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DYE YIELDING PLANTS OF MALABAR REGION, KERALA: A CASE STUDY

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ABSTRACT

Indians have been considered as forerunners in the art of natural dyeing. Natural dyes find use in the colouring of textiles, drugs, cosmetics, etc. Owing to their nontoxic effects, they are also used for colouring various food products. Although indigenous knowledge system has been practiced over the years in the past, the use of natural dyes has diminished over generations due to lack of documentation. A survey has been done along Malabar region of Kerala on the folk use of dye yielding plants and also its medicinal value. Total number of dye yielding species recorded is 80. The major identified dye yielding plants are *Alpinia galanga* Willd. (Zingiberaceae), *Terminalia chebula* Retz. (Combretaceae), *Woodfordia furticosa* Kurz. (Lythraceae), *Morinda citrifolia* Linn. (Rubiaceae), *Clitoria ternatea* Linn. (Fabaceae), *Butea monosperma* Taub. (Fabaceae), *Butea superba* Roxb. Ex Willd. (Fabaceae), *Ventilago denticulata* Willd. (Rhamnaceae), *Nyctanthes arbor-tristis* Linn (Oleaceae) and *Tectona grandis* Linn.f (Verbenaceae). The dyeing parts of the plants are used by the local communities ethnic practices and also as food colourant. However, it is a matter of concern that the indigenous knowledge of extraction, processing and practice of utilization of natural dyes has now diminished due to easy availability of economically cheaper synthetic dyes. It is high time for the proper documentation and conservation of these natural dye yielding plants for future

use. Thus, the study emphasize that these economically important dye-yielding plants need to be screened based on traditional ethnic knowledge to unravel its economic importance.

Keywords: Ethnic communities, traditional knowledge, biodiversity conservation, natural dyes, synthetic dyes

INTRODUCTION

India is a country with large, diverse ethnic societies and also rich in biodiversity. There are 45,000 species of wild plants out of which 9,500 species are reported as ethnobotanically important species [1]. Of these 7,500 species are in medicinal use including indigenous health practices. About 3,900 plant species are used by tribals as food (root and tubers, leafy vegetables, bulbs and flowers, fruits), fiber, fodder, and other species are used for extraction of gum, resins, dyes and perfume [2].

Kerala holds a unique position in the tribal map of India. Scheduled Tribe population in Kerala constitutes 1.10% as per the 1991 census report. There are forty eight tribal communities throughout the State, out of which thirty eight were scheduled tribes and the rest comprises denotified tribal communities. Among the tribal communities in Kerala, the most numerically dominant are Paniyas (45,562), Maratis (17,556), Malayarayans (13,813), Kuravans (15,116), Kurichians (15,700) and Erulas (14,856). Every district in Kerala has some tribal

population and settlements. They are found significantly in the districts of Wayanad, Kannur, Kozhikode, Palakkad and Idukki (Malabar region) [3]. These districts comprise high tribal colonies compared to other districts in Kerala. The general name for tribes in Travancore-Cochin area is 'Kattujathi' and in Malabar 'Kattukuruman'. The tribals of Malabar region use plants for the extraction of herbal dyes for various traditional, aesthetic, special life styles, culture, customs, traditions and religious practices especially for theyyam and thira during festivals.

From time immemorial, natural dyes produced from plants, animal or microbial sources have been used for imparting different hues. Nature has gifted with more than 500 dye yielding plants. The most important Indian natural dye Indigo is as old as textile industry. But due to lack of documentation the use of natural dye have been diminished. History reveals that Chinese have been using dyestuffs even before 2600 BC but by mid 1800 natural

dyes were replaced by synthetic substitutes [4]. By early 20th century only limited percentage of natural dyes were extracted. Currently, there has been an increase in demand for herbal dyes as consumers become aware of ecological and environmental problems related to synthetic dyes. The most commonly used herbal parts used for extracting dyes are seeds, flowers, leaves, berries, stem, barks and roots. Colour depends on the part of the plant and the shades may vary upon season and extraction protocols [5].

Herbal dyes require mordant that help to attach dye to the fiber. Mordant may be metallic salts of aluminium, iron, chromium or copper. Herbal dyes suit best with natural fiber of cotton, linen, wool, silk and jute [6]. Cotton dyeing needs complex process of pre-treatment before it absorbs any dye (exception indigo). On the other hand wool or silk fibers absorb quite easily [7].

Unfortunately, this indigenous knowledge of using herbal dyes or its documents has almost vanished even from the tribals. Thus, the present study is an attempt to survey natural dye yielding plants along North Malabar region of Kerala and its on the traditional use.

