JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Studying anti microbial properties of wool dyed with *Calotropis gigentea* Linn

Dr. Rajashri Ramkrishna Nimbhorkar, Assistant Professor, Smt. Ratnaprabhadevi Mohite Patil College of Home Science for Women, Akluj Email : rajashri.nimbhorkar@gmail.com

Abstract:

The use of natural dyes is growing considerably because of the quality of the natural dyestuff obtained, the environmental compatibility of the dyes and the substantial minimization of the processing costs. In order to enhance the colour palette of natural dyes,*Calotropisgigentea* Linn was selected as a novel source of natural dyeing. Protein fiber wool was selected as textile substrate. Ritha nuts were used for scouring of wool. Alum as a sole mordant was selected for the present investigation. Ferrous and tin were used as synthetic mordants. Pomegranate rind and harda were used as natural mordants. *Calotropisgigentea* Linn flower extract introduced wide range of pale green colour. Good to excellent fastness properties were observed with anti microbial properties.

Introduction:

The beginning of the new millennium surely brings many drastic changes in the life of mankind. One of them is going to be the shift towards revival of natural dyes and their efficient usage as compared to their counter parts i.e. synthetic dye, which has been slowly losing its place mainly due to international awareness to environment and ecology preservation (Haji 2010). There is a big potential for using the vegetable dyes in textile industry due to one and only reason i.e. eco-friendliness of the product. Whole plant i.e. leaves, barks, seeds, roots, flowers and fruits can be the sources of vegetable dyes (Uddin 2015). Therefore present investigation is an attempt to introduce new shades to the colour palette of natural dyes by exploring *Calotropis gigentea* Linn. It is a widely growing shrub which is abundantly available in nature containing latex (Anonymous 2006). The plant belongs to Asclepiadoideae family. Leaves are elliptic, acute and thick. Flowers of plant are purple in colour. Verma (2014) reported that leaves contain flavonoid.

Method :

Textile substrate :

Wool is natural protein fibers and are available in wide variety having varied qualities. 100% pure wool being natural protein fibers were selected for the present research. In order to obtain level dyeing and improve penetration of dyestuff scouring of wool was carried out. Ritha nuts as a natural surfactant were used for the scouringprocess.

Dye Source:

Fresh flowers of *Calotropis gigentea* were collected from nearby area in the month of July.

Mordants:

Alum was selected as a sole mordant for the present investigation. With due considerations, study highlights the use of alum as a sole mordant, along with this it would be fair to justify the need to promote natural mordants and natural surfactants in the processing of textile dyeing. Hence alum is used in binary combination with two metal and two natural mordants. Pomegranate rind contains tannin. Harda is also a rich source of tannin. Alum was used in binary combination with metal mordants and natural mordants in (9:1) (7:3) (5:5) proportions. Pomegranate rind and harda were used as single mordants.

Dyeing

The extraction process focuses on extraction of flowers of *Calotropis gigentea* Linn using aqueous extraction method. Dyeing was carried out at 80 for 60 minutes.

After treatment such as rinsing, soaping and washing were done followed by dyeing.

Samples were assessed for various fastness agencies (Laid by ISO standards) to assess the fastness properties.Dyed wool and silk samples were tested against antimicrobial property (AATCC-147-2016).

Result and discussion :

