

## Natural dyes -a nature gift for health and well being

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### Introduction:

One of the fundamental components of human existence that might enhance its visual appeal is color. Since ancient times, it has been understood that plants, animals, and minerals are the main suppliers of colorants, such as dye or pigment. The manufacturing of synthetic dyes in a wide range of hues and colors has resulted from the rapid industrialization of the textile industry, which may eventually cause natural colors to become extinct.



**Fig.1. Natural dyes**

Synthetic substitutes to popular natural dyes have also been developed<sup>1</sup>. There will be uncertainty about the future of natural and synthetic colors due to the extinction of natural coloring cultures and the potential depletion of fossil resources. Because of this, the viability of colorants derived from natural sources will determine how colors are made in the future.

The practice of natural dye dying has persisted only in several regions of the world to this day. Interest in natural dyes has recently increased once more, mostly among those who are environmentally sensitive. Skin-friendly, renewable, biodegradable, and environmentally friendly ingredients are natural dyes that can be utilized in nearly any type of natural fiber dyeing<sup>2</sup>. Living in an environmentally friendly environment has become increasingly crucial for humans in the current eco-friendly period. Microorganisms, which are the source of deterioration, discoloration, odor, and skin diseases, are the main obstacle in their path. In addition to these negative impacts, microorganisms harm people by spreading illnesses and infections.



**Fig.2. Natural dyed yarns**

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In order to prevent microbial development on textiles without damaging their beneficial qualities, it is crucial to treat all clothing with an antimicrobial finish<sup>3</sup>. Natural and synthetic dyes are the two main types of dyes used in textile dyeing. Natural dyes have been used to color food items, leather, and textiles including cotton, silk, and wool since prehistoric times<sup>3</sup>.

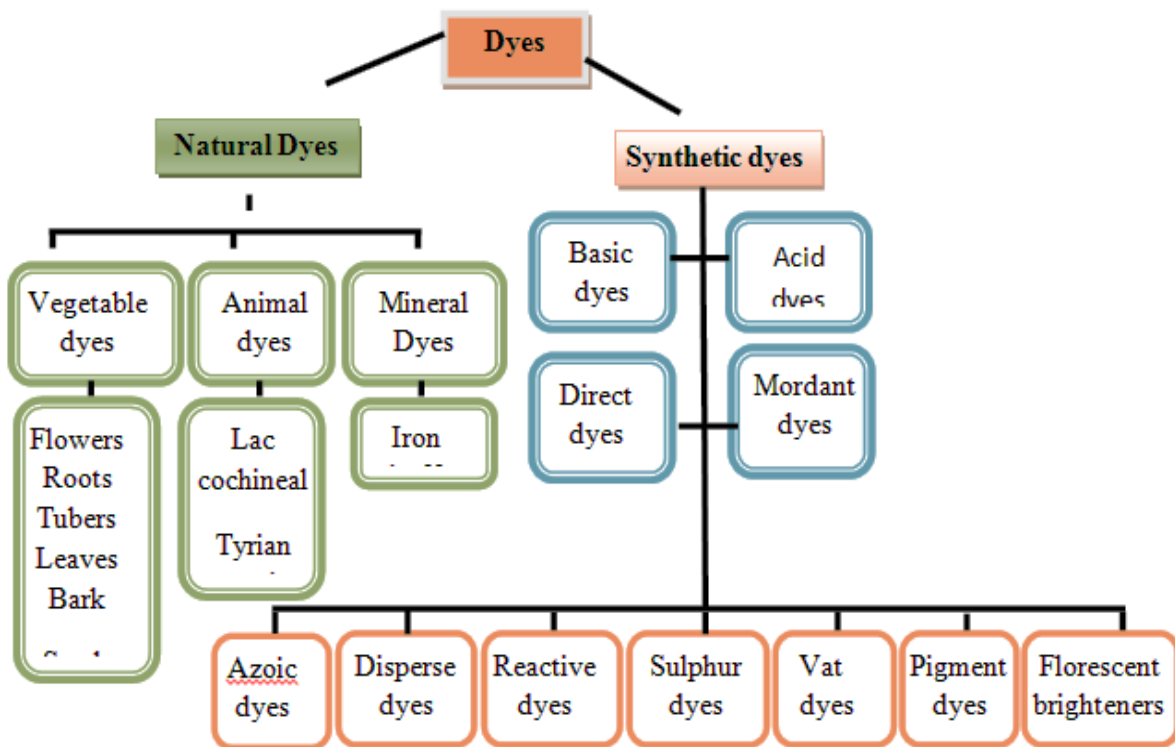
### What is a Dye?

