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CLASSIFICATION AND TYPES OF NATURAL DYES: A BRIEF REVIEW

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ABSTRACT

In this paper reviews, the natural dyes are made from plants, animals, minerals and, insects using environmentally-friendly solvents. Dyeing is a complex, specialized science. Nearly all dyestuff is now produced from synthetic compounds. This means that costs have been greatly reduced and certain application and wear characteristics have been greatly enhanced. But many practitioners of the craft of natural dyeing. With the improvement of living standards, everybody is very much conscious about environmental protection and health safety. Natural dyes have attracted more attention to the industry due to exhibiting better biodegradability and more compatibility with the environment. The chapter contains a brief review of natural dyes from their advantages and disadvantages and their classifications and types of natural dyes.

Keywords: Natural dyes, plant dyes, animal dyes, mineral dyes, and insect dyes

INTRODUCTION

Dyes for textile dyeing can be divided into two main categories, natural and synthetic dyes. Since prehistoric times natural dyes is used for coloring food substrate, leather as well as fibers like wool, silk, and cotton. The use of non-allergic, non-toxic, and eco-friendly natural dyes on textiles has become a matter of significant importance due to the increased environmental awareness to avoid some hazardous synthetic dyes. At present synthetic compounds are used for dyeing textile materials and they cause water pollution as well as waste disposal problems because these are non-biodegradable and carcinogenic. These problems can be solved by the use of natural dye. Natural dyes, also known as natural pigments, are mainly derived from plant roots, stems, leaves, flowers, fruits, animals, or natural-colored ores. Natural dyes are colorants obtained from plants, invertebrates, insects, fungi, or minerals. Most natural dyes are vegetable dyes, the main sources of which are various parts of plants such as roots, stems, seeds, barks, leaves, and wood. There are also other biological sources such as fungi, snails, insects, etc. Natural sources were the main source of textile dyes before chemically dyeing. Our ancestors extracted and prepared dyes from these natural sources. Although, all the natural materials can't produce color there are some elements except plants that produce some expensive colors like sea snails, Cochineal insects, etc. Recently, many commercial dyers have started using natural dyes to overcome the environmental damage caused by synthetic dyes. The majority of the plants used for the extraction of dyes are classified as medicinal and

some of these have recently been shown to exhibit the antimicrobial effect. When these dyes were applied to textiles, the antimicrobial properties of these plant dyes contribute to the longer life of the textile materials. All over the world in the formation of different cultures of human beings Color has played an important role. Our lives, the clothes we wear, the furnishings of our homes are strongly influenced by color. If we compared natural dye with synthetic dye then natural dyes are found eco-friendly and they have no carcinogenic or allergic effect for human beings especially for dyers.

OBJECTIVE

The main objective of this paper is therefore to study the application of natural dyes on textiles. To address the main objective the following specific objectives were included; such as identifying the advantages and disadvantages of natural and its classification and types.

HISTORY OF NATURAL DYES

The first natural dye use was found around 2600 BC. Originally, dyes were made with natural pigments mixed with water and oil used to decorate skin, jewelry, and clothing. Back then, natural dyes were used on caves in places such as Spain. Data show that dyeing was done by plants, barks, and insects in China about 5000 years ago. Navajo textile artist Nona bah Gorman Bryan developed a two-step process for creating green dye. First, the Churro wool yarn is dyed yellow with sagebrush, *Artemisia tridentata*, and then it is soaked in black dye after bath. The team of researchers discovered bright pink pigment in rocks taken from deep beneath the Sahara in Africa. The pigment was dated at 1.1 billion years old, making it the oldest color on the geological record.

NATURAL DYES

Natural dyes are color substances obtained from natural sources. Natural dyes are used for all types of textile dyeing and printing until the middle of the nineteenth century. The use of natural dyes was reduced due to the advent of synthetic dyes, though they were economical and possess excellent fastness properties. However, the growing consumer awareness of the harmful impact of synthetic dyes, concern for the environment worldwide, and stringent environmental laws lead to the revival of natural dyes. Natural colors are beautiful to behold. Coloring matter extracted from the roots, stems, leaves, or barriers and flowers of various plants has various expectations.

ADVANTAGES OF NATURAL DYES

- Natural dyes are extracted from natural sources and hence they are eco-friendly
- Produces soft and soothing colors
- These dyes provide excellent protection from UV rays
- Natural dyes like turmeric have anti-microbial properties and hence protect the fabrics and wearers from microbial attack
- Some natural dyes possess mosquito repellent and flame resistant property
- Minimal Environmental Impact – Because they come from natural sources, natural dyes are not harmful to the environment, which makes them so appealing to consumers. Natural dyes are biodegradable and disposing of them doesn't cause pollution.
- Renewable – Natural dyes are obtained from renewable sources that can be harnessed without imposing harm to the environment.
- Safe – Some natural dyes, such as carmine found in lipsticks, will not cause harm or health problems when ingested.

DISADVANTAGES OF NATURAL DYES

- Natural dyes are difficult to store
- Dye extraction is a time-consuming process
- Reproducibility of the same color shade is difficult
- Impurities in natural dyes fade away the color produced
- Availability of these dyes depends on the seasons
- The natural dyeing process is difficult to standardize

CLASSIFICATION OF NATURAL DYES

Natural dyes are classified into three types based on the source of origin namely vegetable dyes, animal dyes, and mineral dyes.