Washing fastness of *Calotropis gigentea* flowers dyed wool

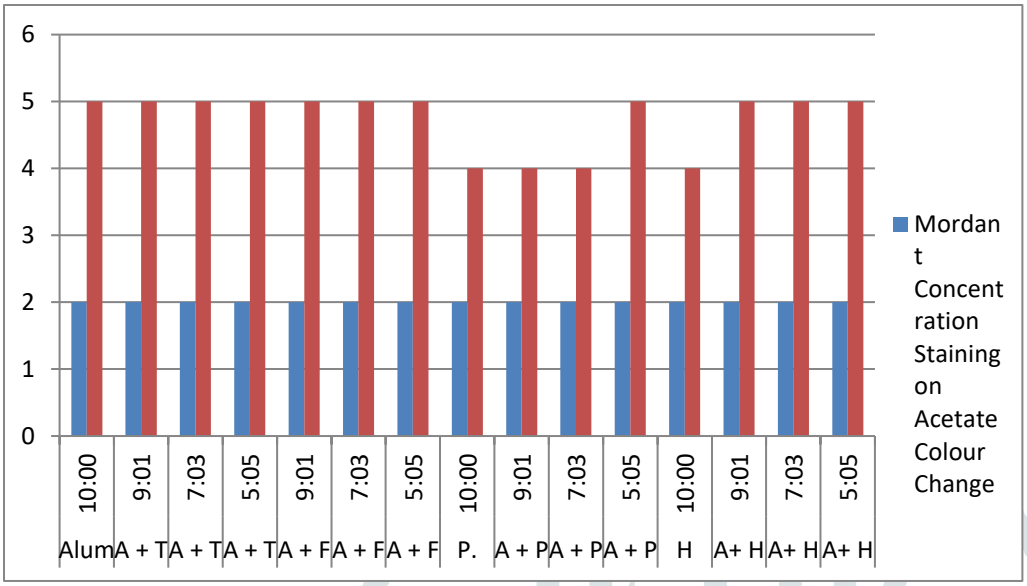
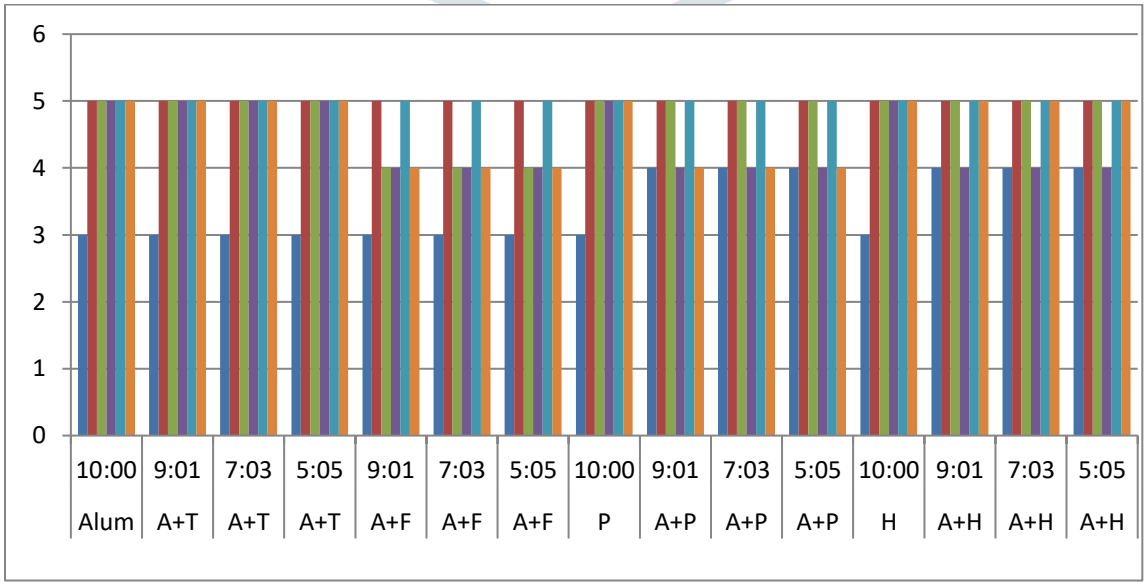


Figure shows the wash fastness properties and ratings of the samples dyed with *Calotropis gigentea* flowers.10% alum as a single mordant showed poor fastness rated 2. Staining on adjacent fabric was rated as very good. The metal mordants i.e. tin and ferrous in terms of all combinations and proportions (9:1), (7:3), (5:5) showed absolutely no staining on adjacent fabric samples representing excellent results i.e. 5. The wool samples mordanted with all combinations of metal mordants and natural mordants exhibited poor results rated 2.

