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Kalmkari – An Eco-friendly Approach for Sustainable Fashion Development

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ABSTRACT: India has the distinction of being the treasure of varied traditional craft. Kalamkari is one of the oldest exquisite arts of painting and printing using natural dyes on textiles. In this era of green minded consumer, Kalamkari can prove as one of the fabulous styles of surface design, which involves the use of vegetable dyes.

The present work has been carried out to study, explore, analyze and evaluate distinct herbal dye sources such as *Buchanania cochinchinensis* (Lour) Almeida, *Tecomella undullata* (Sm.) Seem, *Syzygium cumini* (L.) skeels, *Nyctanthes arbor* – tristis Linn., *Lagerstomia reginae* Roxb. in colour palette of the conventional dye sources.

Painted kalamkari samples were subjected to wash, rub and sunlight fastness and were assessed in terms of colour change. Moderate to very good fastness was found.

Key words: Kalamkari, Vegetable dyes, *Buchanania cochinchinensis* (Lour) Almeida, *Tecomella undullata* (Sm) Seem, *Syzygium cumini* (L.) skeels, *Nyctanthes arbor* – tristis Linn., *Lagerstomia reginae* Roxb.

I. INTRODUCTION

India is the treasuretrove of most exquisite handicraft. The connoisseurs of the world have always coveted Indian textiles. The people from entire world are turning away from hazardous chemical dyes because of the increased environmental awareness. There is a strong urge of eco-friendly, harmless naturally dyed textiles. Kalamkari – The immemorial and an ancient art from Andhra Pradesh where, vegetable dyes are used for surface designing, giving a touch of sophistication to the fabric.

Folk paintings, which utilize natural dyes, like Madhubani paintings, Pata-chitra, Ajarakh and Kalamkari can make a fashion catalogue with eco-lable for the green minded consumer Kalamkari, the ancient art has been performed with limited conventional dye sources. Therefore, the present study was aimed to add in colour palette by using some less popular dye sources.

Buchanania cochinchinensis (Lour) Almeida, (Anacardiaceae) is an evergreen tree of up to 15 m. height found throughout the drier parts of India, Burma, Cambodia – China and Thailand. It is a well known drug of Ayurveda. Gum is used in diarrhoea and intercostals pains. (Chatterjee A. & Pakrashi S.C. 1997).

Tecomella undulata D. Don. (Bignoniaceae) is a deciduous or nearly evergreen tree of arid regions. It occurs on flat and undulating areas. Distribution is restricted to drier part of Northwest India. Bark contains lapactiol which is a known elicitor of contact dermatitis. It is also used as a remedy for syphilis.

Syzygium cumini (L.) Skeels (Myrtacae) is a very common, large, beautiful and evergreen tropical tree 50 to 100 ft tall, found along river banks and moist localities. It is distributed throughout India. Fruits are edible, astringent used in bilious diarrhea. Seeds are hypoglycemic and allay thrust. Formulated fruit juice is diuretic and carminative, used in diabetes (Chatterjee A, & Pakrashi S.C. 1997)

Nyctanthes arbor-tristis (L.) Oleaceae is a common wild shrub growing throughout the country. It is cultivated in many parts of India. Commercially the flower stalks are used as substitute of saffron (Chatterjee A, & Pakrashi S.C.1997).

Laqerstromia reginae Roxb. (Lythraceae) is a tropical woody ornamental tree with attractive flowers. It grows wild; also planted as ornamental.

II. MATERIALS AND METHODS

100% gray cotton was used as textile substrate. *Buchanania cochinchinensis* (Lour) Almeida. (Anacardiaceae) gum, *Tecomella undulta* D. Don (Bignoniaceae) leaves, *Laqerstromia reginae* Roxb. (Lythraceae) leaves, *Nyctanthes arbor- tristis* L (Oleaceae) bark and syzygium cumini (L.) Skells (Myrtaceae) fruits were used as dye source.

All three types of mordant's i.e. vegetable, metal and chemical were tried. Pomegranate rind (*Punica granatum* Linn.), babul bark (*Acacia arabica* Linn.) and baby harda fruits (*Terminalia Chebula* Linn.) were selected as vegetable mordants. Kasim karam (Iron filling and jaggary) and Alum were used as metal mordants, while sodium hydroxide used as chemical mordant. For extraction of gum of *Buchanania cochinchinensis* (Lour) Almeida, bark of *Nyctanthes arbor – tristis,* and leaves of *Lagersrtomia reginae* were dried & powdered 5 gms of powder was soaked for 24 hours in 100 ml of water and then heated for 30 minutes at 40^0C, on water bath, filtered and filtrate used as dye source. 5 gms dried and powdered leaves of *Tecomella undulata* were soaked for 24 hours in 100 ml of water. Extraction was carried out for 60 minutes at 40^0C, volume maintained by adding water, filtered and filtrate used for dyeing. 100 gms of fresh fruits of syzygum cumini were macerated and seeds removed to the pulp 100 ml of water was added and heated at 40^0C for 30 minutes, filtered & filtrate use as dye.

A. Preparation of Stock solution from mordants

2 gm of selected vegetable mordants were soaked for 12 hrs in 25 ml of water each, then boiled for 2 minutes and sieved to remove the residue. 2 gm of alum was dissolved in 25 ml boiling water. Kasimkaram (Black solution) was use to get black colour.

B. Pretreatment with Harda

100 gm Harda powder was soaked in water for 24 hrs and then homogenized with 1 lit of buffalo milk. This mixture was used for pretreatment of scoured grey cotton. Selected designs were traced. Dyes extracted were mixed with mordant solution in definite proportion. Table 1 shows the ratio of dye: mordant and colour range produced.

