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SOURCES OF NATURAL DYE - A CRITICAL REVIEW

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Abstract

Most of the synthetic dyes are noticeably found harmful and toxic. When used on textiles they can cause allergy, skin disease, cancer etc. So, there is need to produce natural dyes. Demand for natural dyes has been growing rapidly due to increased awareness on hazardous, toxic and allergic reactions associated with synthetic dyes. Natural dyes are obtained from natural sources such as plants, insects and minerals. Among all the plant based dye sources i.e. bark, leaves, flowers, seeds etc., these dye sources are more important for textile dyeing as all the sources provide dye from the source which is found in abundance but still not fully utilized. This paper reviews the available different dye sources, extraction of coloring components and colors obtained on textile material after dyeing process.

Keywords:

Natural dye;
Colourant;
Mordant;
Floral dye;
Leaf dye.

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1. Introduction

These chemicals used in textile industry are found to be harmful for both human as well as environment. Synthetic dyes suffer from several draw-backs. Some of the synthetic dyes which are even carcinogenic and mutagenic have been banned. In this era of green minded consumer, interest in natural dyes has grown mainly because natural dyes have been shown to possess health-promoting and eco-friendly properties. India is one of the 17 megadiverse countries and there is no doubt that the plant diversity is a treasure-house of diverse natural products. India is the well-known country of colors as it harbours a wealth of various natural resources. The preliminary study on review collection on extraction of dyes from eco-resources revealed that all could serve as promising, alternate resource of natural dye. Different parts of each species, supplemented with different coloring components, have ability to produce different colors on textiles. In the present study, an attempt has been made to provide valuable information on organic dye extracted from natural resources.

Natural dyes:
Natural dyes are obtained from various sources. These dyes can be classified as:

- Plant dyes - Berry, flower, bark, leaf, seed etc.
- Insect dyes – Cochineal and lac.
- Animal dyes – Mollusk, murex snail, cuttlefish and shellfish.
- Mineral dyes – Clay, ochre and malachite.

A vast array of natural colorant exists in the above sources. These colors are exhibited by various colored pigments. Color of the pigment is due to chromophores present in dye yielding plants to display the hue of the color.

Mordants:

Natural dyes require an element to create a bonding between fabric and the dye particle. The mordant is known as the element which aids the chemical reaction that takes place between the dye and the fibre, so that the dye is absorbed. A mordant is used to fix the dye to the fabric and to increase the color fastness.

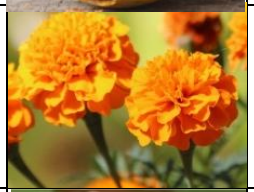
There are three types of mordants:

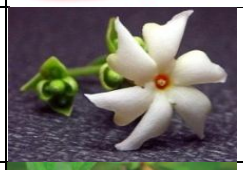
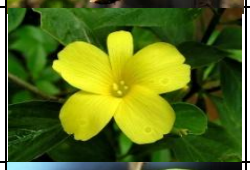
- Metallic mordants- Metal salts of aluminum, chromium, iron, copper and tin
- Tannins – Myrobalan and sumac
- Oil mordants- Turkey red oil

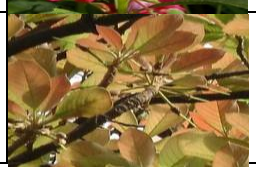
Sources of natural dyes:

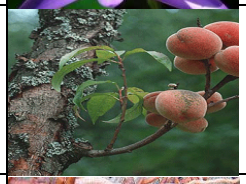
Many natural dyestuff and stains were obtained mainly from plants and dominated as sources of natural dyes, producing different colours like red, yellow, blue, black, brown and a combination of these. Almost all parts of the plants like root, bark, leaf, fruit, wood, seed, flowers, etc. produce dyes[11]. Some important dye yielding plants habitats are given in the following tables.

Table 1: different sources of natural dyes [1-31]

S. No.	Plant	Appearance	Botanical name	Part used	Colour obtained	Textile material	Mordants
1.	Cashew		Anacardiumoccidentale	Pericarp	Light red	Fishing net	Ferrous sulphate, copper sulphate
2.	Sweet Indrajao		Wrightiatinctoria	Seed and leaves	Blue	Eri silk	Copper sulphate, potassium dichromate, ferrous sulphate, stannous chloride
3.	African tulip		Spathodeacampanulata	Flower	Red	Silk and cotton fabrics	Alum, $CuSO_4$, $FeSO_4$, Myrobolan, $SnCl_2$, K_2Cr2O_7
4.	Bel		Aeglemarmelos	Rind of the fruit	Reddish	Cotton and silk	Calico printing without mordanting
5.	African marigold		Tageteserecta L.	Flower	Yellow	Cotton and silk fabrics	Alum, copper sulphate, stannous chloride and ferrous sulphate.
6.	Lac		CoccusLaccae (LacciferLacca Kerr)	Dried bodies of insect	Red	Cotton	No mordant has been used
7.	Bottle brush		Callistemon citrinus	Flower	Purple	Cotton cloth	Copper sulphate and ferrous sulphate