Perspiration fastness of *Calotropis gigentea* Flowers dyed wool

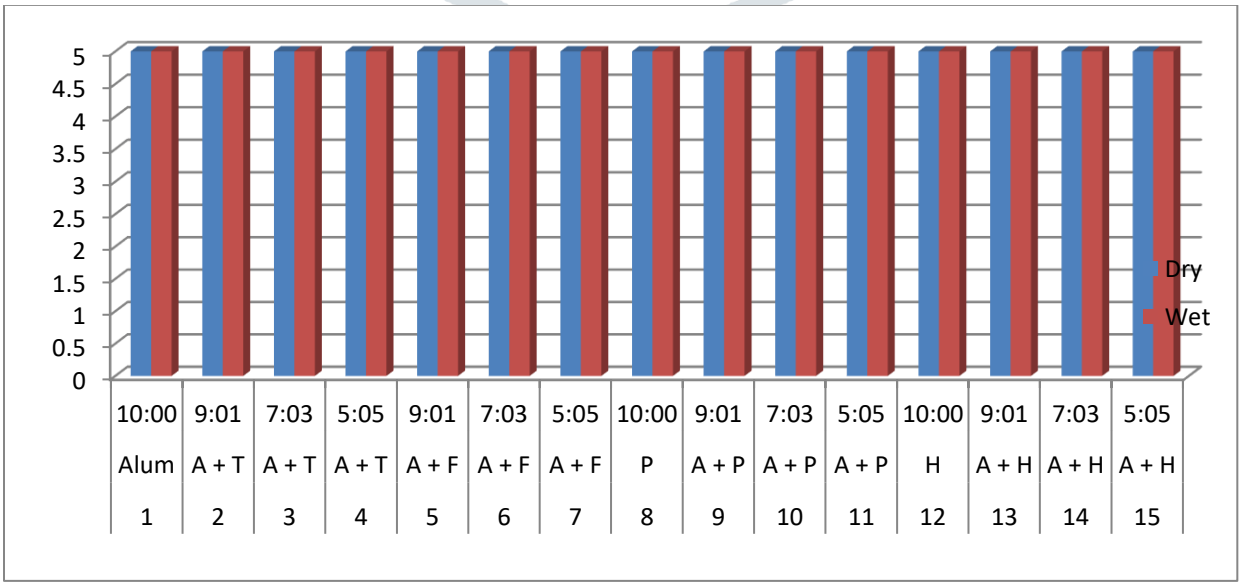


Above figure indicates the data about acidic and alkaline perspiration fastness towards wool samples dyed with *Calotropis gigentea* flowers extract. 10% alum, pomegranate rind and harda exhibited moderate acidic perspiration fastness towards dyed wool samples rated 3 on grey scale. Absolutely no staining was recorded on adjacent cotton and silk fabric. (A+T) (9:1), (7:3), (5:5) observed slight staining on adjacent cotton and silk fabric rated 4 on grey scale.(A+T) (A+F) binary combinations with (9:1), (7:3) and (5:5) proportions recorded moderate fastness towards acidic perspiration rated 3 on grey scale for dyed wool samples.

Natural mordants pomegranate rind and harda in binary combinations with Alum (A+P) (A+H) showed good acidic perspiration fastness with no staining recorded on adjacent cotton and silk fabric. Excellent alkaline perspiration was observed in 10% alum, pomegranate rind and harda as a single mordant with absolutely no staining on adjacent cotton and silk fabric towards wool samples dyed with *Calotropis gigentea* flower extract. Good alkaline perspiration was observed towards wool samples dyed with *Calotropis gigentea* flower extract in mordant combination (A+F) (A+P) (A+H) with (9:1), (7:3) and (5:5) proportions rated 4 on grey scale.

