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DYEING AND KALAMKARI PAINTING OF SILK FABRIC WITH VEGETABLE DYE EXTRACTED FROM FICUS BENGHALENSIS L.

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Abstract

The present investigation was carried out to revive the ancient and ethnic art of textile dyeing, painting and printing with natural dyes. Ficus benghalensis l., as a dye source was used on mulburry silk fabric. Pre- treatment with Myrobolan, and pre- mordanting with Alum and Copper sulphate were carried out. Silk fabric dyed and painted fabric with the dye extracted from Ficus benghalensis, showed fair to excellent results for light and perspiration fastness properties while rated good to washing and rubbing fastness properties. Further, kalamkari painting was done and evaluated for fabric element and colour, which were rated very good to excellent. This dye also screened for its antimicrobial activity, and showed its Excellency for it. Therefore the study suggests the use of extracts of Ficus benghalensis l., as a natural dye has good scope in the garment industry and can be a very good source/option for dyeing and for value addition techniques i.e. for printing and painting of the fashion fabric/garment and can have ultimate use in eco-friendly, skin friendly clothing and helps to encourage the global need “GO GREEN”.

Keywords: Extraction, eco-friendly, antimicrobial, value addition, kalamkari

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The art of dyeing is as old as our civilization. Dyed textiles remnants found during archaeological excavations at different places all over the world provide evidences to the practice of dyeing in ancient civilizations (S. Saxena 2014). The history of Indian dyes appears to have been started from the vedic period. The evidences of dyed cloth is found in the excavation of Harappan culture at Mohenjo-Daro and the wall paintings of Ajanta, Elora and Sithannavasal still demonstrate the efficacy of dyeing craft that the India was forerunner in the art of natural dyeing. The history tells us that India was one of the pioneers. (P. Venkar 2010)

V.H. Kumar (2004) reports, ornamentation of clothes by dyeing and painting with the plants and minerals like alum and iron were

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carried out for centuries it continued till the discovery of Perkins purple in 1856 as after that synthesizing of number of synthetic dyes caused the steady decline of natural dyes.

With the rise in the new industry of synthetic dyes there was gradual decline in the use of natural dyes which were expensive and more difficult to use in comparison to chemical dye and they became a part of the past. Recently the interest in the use of natural dyes has been growing rapidly due to the result of stringent environmental standards imposed by many countries in response to toxic and allergic reactions associated with synthetic dyes (Anita et al. 2007).

The advantages of using natural dyes are manifold as they are eco-friendly, safe for body contacts, unsophisticated and harmonized with nature while most of the synthetic dyes cause environmental pollution during their production and use, may cause different kind of skin turmoil's (Training manual 2011). Vegetable based natural dyes are usually agro-renewable, and at the same time bio-degradable. In some cases, the waste in the dyeing process becomes an ideal fertilizer therefore no problem of disposal of this natural waste (Richa Lakwal 2013).

Many plants thrive on waste land. Thus the utilization of waste land as well as there is no additional cost or effort required to grow it (Ashish Kumar 2007). Also provides job opportunities for all those engaged in cultivation, aggregation, extraction and application of these dyes on textile / food / leather etc. (Richa Lakwal 2013).

Hence worldwide growing consciousness about organic value of eco-friendly products, environmental awareness as well as presence of toxicity in the synthetic dyes, growing awareness about ecosystem of life, respect towards ecology, has revived the interest in the renewable, biodegradable and eco-friendly natural dyes (Training manual 2011). Natural dyes are usually

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moth proof and can replace synthetic dyes in kid's garments and food stuffs for health and safety (Richa Lakwal 2013).

Natural dyes are being preferred over the synthetic dyes because they exhibit biodegradability and compatibility with the environment.Due to all these advantages and benefits, the demand and awareness towards use of textiles dyed with natural dyes i.e. green dyes or eco-dyes has been increasing constantly.

Ficus benghalensis l.

From the family Moraceae, common name **Banyan tree** Ficus benghalensis is the national tree of the Republic of India. The leaves are large, leathery, glossy green. Bark, root-fibers, leaves, seeds, milky juice (i.e. latex) are useful parts.

According to Ayurveda, it is astringent to bowels; useful in treatment of biliousness, ulcers, erysipelas, vomiting, vaginal complains, fever, inflammations, leprosy. According to Unani system of medicine, its latex is aphrodisiac, tonic, vulnerary, maturant, lessens inflammations; useful in piles, nose-diseases, gonorrhea etc. The aerial root is styptic, useful in syphilis, biliousness, dysentery, inflammation of liver etc. (Pankaj Oudhia).

MATERIALS & METHODS

MATERIALS

Dye Source

The bark of Ficus benghalensis L. was collected from Nagpur city and nearby area.

Substrates

Desized and bleached (white) mulberry silk fabric was used.

Mordants and chemicals

For pre-treatments myrobolan and Alum and Copper sulphate mordants were used.

METHOD

Preparation of fabric

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For degumming of silk, neutral soap 10% (owf) and soda ash 1% (owf)were used. The M: L ratio was 1:30, mixed in water, and brought to boil, material was treated for 30 min, removed, rinsed and shadow dried.

Pre-treatment (Myrobolan treatment)

Myrobolan was heated at 80°C for 30min, filtrate was used for pre-treatment. Samples were worked for 60min the ratio (M: L) was 1:20, removed, padded, drip dried (without washing)

Mordanting (pre-mordenting)

The proportion of mordents were

Weight of sample- 10 gm

Alum - 20%

Copper sulphate - 5%

Procedure for alum

Clear solution was prepared, with 100 ml of water, the sample was dipped in it for 40min. removed, drip dried.

