campus
Pauri (Garhwal) Uttarakhand, India
Email: pranjali_pauri@yahoo.com, Mobile No: 9958181411