An organic compound used to impart color on textile material is called a dye. Generally, dye has an affinity toward the functional groups of textile fiber, so it is firmly entrapped inside the fibre through chemical bonding.

The essential properties of the dye are intense color, water solubility, and substantiveness toward fiber, thermal stability, and good fastness properties. Natural Dyeing is the process of using natural dyes that are extracted from natural sources, such as plants, minerals and insects. Beautiful colors from leaves, flowers, bark, roots as well as rocks, fruits and veggies can be extracted for use in textiles and food industry. Dyes make the world more colorful. When the first man picked the first berry, dyes were discovered<sup>4</sup>. Dyes have been used, valued, and traded for millennia.

### Classification of dyes:

Natural dyes are derived from naturally



**Fig. 3. Classification of dyes**

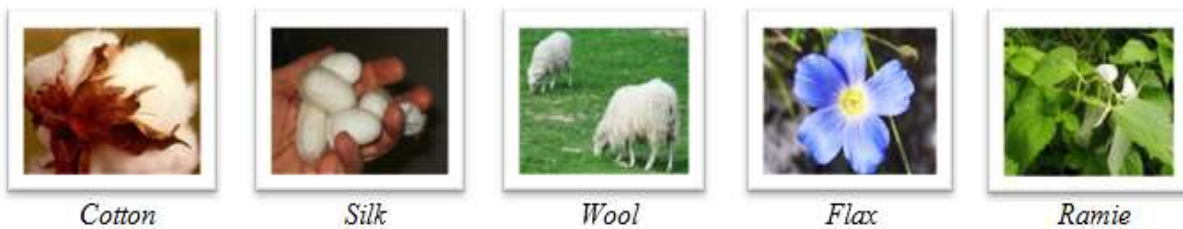
occurring sources such as plants like indigo, saffron etc, animal sources like mollusk or shellfish, insects cochineal beetles, lac scale insects etc. mineral sources like ferrous sulfate, ochre, clay etc. Nature is filled with a wide range of stunning hues, from yellow to dark. The visible range of 400–800 nm is where light is absorbed, giving different organic and inorganic compounds (pigments) and their mixture their colors. The structure or components of the coloring pigment molecules—which contain different chromophores found in the dye-yielding plant determine how much light is absorbed and how the colors are shown. The following groups and chemical structures are used to classify natural dyes: indoles, pyridine, carotenoids, quinoids, flavonoids, dihydropyrans, betalains, and tannins.<sup>5,6</sup>

Natural fibers are those fibers which are obtained from nature, these natural fibers can be dyed with natural dyes with great benefits for the user. The most commonly used natural fibers are cotton, silk wool, flax, ramie, jute, and nettle, can be brightly colored with natural dyes.

**Mordant:** Without the use of a mordant or fixative, natural colors will not stick to natural textiles. The dye molecules bond to the fibers with the aid of the mordant. With plant-based colors, iron, copper, chromium, alum, and urea are frequently utilized. In addition to giving a dye an affinity, mordants frequently result in distinct colors and enhance a dye's fastness. Many plants can produce colors that are eye-catching and attractive, but if they aren't preserved with a mordant, they fade quickly.