MATERIAL AND METHODS

The preliminary survey was made in different tribal settlement areas and rural areas of the North Malabar region of Kerala especially in Kozhikode, Kannur and Kasaragod. Traditional knowledge and various ethnobotanical knowledge were recorded during the study to collect the natural dye yielding plants and its identification using flora. Collected plant specimens were deposited in the Department of Botany herbarium, University College, Trivandrum and planted in the Malabar Botanic Garden, Kozhikode. The ethnic knowledge related with 90 dye yielding plants species were documented from tribals of North Malabar region especially used by Kattukuruman tribals (Table 1)

RESULTS

In the study, 80 dye yielding plants prevalent among the Kattukuruman tribals of North Malabar region of Kerala have been documented (Fig. 1). Among the 90 plant species documented some of them are commonly used by the tribals for various cultural, traditional practices and for the production of blue, red, yellow, black, brown and grey colours. Most of the documented species belongs to families of Monocotyledons and Dicotyledons. These plants have been used to dye silk, cotton,

woolen yarns and also for colouring food. Additional items like slake lime and alum are frequently used to get required shade of a particular dye and/ or to make a dye fast or light and for longitivity of the natural dye in the clothes. Remarkable dye yielding plants, family, parts used and colour obtained have been enumerated in Table 2.

Blue dyes

The colour index lists only three herbal blue dyes, among them the most viable choice is the blue natural dye 'Indigo'. The current demand for Indigo in India priced around \$ 20 million. The main constituents of Indigo are indigotin and indirubin. Synthetic indigo is also available, however natural indigo possess higher affinity and better fastness than synthetic indigo. Flower of *Clitoria ternatea* Linn. (Fabaceae) yields the blue dye which is used for printing 'Patchitra' by the tribals. Roots of *Clitoria ternatea* are used by the tribals to cause abortion and also useful against burning sensation, leprosy and dry cough. The fruits and shoots of *Annona reticulata* is used by the tribals to produce bluish black coloured dye. Indigo yielding glucoside is a major constituent of *Wrightia tinctoria* seeds and leaves that causes blue colouration. *Jatropha curcas*, *Nymphaea alba* and *Commelina benghalensis* are some

of the other blue dye yielding plants.

Red dyes

32 red natural dyes are available according to the colour index list of herbal dyes. The most prominent among them are *Rubia cordifolia*, *Caesalpinia sappan*, *Morinda citrifolia*. Red dye obtained from plants is based on anthroquinone molecules. The dye is extracted by mere boiling in water. Flowers of *Woodfordia furticosa* Kurz (Lythraceae) yields a brick red dye which is used for colouring rope materials and cloths by the ethnic communities. They give flower decoction with honey against various diseases. *Morinda citrifolia* roots yield a dark red dye known as Al dye. The morindone pigment present in the dye, which is used for colouring cotton cloth and other printing materials. Stem and root bark is a source of red dye 'ventilagin' obtained from *Ventilago denticulata* is used for colouring mordanted cotton, wool and tasar silk. Similarly, various parts of *Anacardium occidentale* (pericarp), *Bauhinia purpurea* (flowers), *Madhuca indica* (bark), *Lawsonia alba* (leaves) and *Naregamia alata* (leaves) are used by the ethnic tribals as a source of red dye.

Yellow dyes

Yellow is the most common colour in the

natural dyes. The colour index lists 28 yellow dyes. Some of the important yellow dyes are obtained from *Butea monosperma* and *Curcuma longa*. The main colouring pigment in *Butea monosperma* is butein. Flowers of *Butea monosperma* and *Butea superba* yield brilliant yellowish orange dye, which is used for colouring the clothes and other decorative purposes. Corolla tube of *Nyctanthes arbor-tristis* Linn (Oleaceae) contains an orange colouring pigment 'nyctathin', which is used for colouring silk; also useful in printing purposes. The ethnic people use the crushed leaves of *Tectona grandis* to obtain the deep orange dye, which is used in the making 'patchitra' which is also suitable for dyeing silk and wool. The leaves of *Adhatoda vasica* are rich in the pigment: 2-pyridyl methyl amine causing yellow colouration. *Aegle marmelos*, *Michelia champaka* and *Alpinia galanga* yields yellow dye from the rind, rhizome and roots respectively.

