IOSR Journal of Applied Chemistry (IOSR-JAC)
e-ISSN: 2278-5736.Volume 8, Issue 5 Ver. II (May. 2015), PP 85-89
www.iosrjournals.org

A Study of Extraction and Dyeing Behavior of Natural Dye Obtained From Cotton A Study

S.Thiyagarajan[1], K.Balakrishnan[2], S.Tamilarasi[3]
Department of chemistry, A. V. V. M. Sri Pushpam college, Poondi, Thanjavur, Tamilnadu-613503, India.

Abstract: *In the present study a flower of Hibiscus vittifolius.L of the was used as a source of natural dyes for dyeing of cotton samples. It belongs to family Family Malvaceae, Commonly known as Siru thutthi. The dye has good scope in the commercial dyeing of cotton in textile industry. In the present study, bleached cotton fabrics were dyed with different chemical mordants. Dyeing was carried out by pre-mordanting, post- mordanting and simultaneous mordanting. The dyed samples have show good washing, light, rubbing fastness and perspiration fastness properties. The various colour changes were measured by computer colour matching software.*
Keywords: *Extraction, natural dyes, flowers, Hibiscus vittifolius.L, cotton, textiles.*

I. Introduction

Today due to global environment awareness trend of using natural colours is drawing production and application of synthetic dyes release large amount of waste and unfixed colourand causing health hazards pollution and disturb eco – balance the most alarming and injurious to health is the presence of toxic chemicals in the finished textiles especially which are coming in contact with the skin has opened new challenges for the persons working in the field of textiles[1]. India has a rich tradition in the use of natural dyes. Natural dyes have been a part of human life since time immemorial and synthetic were the only colourants in the word. But with the invent of synthetic dyes about 175 years back use of natural dyes have witnessed diminished. During last two decades natural dyes have witnessed a process of revival with the increasing awareness of consumers far eco textiles and need to preserve environment has lead to the revival of old practice of coloration with natural dyestuff. Due to the carcinogens what natural of some synthetic dyes and their intermediates natural some synthetic dyes and their intermediates natural dyes are being looked at as an "eco solution" to the ill effects of synthetic dyes. The serious limitation associated within the natural dyes is the process of dyeing with natural dyes in very lengthy and time consuming moreover reproducibility of shades is also a major problem faced in dyeing with natural dyes as traditional processes for their application on various substrates have been lost in the absence of proper documentation and years of neglect. Therefore, it becomes necessary to develop new techniques of coloration and also to standardize these processes with the help of modern scientific so that these dyes can offer themselves as an effective eco option[2]. Natural dyes are known far their use in coloring of food substrate leatherwood has well as natural fibers like wool silk cotton and fax as major areas of application since ancient times natural dyes may have a wide range of shades and can be obtained from various part of plants including roots bark leaves to flowers and fruit[3].

Natural dyes have better biodegradability with the environment. They are non-toxic non – allergic to skin non – carcinogenic, easily available and renewable. Colour fastness is the resistance of a material to change any of its colour characteristic are extent of transfer of its colorants to adjacent which materials in touch generally light fastness wash fastness and rub fastness are considered far textile fibers [4].

Hibicus vittifolius.L, Undershrub, up to 1 m high; stem stellate-pubescent, greenish-purple. Leaves alternate Stipule small, deciduous. Flowers ca 5 cm across, golden yellow, with dark purple center, solitary, axillary. Plant Name Hibiscus vitifolius ,L. Synonym Fioria vitifolia, L. Mattei , Family Malvaceae, Local Name Siru thutthi.

II. Materials And Methods

2.1 Materials:

2.1.1 Source: The flowers of Hibicus vittifolius.L, Mattei was collected from alivalam village, Thanjavur district (fig.1).

Fig: 1 Hibicus vittifolius.L,

2.1.2. Fabric: Desized, scoured and bleached cotton fabric was used for dyeing.

2.1.3 Mordants:
Chemical used: AR grade metallic salts such as copper sulphate, ferrous sulphate, aluminium sulphate, Potassium dichromate, stannous chloride were used as chemical mordants.