Procedure for copper sulphate

0.5 gm copper sulphate was dissolved in 100 ml of hot water. Samples soaked in it for 30 min. with continuous handling, removed, rinsed, drip dried.

Preparation of Dye extraction

For dye extraction, aqueous extraction method was used.

Extraction procedure

Optimization of dyeing parameter processes were carried out

A. Optimization of dye material concentration:

B. Optimization of extraction time:

C. Optimization of pH of dye solution:

Preparation of dye extraction of ficus benghalensis plant

With 80% (owf) dye material the dye extraction was prepared by keeping M: L ratio 1:20, strained, through nylon mesh, care was taken.

Actual Dyeing - 2gm

The dyeing of silk samples was carried out for 60 min. M: L ratio was 1:30; samples were removed squeezed and rinsed properly.

After treatments

Soaping and Rinsing after treatments were carried out.

VALUE ADDITION TECHNIQUE

Kalamkari paintings was carried out with dyes extracted from Ficus benghalensis with 'kalam' on silk fabric.

The steps involved were

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Preparation of fabric

De-gumming,

Myrobolan treatment

Milk Treatment

The pretreated fabric was dipped in creamed raw milk for four hours with continuous handling. Squeezed, pad dried.

Preparation of 'kalam' of Kalamkari

The pointed kalam for outlines or fine work and the flat end kalam for filling of the design were used.

Preparation of colors for painting

For black kasim was used and the other were extracted colors (dye) .

Preparation of mordants for kalamkari painting

Diluted alum and copper sulphate solutions were prepared with boiling in water

Actual painting procedure

Preparation of fabric for designing

Myrobolan treated fabric was stretched on table.

Application of black kasim on silk fabric

Black kasim was applied to the outline of design.

Mordanting

Mordan's, extracted diluted solutions were applied to the fabric.

Application of colors on silk fabric

Colors were applied to the desired mordented area.

After treatment

Steaming was carried out for fixation of dyes. Washed with cold water and shadow dried.

Assessment of color fastness properties

Four color fastness properties tests were carried out viz. to washing, to perspiration, to rubbing (crocking) and to sunlight. All testing were done by **Regional Laboratory, Textile Committee, (Ministry of Textiles, Govt. of India), Textile testing services, quality cell, Hyderabad.**

Assessment for anti microbial properties:

Dye was subjected to screen their antimicrobial activity.

RESULT AND DISCUSSION

Aqueous extract of ficus benghalensis.l. was found to discharge colour in hot water very easily. Increasing the quantity of barks is accompanied with the increase in colour strength and

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depth in colour.

The dye extract was found to be suitable for silk fabric .It was observed that, the dye uptake was found to be good in pre-treated, pre mordented method.

Fastness Properties

Dyed silk showed good fastness properties. It can be used for commercial purposes.

The dye of Ficus benghalensis showed **good antimicrobial activity.**

Anti microbial activity shown by the dye sample and standard

Micro-organism Taken	Activity shown	
	Control (DMSO)	Ficus benghalensis
S. aureus (gram+)	+++	+++++
E. coli (gram -)	+++	+++++

Score Card

SCALE / RATING	COLOUR CHANGE	STAINING
5	EXCELLENT	NO STAINING
4	GOOD	SLIGH STAINING
3	FAIR	NOTICABLE STAINING
2	POOR	CONSIDERABLE STAINING
1	VERY POOR	EXTENSIVE STAINING

Colour obtained from Ficus benghalensis wood extract with mrodants.

Mordants / combinations	Coding	Color obtained
Myrobolan + Alum	MAFB	Bronze
Myrobolan + Copper sulphate	MCSFB	Carmel custard

pH determination

The pH observed was 5.7 ± 0.1 at room temperature.

Rating for color fastness to washing at 40°C

Mordant	Dye	CC	Son S/c.
Alum	FB	3-4	4-5/4-5
Copper sulphate	FB	4	4-5/4-5

CONCLUSION

The dye obtained from ficus benghalensis l. can be a good source of textile dye and helps to reduce the consumption of more harmful synthetic dyes and has a potential to replace some of the allergic, toxic and carcinogenic dyes. The dye can be used for any type of traditional as well as contemporary painting or printing style.

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Rating for colour fastness to perspiration

Mordant	Dye	Acidic		Alkaline	
Alum		CC	CS	CC	CS
	FB	4	4-5	5	4-5
Copper sulphate	FB	4-5	3-4	4-5	3-4

Rating for color fastness to rubbing.

Mordant	Dye	Dry rubbing	
		Warp	Weft
Alum	FB	3-4	3
Copper sulphate	*FB*	*4*	*3*

Rating for colorfastness to light (Blue wool rating)

Sr. No.	*Mordant*	*Dye*	*Rating*
1.	*Alum*	*FB*	*5*
2.	Copper sulphate	FB	5

Alum + Fb (Kalamkari).

1.	Colour fastness to washing Change in colour Staining in cotton / silk	 4 4-5/4-5
2.	Color fastness to perspiration Acidic – change in color Staining in cotton / silk Alkaline – Change in color Staining on cotton / silk	 4 4-5/4 4 4-5/4
3.	Color fastness to rubbing Dry (Warp / Weft)	 3/3
4.	Color Fastness to light Blue wool rating	4-5

Kalamkari painting with dye extracted from ficus benghalensis l.

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Copper sulphate + Fb (Kalamkari)

1.	Color fastness to washing Change in color Staining in cotton / silk	 4 3-4/3-4
2.	Color fastness to perspiration Acidic – change in color Staining in cotton / silk Alkaline – Change in color Staining on cotton / silk	 4 3-4/3-4 4 3-4/3-4
3.	Color fastness to rubbing Dry (Warp / Weft)	 3/3
4.	Color Fastness to light Blue wool rating	 4-5

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