Black, Brown and Grey dyes- Tannins

Tannins are phenolic compounds, the most important ingredients in the dyeing process with natural dyes producing yellow, brown, grey and black colours. They also modified the affinity of fibers towards different dyes. However the treatment with tannins makes

dyeing dull and they form natural mordants. Heart wood, root and branches of *Acacia catechu* is rich in catechin and catechautanic acid and yield is brown or black in colour. The fruits of *Emblica officinalis*, *Mimusops elengi*, *Melastoma malabathricum*, *Ziziphus mauritiana*, *Terminalia arjuna* are some of the natural mordant yielding plants that produce black or brown colouration in fibers.

DISCUSSION

India is known to possess more than 450 taxa that yield herbal dyes. Among them 50 are considered as most important and they possess various medicinal properties [5]. Genetic variations in dye content in *Bixa orellana* is also reported by Siva and Krishnamurthy [8]. Natural dye yielding plants and its ethnic knowledge from the tribals in Achanakmar-Amarkantak Biosphere reserve of Chhattisgarh was documented as an initial step to conserve ethnic knowledge [9]. An extensive survey of dye yielding plants of Garhwal Himalaya reported 46 plants of different families. The study is an aid to the availability, extraction of natural dyes from the selected plants and its application textile making [10].

CONCLUSION

The use of herbal dyes started to decline gradually after the usage of synthetic dyes.

The major reason for the decline in the utility of natural dye is due to the difficulty in getting raw materials or lack of vision and ignorance of the traditional knowledge. However, natural dye is costly but user friendly. It may lead to employment generation among tribals. If serious efforts are taken then natural dyes can add a boon to the textile industry which markets its products to the Western countries. Thus, natural dyes are ideal than synthetic dyes and in future the production and applications of herbal dyes in industries can be increased using modern technological development.

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Table 1: List of natural dye yielding plants used by the kattukuruman tribals of North Malabar region

Sl.no.	Binomial	Family
1.	<i>Acacia catechu</i> Willd. var. <i>sundra</i> Train	Fabaceae
2.	<i>Acacia nilotica</i> (Linn.) Delile syn. <i>A. arabica</i> Willd.	Fabaceae
3.	<i>Adenantha pavonina</i> Linn.	Fabaceae
4.	<i>Adhatoda vasica</i> Nees	Acanthaceae
5.	<i>Aegle marmelos</i> Correaex Roxb.	Rutaceae
6.	<i>Aloe vera</i>	Liliaceae
7.	<i>Alpinia galanga</i> Willd.	Zingiberaceae
8.	<i>Althaea rosea</i> Cav.	Malvaceae
9.	<i>Anacardium occidentale</i> Linn.	Anacardiaceae
10.	<i>Annona reticulata</i> Linn.	Annonaceae
11.	<i>Antigonon leptopus</i>	Polygonaceae
12.	<i>Azadirachta indica</i>	Meliaceae
13.	<i>Bauhinia purpurea</i> Linn.	Fabaceae
14.	<i>Bixa orellana</i> Linn.	Bixaceae
15.	<i>Bougainvillea glabra</i> Choisy	Nyctaginaceae
16.	<i>Butea monosperma</i> (Lam.) Kuntze	Fabaceae
17.	<i>Butea superba</i> Roxb.	Fabaceae
18.	<i>Caesalpinia pulcherrima</i>	Fabaceae
19.	<i>Caesalpinia sappan</i> Linn.	Fabaceae
20.	<i>Cassia auriculata</i>	Fabaceae
21.	<i>Cassia fistula</i> Linn.	Fabaceae
22.	<i>Cassia tora</i> Linn.	Fabaceae
23.	<i>Casuarina equisetifolia</i> Forst.	Casuarinaceae
24.	<i>Chukrasia tabularis</i> A. Juss.	Meliaceae
25.	<i>Cinnamomum verum</i>	Lauraceae
26.	<i>Citoria ternatea</i>	Fabaceae
27.	<i>Clerodendron infortunatum</i>	Lamiaceae
28.	<i>Commelina benghalensis</i> Linn.	Commelinaceae
29.	<i>Cryptostegia grandiflora</i>	Periplocaceae
30.	<i>Curcuma longa</i> Linn.	Zingiberaceae
31.	<i>Curcuma zedoaria</i> Rosc.	Zingiberaceae
32.	<i>Dalbergia latifolia</i>	Fabaceae
33.	<i>Delonix regia</i>	Fabaceae
34.	<i>Dipterocarpus</i> spp.	Dipterocarpaceae
35.	<i>Dodonaea viscosa</i>	Sapindaceae
36.	<i>Eclipta prostrata</i>	Asteraceae
37.	<i>Euphorbia tirucalli</i>	Euphorbiaceae
38.	<i>Garcinia xanthochymus</i>	Guttiferae
39.	<i>Hamelia patens</i>	Rubiaceae
40.	<i>Hemigraphis alternata</i>	Acanthaceae
41.	<i>Impatiens balsamina</i> Linn.	Balsaminaceae
42.	<i>Indigofera tinctoria</i> Linn.	Fabaceae