III. Experimental

3.1 Dye Extraction: 200 gram of fresh flowers was weighed and taken in soxhlet apparatus and 500 ml of solvent (ethanol: water) in the ratio 80:20 was added to it. The soxhlet apparatus was heated 70°c for 60 min. After extraction, the extract was filtered and used for dyeing.

3.2 Dyeing procedure: The cotton samples were dyed with dye extract keeping M: L ratio as 1:20 Dyeing was carried out at 78°c and continued for 1hour.

3.3 Mordanting:
The cotton samples were treated and with different chemical mordants by following three methods [5].
(i) pre- mordanting
(ii) simultaneous mordanting
(iii) post- mordanting

(i) pre- mordanting methods:
In this method, samples were pretreated with the solution of different chemical mordants and then dyed with dye extract.
(ii) Simultaneous mordanting:
In this method, the cotton samples were dyed with dye extract as well as different chemical mordants[6].
iii) Post- mordanting:
In this method, dyed cotton samples were treated with solution of different chemical mordants and then dyed with dye extract.

3.4 Color fastness:
The colour fastness of the dyed fabrics was tested according to IS standards. color fastness to washing, light, rubbing and perspiration were determined from standard test methods. ISO – 105- C06: 2010, ISO 105-BO2 : 2014, IS: 766-1956, and ISO : E04 : 2013 respectively[7]**.**

3.5 Measurement of colour strength: The colour strength of the dyed cotton fabrics were determined by K/S values. The light reflectance of the dyed cotton samples were measured using a Text flash spectrophotometer (Data colour corp). The K/S values were calculated by Kubelka-Munk equation.

$$K/S = (1-R)^2 / 2R$$

Where, R is the decimal fraction of the light reflectance of the dyed fabfric at λmax. K is the absorption coefficient and S is scattering coefficient[8]

IV. Result And Discussion

4.1: Soxhlet Extraction Method:

We carried out this extraction method in order to avoid the filtration of the solvent and residue and also to obtain better efficiency of separation in this method[9]. 200 gram of fresh flowers was kept in the thimble of soxhlet extractor and 500 ml of solvent (ethanol80:water20) pourd in the RB flask and a condenser with high flow rate of water is fitted over it. The soxhlet apparatus was heated 70°c for 60 minutes. After extraction, the extract was filtered and used for dyeing. It was observed that, colour of the dye extract was milky yellow colour as shown in figure 2.

fig(2) Hibiscus vitifolius L.

V. Effect Of Mordanting

The dye extract was found to be suitable for cotton fabric. The cotton fabrics were dyed with chemical mordants. It was observed that, the dye uptake was found to be good in Simultaneous mordanting method is shown in figure – 3.

5.1 Optimization of mordants with K/S value and colour hue changes:

Various hues of colour were obtained from Simultaneous mordanted cotton with copper sulphate, ferrous sulphate, aluminium sulphate, potassium dichromate, stannous chloride as shown in table-1. The different mordants not only cause difference in hues of colour and significant changes in K/S values but also changes in L* Values and brightness index value. The effect of mordants on colour values of cotton dyed with flowers of Hibiscus vitifolius, L is shown in figure-4

Table-2 shows L*,a*andb* K/S values and it can be seen that, mordants which show higher value of L*show lighter shades while lower L*value show darker shades for cotton. Similarly, negative values of a*and b* represent green and blue respectively. Among the chemical mordants used, the highest colour value (K/S =90.487) was obtanined with copper sulphte and lowest colour value (K/S =9.853) with potassium dichromate.