Table 1: Preparation of Colour Range from Selected Dye Sources.

Dye Source	Dye extract & Mordant mixtures	Ratio (ml) Dye:Mordant	Colour range	Colour range produced
B. lanzan	Bl + Sodium hydroxide		Bl	Chocolate brown
T. undulata	Tu + alum	50:2.5	Tu 1	Yellow ochar
	Tu + alum + babul bark	50:2.5:2.5	Tu2	Orange yellow
	Tu + alum + babul bark	50:2.5:0.5	Tu3	Orange yellow
	Tu + kasimkaram	50:2.5	Tu4	Wood brown
	Tu + kasimkaram	50:5	Tu5	Brown
S. cumini	Sc + alum + kasimkaram	50:2.5:5	Sc1	Greenish gray
	Sc + alum + anarchal + Na	50:2.5:2.5:5	Sc2	Tone of yellow
	Sc + alum + Na + anarchal + kasimkaram	25:2.5:10:2.5:1.5	Sc3	Tone of brown
	Sc + alum + anarchal + kasimkaram	50:5:10:1	Sc4	Tone of green
N. arbor tristis	Na + alum + kasimkarm	50:2.5:0.5	Na	Wood yellow
L. reginae	Lr + anarchal	50:10	Lr1	Tone of yellow
	Lr + kasimkarm	50:2.5	Lr2	Tone of brown
	Lr + babul bark	50:5	Lr3	Brown

C. Kalamkari Painting

As the name implies 'Kalam' made of bamboo stick was used in filling the selected traditional designs traced on cotton fabric. To fill the various forms of design; colour and different shades were prepared by using mordants along with the dye extracted from the selected dye sources.

III. RESULTS AND DISCUSSION

Out of five vegetable dyes selected for present study, only *Nyctanthes arbor- tristis* is traditionally used as dye source (Anonymous 2000, Siva 2007, Bhatnagar 2008) *Syzygium cumini* has been used as a textile dye (Mahanta and Tiwari 2005) while rest of the three sources are exploited for the first time as dye. However use of all dyes for Kalamkari is the first effort of its type. Here an attempt is also made to standardize the ratio of dye and mordant/s for colour range.

A. Washing fastness

From Table 2 it is clear that the results obtained from *Buchanania cochinchinensis* (Lour) Almeida (Bl) rated moderate fastness towards washing. Range of colours orange and brown imparted by *Tecomela undulata i.e.* Tu1, Tu2 and Tu5 rated good fastness, where as Tu4 rated excellent wash fastness, and Tu3 rated fairly good fastness. Fastness varies with the change in mordant used. Range of colour obtained with *syzygium cumini* has very good fastness while using Sc1, Sc2, Sc3, on cotton and Sc4 rated fairly good fastnes. *Nyctanthes orbortristis* painted cotton rated good fastness when subjected to washing. Range of colours produced with *Laqerstomia reginae* in combination with vegetable mordants rated to excellent colour fastness towards cotton painted with Lr2, Lr3 and Lr1 respectively.

Table 2: Determination of colour fastness to Washing, Rubbing and Sunlight.

Colour Obtained	Range of Colour obtained	Washing	Sunlight	Rubbing	
				Dry	Wet
Chocolate brown	B1	3	4	5	5
Yellow OChar	Tu1	4	4/5	4/5	4/5
Orange yellow	Tu2	4	4/5	4/5	4/5
Orange yellow	Tu3	3/4	4/5	4/5	4/5
Wood brown	Tu4	5	5	4/5	4/5
Brown	Tu5	4	4/5	4	4
Greenish gray	Sc1	4/5	4/5	4	4
Tone of yellow	Sc2	4/5	4	4/5	4/5
Tone of brown	Sc3	4/5	4/5	4/5	4/5
Tone of green	Sc4	3/4	4	4/5	4/5
Wood yellow	Na	4	5	4	4/5
Tone of yellow	Lr1	5	5	4/5	4/5
Tone of brown	Lr2	4/5	5	4	4
Brown	Lr3	4/5	4/5	4/5	4/5

B. Sunlight fastness

Painted fabric rated good for B1, as a natural colourant. Very good fastness was found for the Tu1, Tu2, Tu3 and Tu5 where as it was rated excellent for Tu4. Allmost all painted sample showed very good fastness when *Syzygium cumini* was used as a colour source. *Nyctanthes arbortristis* painted cotton rated excellent light fastness towards wood yellow colour. Colour extract of *Lagerstomia reginae* leaves rated excellent to very good fastness towards Lr1, Lr2 and Lr3 respectively.

C. Rubing fastness

Buchanania cochinchinensis (Lour) Almeida gum produced chocolate brown colour which rated excellent dry and wet rubbing fastness to painted fabrics.

Range of yellow and brown i.e. Tu1, Tu2, Tu3, Tu4 produced with *Tecomela undulata* showed very good dry and wet rubbing fastness. Except Tu5 which rated good fastness. Table also represents the wash fastness of cotton painted with *Loqerstromia reginae* yellow and brown produced which rated good to very good fastness.

IV. CONCLUSION

The present work aims to highlight the revival and promotion of the ancient art. Kalamkari by using less popular and new vegetable sources for painting. Taking the global environmental awareness into consideration vegetable mordants such as Babul bark, Anar Chal and Alum was used. Result show that vegetable mordants can be successfully used as substitute for metal and chemical mordants. Vegetable dyesources and mordants yielded variety of colours and shades. The colours when used for kalamkari on cotton showed good to excellent fastness. Hence the dye sources can be explored commercially to design interesting value added fashion products.

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