

Chemical Extraction of Plant Pigments from Medicinal Plants

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Abstract

The study included a discussion of how to chemically extract plant dyes from medicinal plants. Dye is a chemical compound used to produce colors that remain for a long time on the surface of materials. The textile industry uses dye to color yarn, yarn and cloth. It is also used in the food, fur, ink, leather, paper, plastic and wood industries. Until the end of the 1850s, all dyeing materials were made from natural sources, such as different parts of plants or some animals. Then, in the 19th and 20th centuries, chemists produced dyes extracted from synthetic materials. These dyes retain their colors better than dyes extracted from natural materials and are less expensive. Currently, the industry depends largely on dyes extracted from synthetic materials.

Keywords: extraction, Pigments of Plant, Bio-pigment, Dye of plant.

Introduction

Mineral dyes There was no specific time in which man knew the process of dyeing, but since his inception he was fascinated by the beauty of nature, so he worked to imitate it and colored animal skins and the materials from which he used to make clothing by rubbing them with colored fruits. Then he discovered the dye materials found in some plants such as jahara, turmeric, onion peel, and these. They give the color yellow and its derivatives, indigo gives the color blue, and pomegranate peel and brazil wood give the color red and its derivatives.

Humans began dyeing fabrics and other materials more than 5,000 years ago. Dyers have also used color-stabilizing chemicals for thousands of years. Synthetic dyes were discovered in 1771 by preparing picric acid, which dyed silk yellow. Then, in 1856, the English chemist William Perkin discovered, by sheer coincidence, the first synthetic dye. This dye, called Mauve, was a pale purple colour. Perkin produced this dye when he was trying to extract an alkaloid from a coal tar dye product called aniline. Before World War I (1914 - 1918 AD), Germany produced most of the world's dyes. During the war, the Germans stopped supplying dyes to other countries. As a result, the situation developed rapidly. The dye industry in many countries. Since the 1940s, chemists have invented many industrial textile threads, and have developed thousands of industrial dyes suitable for these threads.

Discovery of dyeing

The Indian madder plant, which grows in Asia and Europe, produces bright red dyes that are used in many fabrics such as linen and silk. Residents of many countries were able to extract saffron dye, which is a yellow dye from the saffron plant, and used this dye to dye some

textiles such as silk and wool. The natural dark blue indigo dye is extracted from the indigo tree that grows in India.

Types of dyes

Plant and animal dyes

Most natural dyes are extracted from plant parts such as tree bark, fruits, flowers, leaves and seeds. The Indian madder plant, which grows in Asia and Europe, produces bright red dyes that are used in many fabrics such as linen and silk. Residents of many countries were able to extract saffron dye, which is a yellow dye from the saffron plant, and used this dye to dye some textiles such as silk and wool. The natural dark blue indigo dye is extracted from the indigo tree that grows in India. It is used in dyeing cotton, wool, and some other fabrics, and is still used in dyeing durable cotton denim fabric. Bagwood dye is one of the natural dyes that is still used today. This dye is extracted from a tree that grows in Central America, Mexico, and India. Black and brown dyes are extracted from this tree, and are used to dye some fabrics such as cotton, fur, and silk. The orange-brown henna dye is made from shrubs found in North Africa and the Middle East. Henna was once used to color leather, and henna is sometimes used to dye hair. As for dyes extracted from some animals, they include cochineal and saurian purple. The red cochineal dye was made from the dried remains of a turtle that lives in Mexico and Central America. As for Tyrian purple, it is a rare dye extracted from oysters found in the Aegean Sea and the Mediterranean Sea.

Industrial dyes

The main types of industrial dyes include: acid dyes, nitrogenous or advanced dyes, basic dyes, direct dyes, crumb dyes, pre-mineralized dyes, reactive dyes, sulfur dyes, and fermentation dyes.

Textile dyeing

Fixing dye color in fabricTextile dyeing is done in several stages. If textile threads are dyed before converting them into yarn, this stage is known as dyeing the raw material. When dyeing yarn or when dyeing yarn, the yarn is dyed after turning it into yarn. Most of the yarn and raw material dyeing process is done in huge vats. In dyeing the item, manufacturers use dyes after the yarn turns into fabric. Dyeing of the piece is used in order to reach the stage of color stability of the threads. Some dyeing machines draw the fabric through specific baths of dye. Some other machines have pressure wheels that in turn press the dye onto the fabric. Some machines are capable of dyeing 90 meters of thread per minute. Industry workers print some designs on some fabrics, and the machine distributes different colors to different parts of the fabric, through screens or wheels engraved with the designs required to be cast on the fabrics. The colored parts of the fabric form a specific pattern or artistic form, and the process of printing this is known as Colors as silkscreen printing. Textile dyeing was discovered a long time ago, but progress in this field dates back only to the last hundred years. In ancient times, man learned to extract dyes from natural sources. Examples of these dyes include indigo and Al-Ala dye. These dyes gave amazing results that remained as they were for quite a few years without any change occurring to them.