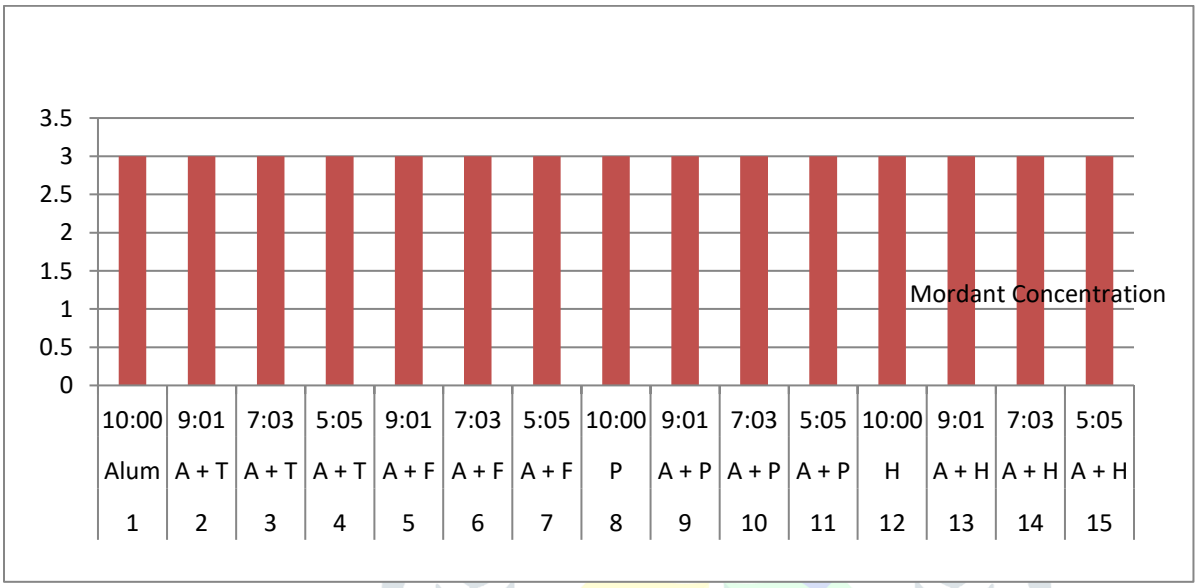
Staining on adjacent cotton fabric found negligible towards dyed wool samples rated 5 where as slight staining was recorded for adjacent silk fabric for (A+F) and (A+P) mordant combination with (9:1), (7:3) and (5:5) proportions.Absolutely no staining was recorded in (A+T) and (A+H) for (9:1), (7:3) and (5:5) proportions towards dyed samples. Natural mordants pomegranate rind and harda found suitable mordants for acidic as well as alkaline perspiration.

Rubbing fastness of *Calotropis gigentea* Flowers dyed wool



The figure revealed the data obtained towards dry and wet rubbing fastness of wool samples dyed with *Calotropis gigentea* flowers. The dry and wet rubbing fastness grade was excellent towards dyed wool samples mordanted with 10% alum, pomegranate rind and harda as a single mordants. In case of the mordants in binary combination with alum (A+T) (A+F) (A+P) and (A+H) with (9:1) (7:3) (5:5) proportions exhibited excellent dry and wet rubbing fastness rated 5 on grey scale.

Light fastness of *Calotropis gigentea* dyed wool



Calotropis gigentea flowers dyed wool samples when subjected to light fastness, it was noted moderate which rated 3 for almost all samples mordanted with 10% alum as a single mordant (A+T) and (A+F) binary mordant combination with (9:1) (7:3) and (5:5) proportion. The exposure to light showed moderate rating (3) for 10% alum, pomegranate rind and harda as a single mordant for wool samples dyed with *Calotropis gigentea* flower extract.

In case of (A+T) (A+F) (A+P) and (A+H) binary mordant combination with proportions (9:1) (7:3) and (5:5) expressed moderate degree of fastness towards light rated 3 on grey scale for wool samples dyed with flowers of *Calotropis gigentea*.

Antimicrobial properties of wool dyed with *Calotropis gigentea* Linn against selected microbes.

Dyed Samples with Code	**Diameter of Inhibition Zone - 38 (mm)**	
	Tested Microbes	
	Staphylococcus aureus	***Klebsiella pneumonia***
CFWF7	No growth (Antimicrobial activity present)	No growth
CFSF7	No growth (Antimicrobial activity present)	No growth

Conclusion :

Calotropis gigentea Linn flower extract can be good source of dye for dyeing wool. It introduced wide range of pale green colour. Dyed wool samples exhibited good to excellent fastness properties regarding washing, perspiration, rubbing and light fastness. Present study concludes that the selected dye source is novel in the field of natural dyeing and can be ideal source of natural colourants for dyeing of textile substrate. The dye source is abundantly available in nature. This source is inexpensive and its method of application is simple, producing less pollution and having antimicrobial property.

References:

- Uddin 2015 Effects of Different Mordants on Silk Fabric Dyed with Onion Outer Skin Extacts Journal of Textiles Volume 2014 (2014), Article ID 405626, 8 Pages
- Uddin Extraction of Eco-friendly natural dyes from mango leaves and their application on silk fabric Textile and clothing sustainability 2015 1:7
- Anonymous 2006
- Verma, Vishwa Nath, 2014. The Chemical Study of Calotropis. International Journal of Chemistry, Physics and Astronomy, vol.20 : 74-90
- Haji, Aminoddin, 2010. Functional Dyeing of Wool with Natural Dye Extracted from *Berberis vulgaris* wood and *Rumex hymenosepolus* Root as Biomordant. Iran Journal Chem.and Eng. 29(3).