	<i>Jatropha curcas</i> L.	Euphorbiaceae
44.	<i>Lagerstroemia indica</i>	Lythraceae
45.	<i>Lawsonia inermis</i> Linn.	Lythraceae
46.	<i>Madhuca indica</i> J. F. Gmel.	Sapotaceae
47.	<i>Mallotus philippensis</i> Muell.- Arg.	Euphorbiaceae
48.	<i>Mangifera indica</i> Linn.	Anacardiaceae
49.	<i>Melastoma malabathricum</i> L.	Melastomaceae
50.	<i>Morinda citrifolia</i> Linn.	Rubiaceae
	<i>Nerium oleander</i> L.	Apocynaceae
52.	<i>Nyctanthes arbor-tristis</i> Linn.	Oleaceae
53.	<i>Nymphaea alba</i> Linn.	Nymphaeaceae
54.	<i>Osbeckia aspera</i> (L.) Blume.	Melastomaceae
55.	<i>Osbeckia minor</i>	Melastomaceae
56.	<i>Phyllanthus emblica</i> L.	Euphorbiaceae
57.	<i>Plumbago zeylanica</i>	Plumbaginaceae
58.	<i>Prunus persica</i> Batsch.	Rosaceae
59.	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae
60.	<i>Pterocarpus santalinus</i> L.f.	Fabaceae
61.	<i>Punica granatum</i> Linn.	Punicaceae
62.	<i>Rauvolfia tetraphylla</i> L.	Apocynaceae
63.	<i>Tradescantia spathacea</i> Sw.	Commelinaceae
64.	<i>Rubia cordifolia</i> Linn.	Rubiaceae
65.	<i>Rubia tinctorum</i> Linn.	Rubiaceae
66.	<i>Rubus fruticosus</i> Linn.	Rosaceae
67.	<i>Sesbania grandiflora</i> (L.) Poir.	Fabaceae
	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae
69.	<i>T. patula</i> Linn.	Asteraceae
70.	<i>Tagetes erecta</i> Linn.	Asteraceae
71.	<i>Tectona grandis</i> Linn. f.	Verbenaceae
72.	<i>Terminalia arjuna</i> (Roxb.)Wight & Arn.	Combretaceae
73.	<i>Terminalia chebula</i> Retz.	Combretaceae
74.	<i>Thespesia populnea</i> (L.) Soland.	Malvaceae
75.	<i>Thunbergia grandiflora</i> (Roxb. Ex Rottl.) Roxb.	Acanthaceae
76.	<i>Ventilago maderaspatana</i> Gaertn.	Rhamnaceae
77.	<i>Vitex negundo</i> L.	Verbenaceae
78.	<i>Woodfordia fruticosa</i> Kurz .	Lythraceae
79.	<i>Wrightia tinctoria</i> R. Br.	Apocynaceae
80.	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae

Table 2: Important dye yielding medicinal plants of North Malabar region

Sl. No.	Plant name	Family	Dyeing parts	Colour obtained
1	<i>Alpinia galanga</i>	Zingiberaceae	Root	Yellow brown
2	<i>Annona reticulata</i>	Annonaceae	Fruits and shoots	Bluish black
3	<i>Butea monosperma</i>	Fabaceae	Flowers	Brilliant yellowish orange
4	<i>Butea superba</i>	Fabaceae	Flowers	Yellowish orange
5	<i>Caesalpinia sappan</i>	Caesalpinaceae		
6	<i>Clitoria ternatea</i>	Fabaceae	Flower	Blue dye
7	<i>Emblica officinalis</i>	Euphorbiaceae	Fruits	Brown
8	<i>Jatropha curcas</i>	Euphorbiaceae	Nut	Blue
9	<i>Madhuca indica</i>	Sapotaceae	Bark	Reddish yellow
10	<i>Michelia champaka</i>	Magnoliaceae	Flower	Yellow
11	<i>Mimusops elengi</i>	Sapotaceae	Bark	Brown
12	<i>Morinda citrifolia</i>	Rubiaceae	Roots	Red dye
13	<i>Naregamia alata</i>	Meliaceae	Leaf	Red
14	<i>Nyctanthes arbor-tristis</i>	Oleaceae	Flowers	Orange