Natural dyes

The first dyes that humans used were plant roots or seeds. Some insects were also used as animal sources. Mineral sources were natural well water, but these last dyes caused a weakening of the fibres.

Vegetable dyes

Indigo dye: A plant that grows mainly in hot, tropical climates. Its color is a stable blue dye derived from the leaves.

Saffron dye: A plant that was widely cultivated by the ancient Greeks and the Romans as well, and the female parts of the flower were used to extract a yellow dye.

Brazil wood dye: One of the redwood trees, a bright red dye is extracted from the wood.

Logwood dye: A large tropical tree whose wood produces a range of purple, violet and black dyes.

Mineral pigments

Mineral dyes are rare in ancient antiquities, and some people in different parts of the world have discovered that cloth can be dyed with color by dipping it in a spring or stream of water rich in iron compounds. The ancient Egyptians also used red copper oxide for green dye. Lapis lazuli is a blue mineral found in copper mines for the blue dye.

Synthetic dyes

The demand for natural dyes decreased as a result of scientific research carried out by the English chemist Perkin. In 1856, during his attempts to prepare quinine from aniline, he accidentally discovered a way to prepare dyes chemically in the laboratory, and the first dye he produced was the well-known dye. Mauve This was the beginning of the scientific revolution in the dye industry. This discovery was followed by a number of bright aniline dyes. Chemists also succeeded in preparing a number of new dyes that did not originally exist in nature. There was also a great demand for coal tar as a raw material for preparing a large number of new dyes.

Dyes industry

The dyeing process takes place after the dye is first dissolved, and the fabric, after being placed in the dye bath, absorbs the dye molecules that give the fabric the desired color. Dyed textiles differ among themselves in terms of their ability to retain color. The colorfast fabric does not lose its color after normal use. For example, a fabric is strong and can withstand washing if it does not fade in sunlight, and if it retains its color after washing. Some substances, such as chlorine and sweat, may affect the colors of fabrics, and a large number of dyes are not affected by the changes in color resulting from these substances.

Extraction of plant dyes

Pigments are extracted from plants through the most widely used folk method is the oil method, which relies on extracting natural oils from plants using natural oil. The second method is the gas method that relies on the use of natural gas to extract natural oils from plants

History of the discovery of dyes:

Since the 1850s, dye materials have been obtained from various natural sources, such as plants, trees, and some insects. Strong evidence has been found proving that dyeing methods are more than 4,000 years old through dyed fabrics found in the tombs of ancient Egyptians, and ancient hieroglyphics describe the extraction of natural dyes. It is applied where countless attempts have been made to extract dyes from plants and brightly colored flowers.

Dyes are colored materials that add a fixed color to textiles, papers, leather, and other materials as a result of the formation of various chemical bonds between them and those materials. They are not affected by water, heat, light, or other factors to which these materials are likely to be exposed. Most known dyes consist of organic chemical compounds. Some of them also consist of inorganic compounds and may be dyes that are insoluble in the medium used. Not all dyes can be applied to all materials. Silk, for example, differs in its dyeing from cotton, leather, or synthetic textiles, as a result of the chemistry of these textiles being different from each other, and thus the chemical bonds between them and the dye used.

Natural dyes: are divided into:

Vegetable dyes:

There is a whole group of plants that can be used to extract plant dyes, and different parts of plants are used to obtain dyes, such as leaves, fruit peels, bark, roots, wood or lichens and mosses, those small plants that grow on rocks and are distinguished by their many-colored flowers.

Examples of pigmented plants include:

Alkanna tinctorial:

A herbaceous plant with dark blue flowers that grows with cannabis on the edges of wells in the regions of the Arab Levant and Turkey. A red dye is extracted from its roots that has many medicinal benefits.

Indigo-fera:

These plants grow in India and Egypt and are considered a source of the famous indigo blue dye, which is now prepared artificially to dye jeans.

Turmeric plant

From which the yellow color is extracted.

Insect Pigments:

Yes, there are also some insects that contain dyes, the most famous of which is the cochineal dye, Kermes, which is obtained from the Kermes insect, which are small scale insects of the Hemiptera family. They are considered plant parasites that feed on plants in southern Europe on small evergreen oaks (*Quercus coccifera*). After drying, the crimson color is extracted from their bodies, which dates back to the ancient Egyptians and Romans. There are also many dyes that are extracted from various insects, such as:

Tyrian purple dye: which is extracted from the mucus of the purple snail Murex snail, which was discovered by the Phoenicians in 1200 BC.

The red dye (carmine): which is obtained from carminic acid produced by some insects such as the cochineal.

Polish cochineal dye: It is extracted from some parasitic insects.

Conclusions

Dyeing workers add color stabilizers to dye baths for the purpose of fixing the color in some textiles. These substances combine with dye molecules and attach them firmly to the fabrics.

These color-fixing materials include tannic acid and compounds of some soluble metals such as aluminum, chromium, copper, iron, and tin.

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