There are two kinds of mordants—bio mordants, such as tannic acid, and metallic mordants, such as alum. Various issues are brought forward by some "experts" (land for growth, inadequate technical performance).



**Fig.4. Types of natural fibers suitable for natural dyeing**

India's textile, coloring, and agricultural sectors all need revitalization. The Science and Innovation Strategy's main goal is the development of new crop alternatives. Combining disparate information sets to create the synergy between several areas. Supply of premium raw materials combined with cutting-edge dyeing techniques using natural colors. Vegetable dyes are colored compounds made from various plant parts, including the root, stem, heartwood, bark, leaves, flowers, fruits, seeds, gum, and resin. The factors that are responsible for affinity of natural dyes are the chemical constitution of natural dyes, preparatory process, nature of fiber, mordanting techniques, dyeing temperature, pH of the extraction medium and dye bath. The various phases & steps that make up the natural coloring process are shown below:

**Significant Natural colorants:** Natural colors can improve our wellbeing by reestablishing a connection with nature and are safer and kinder to the environment.

**Therapeutic:** Natural dyes can contribute to the creation of a calming and healing atmosphere in addition to being kinder and safer for our skin and our houses.

**Non-Toxic:** Natural dyes are non-toxic, non-allergenic, and biodegradable. They have a far smaller environmental impact than synthetic dyes, as long as the dyeing and finishing processes are carried out without the use of hazardous chemicals.

**Regenerative:** Natural dyes have the power to revitalize rural economies and repair the environment. Regenerative dye crops can be produced using byproducts like organic waste and biofuel, offering environmentally

Natural dyeing ⇒ Migration ⇒ Adsorption ⇒ Diffusion ⇒ Fixation ⇒ Dyed products

**Benefits of natural dyes:** They come from natural sources, are renewable resources, safe for the environment, don't require additives, and are skin-friendly. On the other hand, their drawbacks include low dye yield, a small range of shades, poor shade repeatability, dull shades, high costs, drawn-out processing times, limited market availability, and lack of commercial availability.

friendly substitutes for other goods.

**Advantage of natural dyes for wellbeing:**

The majorities of natural dyes are sustainable and have antibacterial and therapeutic qualities, nature that is eco-friendly, non-carcinogenic, and polluting biodegradable and pose no risks to health. Despite the strain of living in a city, cut down on our industrial pollution and wastefulness, Natural dyes are safe, non-allergic, and

resistant to moths. In addition to being visually pleasing and environmentally friendly, creating jobs and making use of wasteland. Simple color extraction from boiling plants, a broad color spectrum from a mix-and-match method, and the waste produced that can be used into bio-fertilizers. Natural dyes have greater UV absorption, which may lower the risk of melanoma. The colors are not only therapeutic to the eye, but they also improve our general health. No risks to health while using renewable sources. Simple to extract from or purify. Additional health-protective qualities it possesses. There is no waste production and the leftovers decompose naturally. softer applicability. Natural dyes as protective agents; lack of precise knowledge of extraction and dyeing technique; difficulty in reproducing the same shade; need for a mordant to fix the dye into the fabric; high cost; poor color and light fastness; and inferior color fastness.<sup>7</sup>

**Conclusion:** For human use, natural colors have many advantages. The benefits of re-kindling natural dyeing processes are clear. Using natural dyes provides an important alternative to the highly polluting synthetic dyeing industry responsible for the degradation of waterways and negative health impacts. Natural dyes acquaint us with a high-quality sensory experience, reconnecting us with the land, its seasons and its processes. And with

their potential for rebuilding soil health and supporting local communities, natural dyes are an exciting part of the regenerative textile movement. We hope to draw attention to the negative impact that synthetic dyes have on both the environment and human health with this article. The scientific community has been interested in using natural dyes in both established and emerging application fields since they are sustainable, nontoxic, and renewable resources with little environmental impact.

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