15	<i>Tectona grandis</i>	Verbenaceae	Leaves	Deep orange
16	<i>Terminalia chebula</i>	Combretaceae	Fruits	Yellow, dark grey
17	<i>Ventilago denticulata</i>	Rhamnaceae	Stem & root bark	Red dye
18	<i>Woodfordia furticosa</i>	Lythraceae	Flowers	Brick red dye
19	<i>Wrightia tinctoria</i>	Apocynaceae	Seeds and leaves	blue
20	<i>Ziziphus mauritiana</i>	Rhamnaceae	Fruit	Reddish pink

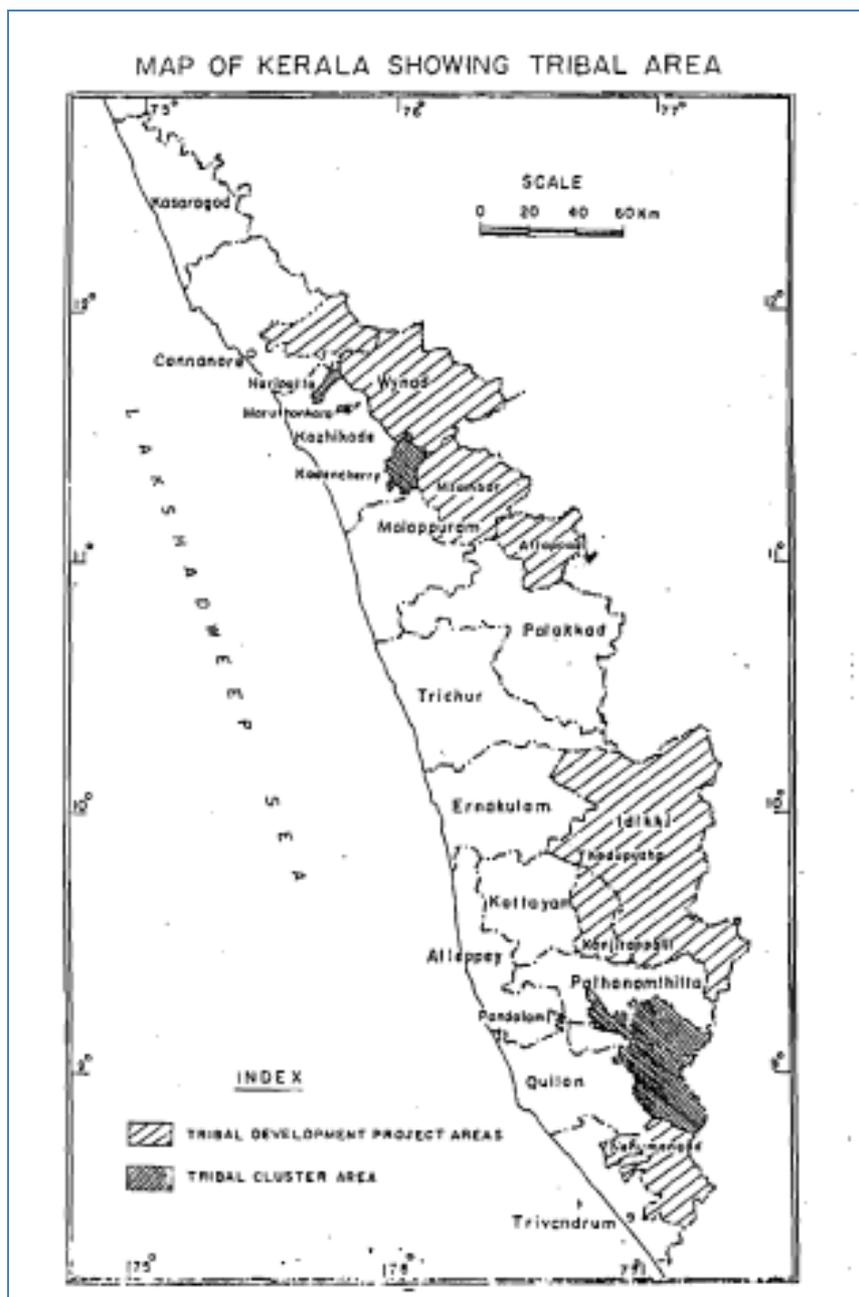


Figure1:Map of Kerala showing tribal area