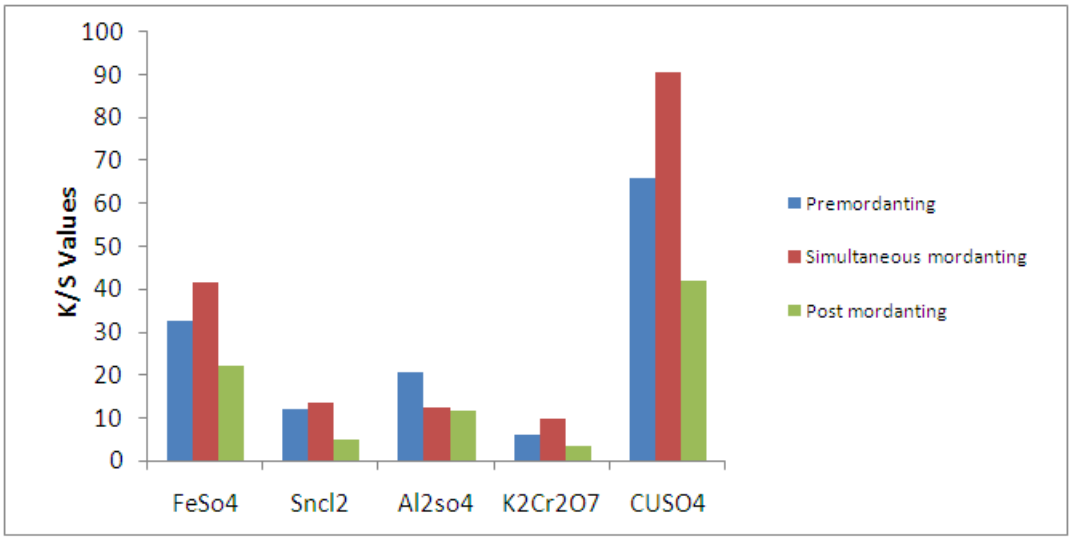

Figure – 3: Surface colour strength (K/S values) of dyed cotton fabrics after pre, Post and Simultaneous Mordanting

Table-1: Colour produced on Cotton by different mordants in - Simultaneous mordanting.

Mordants	Colour obtained
$Feso_4$	
$Sncl_2$	
Al_2so_4	
$K_2Cr_2O_7$	
$CUSO_4$	

Table-2: Different simultaneous mordants L^*,a^*,b^* and K/S values for cotton dyed with flowers of Hibicus vittifolius.L

S.NO	Mordants	L*	a*	b*	K/S Value
1	$FeSo_4$	56.440	2.526	13.974	41.471
2	$Sncl_2$	77.775	4.958	24.637	13.372
3	Al_2so_4	80.332	2.124	33.709	12.439
4	$K_2Cr_2O_7$	78.954	2.719	23.858	9.853
5	$CUSO_4$	61.067	6.348	49.840	90.487

5.2 Fastness properties:

It was observed that, dyeing with Hibiscus vittifolius.L gave good washing, light and rubbing fastness properties. The fastness properties of dyed of cotton fabrics are shown in Table3.Overall, it could be used for commercial purposes and attain acceptable range.

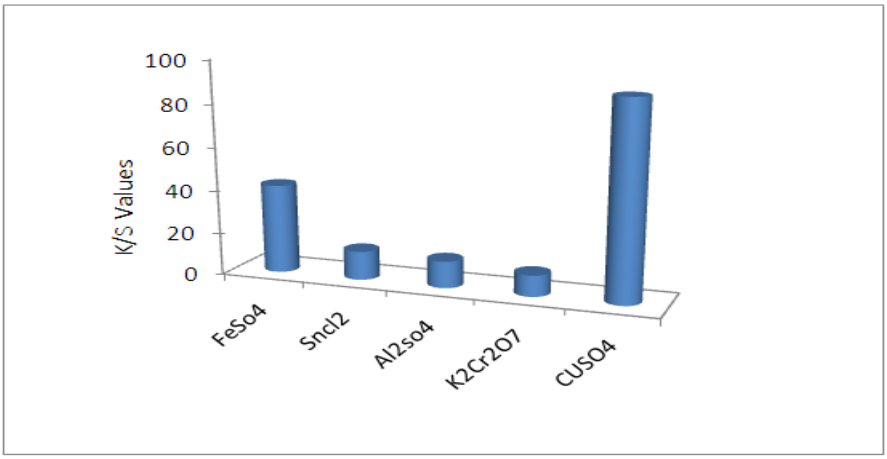

Figure 4:Effect of Mordants on colour Values of Cotton with Flowers of Hibicus vittifolius.L(Simultaneous-Mordanted)