8.	Pink Hollyhock		AlceaRosea	Flower	Green	cotton, silk and wool	Alum, stannic chloride, stannous chloride, Copper sulphate and ferrous sulphate
9.	Saffron		Crocus Sativus Linn	Flower	dark yellow	Pashmina wool	Aluminum sulphate, Stannous chloride and Ferrous sulphate
10.	Pomegranate		Punicagranatum Linn.	Fruit rind	Mustard gray	Wool and silk	Aluminium sulphate , Ferrous sulphate
11.	Night-flowering jasmine		Nyctanthes arbor-tristis	Flower	Brown	Cotton and wool fabric	Alum, Copper sulphate, vinegar and ammonia
12.	Aparajita		Clitoriaternatea	Flower	Blue	Cotton and wool fabric	Alum, Copper sulphate, vinegar and ammonia
13.	Cutch		Acacia catechu	Wood	Reddish brown	Cotton and silk	Calico printing without mordanting
14.	Flame of the Forest		Buteamonosperma	Flower	Yellow	Cotton, silk and wool	Alum, chrome, copper sulphate and ferrous sulphate
15.	Yellow flax		Rein wardtia	Flower	Yellow	Silk	Stannous chloride, ferrous sulphate, Indian gooseberry and babool
16.	Fire Flame Bush		Woodfordiafruticosa	Flower	Yellowish brown	Yarn - Silk, wool, cotton fabrics - cotton, cotton blend	Myrobalan, Ferrous sulphate, Stannous chloride and Potassium dichromate
17.	Henna		Lawsoniainermis L.	Leaves	Red blue green and yellow	Cotton fabric	Copper Sulphate, Ferrous sulphate
18.	Scarlet Cordia		Cordia Sebestena	Flower	Brown	Silk	Myrobolan, nickel sulphate, aluminium sulphate, potassium dichromate, ferrous sulphate, stannous chloride
19.	Purple		Bauhinia	Bark	Purple	Wool yarn	Indian gooseberry

	Orchid Tree		purpurea Linn.				and babool
20.	Cosmos orange		Cosmos sulphureus Cav.	Flower	Yellow, orange, brown	Wool yarns	Alum, Copper Sulphate, Ferrous Sulphate
21.	Gulzuba		Hibiscus mutabilis Linn.	Flower	-	Cotton, wool and silk	Metal mordants
22.	Prince-of-Wales Feather		Amaranthushypochondriacus	Arial part	Red	Silk and wool	Alum, vinegar
23.	Safflower		Carthamustinctorius	Flower	Red and yellow	Wool, silk and food	-
24.	Amaltas		Cassia fistula Linn.	Bark and sandwood	Red	Cotton blends	Alum, stannous chloride
26.	Whistling Pine		CasuarinaequisetifoliaForst.	Bark	Light reddish	Cotton yarn and wool yarn	Used as mordant
27.	Chikrasi		Chukrasiatabularis	Flowers and leaves	Red and yellow	Silk and wool	nickel sulphate, potassium dichromate,
29.	European Lily of the Valley		Convallariamajalis	Leaves and stalk	Green	Cotton fabric	Ferrous sulphate
30.	Garden Balsam		Impatiens balsamina Linn.	Flower	Brown, orange	Wool and silk fabric	Alum and tin
31.	Mahua		MadhucaindicaJ.F.Gmel.	Bark and leaves	Reddish yellow	Cotton and wool yarn	Myrobolan, ferrous sulphate, stannous chloride

32.	Mango		Mangiferaindica Linn.	Bark and leaves	Yellow	Silk	Aluminium sulphate, potassium dichromate, stannous chloride
33.	Great Morinda/Bartundi/ Indian mulberry		Morindacitrifolia	Root and bark	Dull red	Silk	Copper sulphate, nickel sulphate
34.	Nilofar		Nymphaea alba	Rhizome	Blue	Wool yarn	-
35.	Peach		Prunuspersica	Leaves root and bark	-	Cotton	Stannous chloride
36.	Indian Madder		Rubiacordifolia	Root and stem	Reddish brown, light pink	Cotton fabric	Alum, copper sulphate, ferric sulphate
37.	Arjuna tree		Terminaliaarjuna(Roxb.) Wight and Arn.	Bark	Light brown	Silk	Myrobolan, vinegar
38.	ChebulicMyrobalan		Terminaliachebula	Fruits	Yellow, camel yellow and dark gray	Wool	Copper sulphate ferrous sulphate and alum
39.	Teak		Tectonagrandis	leaves	Pink	Cotton and wool fabric	Alum, Copper sulphate, vinegar and ammonia
40.	Stinging Nettle		Urticadioica	Leaves	Green	Silk	Alum
41.	Red creeper		Ventilagomaderaspatana	Root and bark	Chocolate	Cotton and Tassar silk	potassium dichromate, stannous chloride
42.	Lipstick Tree or annatto		Bixaorellana Linn.	Pulp (Arial) surrounding the seeds	Orange yellow	Silk and cotton	-

2. Conclusion

Due to increasing awareness among people about the harmful effects of synthetic dyes, products made from natural materials are gaining popularity. As natural dye shows non-toxic, non-allergic effects and results in less pollution as well as less side effects, it become a thrust area in the field of textile dyeing research. The art of natural dyeing was known to Indians from the Vedic times, but the sudden advent of synthetic dyes has subjugated the interest of scientists in this indigenous dyeing. However the aftermath impact of synthetic dyes has again set the dyers thinking about the various benefits of owing wearable dyed in natural colours. It is also being explored if they could also have some aromatic and medicinal power along with a beautiful vibrant fast colour. The study on review collected on natural dyes is an important step towards documenting these treasures of indigenous knowledge on the utilization of resources of natural dyes. Such review is collection, documentation and analysis of data on valuable resources available for natural dyeing. It focuses on forming strategy for conservation of eco-friendly dye resources.

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