PLANT DYES

The earliest dyes were of vegetable origin, discovered by accidentally staining garments with juices of fruits or plants. Vegetable dyes are obtained from different parts of plants such as leaves, flowers, fruits, pods, bark, etc. These vegetable dyes can be applied directly or with different mordants.

Henna: The dye is extracted from the dried leaves of the Henna plant, *Lawsonia inermis*. It produces yellowish-orange color. It is suitable for dyeing wool and silk fibers.

Indigo: Indigo (blue dye) is called the king of all-natural dyestuffs. It imparts blue color. It is extracted from the leaves of the leguminous plant, *Indigofera tinctoria*. It is suitable for dyeing cotton and wool.

Indian Madder: It produces shades of red on textile fabrics. It is used for dyeing cotton and woolen fabrics. It is extracted from the roots of *Rubia tinctoria*.

Turmeric: It produces shades of yellow on fabrics. It is suitable for dyeing cotton, silk, and wool. The yellow dye is extracted from the ground root (rhizome) of the turmeric plant (*Curcuma longa*).

Marigold: It is extracted from lemon or orange-colored marigold (*Calendula officinalis*) flower. It is suitable for dyeing both silk and wool fibers.

Tea: Leaves of tea plants (*Camellia sinensis*) or tea powder is used to extract the dye. It produces different shades of brown.

Onion: The dye is extracted from the outermost skin or peel of the onion (*Allium cepa*). The onion skins if properly dried can be used for one year.

Senegalia catechu: The dye is extracted from the resin. The sticky substance from the plant of the acacia tree. It produces shades of brown.

Fustic: Old fustic, or yellowwood, is derived from the heartwood of dyer's mulberry, a large, tropical American tree (*Chlorophora tinctoria*, or *Maclura tinctoria*) of the mulberry family, *Moraceae*. The dye produces yellows on wool mordanted (fixed) with chromium salts.

Logwood: It may also refer to members of the genus *Xylosma*, part of the willow family. The dye is extracted from the core heart of the logwood tree, it creates black color.

Saffron: It is a spice derived from the flower of *Crocus sativus*, commonly known as the "saffron crocus". The dye is extracted from stigmas of the common crocus. It produces from yellow color.

ANIMAL DYES

The red-mouthed rock shell was one of the main sources of Tyrian purple and the study blames its collapse on rising sea temperature. Phoenician purples and BIBLICAL BLUES are the most royal and sacred of all ancient dyeing were produced from Levantine sea snails of the family *Muricidae*. These mollusks may have been in use for the production of the royal purple pigment.

Cochineal

Cochineal dye is extracted from the dried bodies of the female red bug (*Dactylopius coccus*). It produces crimson and scarlet colors with mordants aluminum and tin oxide. This dyestuff was mostly used for dyeing wool and silk. These dyes exhibit excellent fastness properties.

Tyrian Purple

This dye is extracted from the sea snails found in the Mediterranean Sea. The amount of dye produced was very limited and therefore very expensive. Hence, it is called Royal purple.

Lac Dye

This dye is extracted from the fluid secreted by the lac insect (*Lacifer lacca*), which lives on the twigs of the banyan trees and other varieties.

MINERAL DYES

Dyes extracted from mineral sources are called mineral dyes. Chrome green-from a compound of chromium and oxygen, Chrome red-from from a compound of chromium and lead, Chrome yellow-from a compound of chromic acid and lead, and Prussian blue from a compound of iron and cyanide. As minerals are used for fixing or improving the fastness of vegetable dye, the name natural dye is more appropriate which covers all the dyes derived from natural resources including. And some minerals are also used to give a coloring matter.

OCHRE - A kind of iron ore, also called limonite which is an earth mineral oxide. It is used for yellow, brown, and red nuances.

MALACHITE - An intense green mineral, actually copper carbonate mixed with copper hydroxide. Breaks from time to time as copper ore. Used for green nuances.

MANGANESE - A metallic element. Used for black nuances.

CINNABAR - A heavy reddish mineral, with a metallic adamantine luster. It is made from quicksilver sulfide. Used for red nuances.

AZURITE - A blue/dark blue copper mineral. It is crystallized and often found together with the green mineral malachite. Both are products of erosion and oxidation from copper minerals. Used for blue nuances.

LEAD - Used for red nuances.

ARAGONITE - Usually colorless or white mineral. Used for white nuances.

LAPIS LAZULI - Also known as lapis, a blue rock. Consists of a mixture of azurite and calcite, pyroxenite, and other silicate minerals besides pyrite. Used for blue nuances.

INSECT DYE

The secretion of insects and dried insect bodies are the major source of natural dyes. For example, shellfish provides coloring matter. Lac and cochineal is an example of natural dye obtained from insect carmine and it gives similar colors. It is gathered by spreading a cloth on the ground under infested trees, during the season of red rain.

- Cochineal insect (red)
- Lac insect (red, violet)
- Murex snail (purple, indigo blue)
- Octopus/Cuttlefish (sepia brown)

CONCLUSION

In conclusion, natural dyes offer a host of benefits for human use. During the last few years, many articles discussing natural dye have been published. This review is an attempt to highlight the undesirable effect of synthetic dye on the environment and human health. Natural dyes supposed to be a cheap, non-toxic, renewable, and sustainable resource with minimal have attracted the attention of the scientific community to use them in a variety of traditional and newly discovered application disciplines. Thus there is a need for many more active types of research to build a knowledge base and database with the production of natural dyes is important to human healths.

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