Table-3: Fastness properties for cotton fabric dyed with flowers of Hibicus vittifolius.L

S.NO	Mordant Proportions	Light Fastness Grades (ISO – 105- C06 : 2010)	Washing Fastness Grades(ISO 105-BO2 : 2014)		Rubbing Fastness Grades(IS: 766-1956)		Perspiration Fastness(ISO : E04 : 2013)			
							Acidic		Alkaline	
			CC	CS	Dry	Wet	CC	CS	CC	CS
1	$Feso_4$	III	I	IV-V	IV-V	IV	III	IV	III-IV	IV-V
2	$Sncl_2$	III	II	IV-V	IV-V	IV	III	III	III	III
3	Al_2so_4	III-IV	I-II	IV-V	IV	III-IV	III	III	III	III
4	$K_2Cr_2O_7$	IV	II	IV-V	IV-V	IV	IV-V	IV	IV-V	IV-V
5	$CUSO_4$	IV	I-II	IV-V	IV-V	III-IV	II-III	II-III	III	II

VI. Conclusion

The dyeing of cotton can achieved using the flower extracts of Hibiscus vittifolius.L by using chemical mordants .The washing, light and rubbing fastness of all dyeing with mordants were quite good. From the comparative study of fastness properties the dyed cotton samples, Hibiscus vittifolius.L in simultaneous mordanting method gives better results.

References

[1]. Anjali Deshmukh colour gamut of holarrhena antidysentrica linn. dyed silk rmutp International Conference: Textiles & Fashion(2012).
[2]. Yadav Saroj, Rose Neelam, Singh Jeet Saroj and Khambra Krishnanatureal dye powder: an easy technique for eco – dyeing Research Journal of Recent Sciences _ Vol. 2 (ISC-2012), 308-311 (2013).
[3]. Saravanan P.[1], Chandramohan G.[2], MariajancyraniJ.[2] and Shanmugasundaram P.[3] Extraction and application of Eco – Friendly Natural dye obtained from Leaves of Acalypha indica Linn on Cotton Fabric, International research journal of environment science. Vol 2 (12),1 – 5, December (2013).
[4]. Kulkarni. S.S, Gokhale. A.V, Bodake.U.M and Pathade.G.R, 2011, Cotton dyeing with Natural Dye Extracted from Pomegranate Peel, Universal Journal of Environmental Research and Technology, Vol. 1(2): 135-139.
[5]. M.Kumaresan, P.N.Palnisamy and P.E.Kumar, 2011, Application of Ecofriendly Natural Dye Obtained from flower of Spathodea Campanulata on Silk, European Journal of Scientific Research,Vol.52, No.3, pp.306-312.
[6]. Saravanan P., Chandramohan G., Saivaraj S. and Deepa D., J. Nat. Prod. Plant Resour., 3(2), 80-85, (2013).
[7]. Vankar P.S., Shanker R. and Dixit S., Pigment and Resin Technology, 37(5), (2008).
[8]. S.Habibzadeh, H. Tayebi, E..Eerami, A.Shams Nateri M.Allahnia and M.Bahmai, 2010, silk Dyeing Using Saw- Wood of the Zelkoa Forest Tree, World Applied Journal, 9(3), 295-299.
[9]. Kannadasan T.1, Gnanaprakasam A.1, Harikrishnan R.3*, Nganyei konyak3, Rajkumar A.3 Journal of Advanced Scientific Research.ISSN 0976-9595. Harikrishnan et al, J Adv Sci Res, 2013, 4(2): 48-50.
[10]. Lokesh P* and Kumara Swamy M Pelagia Research Library Extraction of natural dyes from Spathodea campanulata and its application on silk fabrics and cotton. Der Chemica Sinica,2013,4(1):111-115
[11]. Shyam Vir Singh1* and M. C. Purohit2 Dyeing of Wool Fabrics with Extracted Eco-Friendly Natural Dyes from Rhus Parviflora (Tung) Using Chemical Mordants: Comparison of Fastness Properties and Colour Strength with Some Mordants.
[12]. Chemical Science Transactions 2014,3(3),1124-1130.