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Various Natural Dyes Using Plant Palette in Coloration of Natural Fabrics

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THE use of natural dyes in textile coloring has shown a growing interest. Many countries have developed stringent environmental rules to respond to hazardous and allergic synthetic coloring reactions. Since there is a growing need for these ecologically friendly wool yarns, cotton, and silk, there are enormous regions for novel color sources. In the following content, several innovative natural dye sources are explored. New coloring features such as quickness and natural dyeing were also applied.Natural dyes form plants are become more popular in textile coloring. This is because the poisonous and allergic synthetic tinting responses have enforced strict environmental rules in many nations. During this review using of natural dyes extracted from plants and its application on textile materials were investigated.

Keywords: Natural dyes; flowers; cotton; wool; silk.

Introduction

Earth's quality of life is intrinsically linked with environmental quality as a whole. In the early days, people believed that human beings should use endless land and riches. Massive industrialization and technological breakthroughs have nonetheless led to considerable atmospheric deterioration [1, 2]. Today, the clothes dye industry appears to be a major contaminant. However, customers and producers now seek ecologically friendly fabrics and clothes. If the demand for these ecologically friendly products increases, new natural teal suppliers will be provided with plenty of chances. These natural coloring supplies are well suited for different natural fabrics[3].

This is because the poisonous and allergic synthetic tinting responses have enforced strict environmental rules in many nations. The recovery of natural colorants facilitated the finding of additional natural sources of coloration. These new colors, together with other factors like speed and color dimensions, were employed in a natural color scheme [2].

Natural Flowers for Different Natural Fabrics

Geographical variation has led to a rich biodiversity of the world, with its diversity of climatic zones and altitudes, which has gifted the flora and fauna to produce several colorful shrubs and permanent shrubs. The people of old used mainly veggies, minerals, and animals, all of which could be conveniently found in their neighborhood. It has been commonly used to stain fabrics and other materials. New pigment crops are pursued to satisfy the increasing demand for natural dyes. However, due to its exceptional and proven flexibility, some crops, such as Al root, manjistha, safflower, and indigo have a structured culture^[4]. Increased acres are only due to their coloring qualities for root and safflower cultivation. More plants should be regarded as agriculturally viable plants. Natural

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dyes are mostly natural resource components and are commonly classed as plant, animal, microbial and mineral dyes depending on their nature, though plants are the main source of natural dyes[4].

Natural Flowers for Applied to Cotton Fabrics

As organic and biodegradable, natural dyes are in themselves sustainable. The natural dyeing experience has provided an insight into the neighborhood plants. The quest for colors of fibers on plants that develop easily and quickly led to a new world of exotic colors. These natural colors have richness and glistening, which can never be achieved by synthetics. It's a widespread myth that natural colorants only make beiges and browns and other colors washed away. Quick, vibrant natural colors, comparable to the colors of synthetics and often overcome, can be created. In addition to these dyes, the dedication and therapeutic efficacy of the pigment is perhaps the cause of the uniqueness of natural dyeing as well as the production of stable coloration. It also applies to the source of these dyes[5].

Experimental studies have been conducted in household gardens with botanists based on the optimal conditions for soil and climatic growth of teeth plants. A new cultivation system has been modified to achieve maximum dye yields with optimum seeding and harvest time and optimal fertilization methods. The usable components of the plant were dehydrated or the teat was extracted following the strategy given[6].

It helps to create an idea of what high-quality natural colors, generating new options both for producers and for the manufacturing sector, can be supplied, in line with recent market preferences towards ethnic and natural goods. This can help. Several new natural dyes are available, especially for teasing cotton and silks to produce a range of colors from plants, which provide both farmers and the fabric industry with new opportunities in line with current market developments for ethnic and natural environmentally-friendly goods[7].

Many new plant sources for natural dyeing have been explored, and the following is a short guide to plants used in our screening. Many of them are well-known medicinal plants and be potentially rich in natural color. For the potential use of these plants as suppliers of natural coloring plants, it is important to log these plants[3, 8].

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Salvia splendens (S. splendens)

Plant taxonomy classifies red salvia as S. splendens (see Figure 1) usually many refer to them simply as red salvia, native to Brazil, but also as a seasonal flowering plant. Red salvia flowers in temperate areas are known as annual plants: they have been weakened by harsh frosting and do not tolerate cold winters.

Splendens is a tender, herbal, perennial born in Brazil. But, Salvia splendens still grows in India and grows at 2000-3000 meters higher than the sea level. It is situated in a humid and warm environment. The plant grows to a height of 1.3 meters. Salvia favors fertile soil with maximum sunshine and well-drained soil for good development[5].

Salvia is a tender tropical plant that usually grows as a yearly bedding plant for warm weather. It was a garden standard for a long time and has flourished confidently over the long term. A diverse variety of colors, including white, salmon, yellow, as well as the standard bright red and heights of around 8 inches and almost 3 feet, is growing (0.9 m). That is the vivid red varietal used in the tongue and the upper lip of the helmet.

Salvias are prolific, long-lasting flowers. The pests don't trouble them. While the scarlet variants are the most popular, S. magnificence comes in other colors. Dark red salvia floral variety has been collected from the Tawang Forest, Arunachal Pradesh, and classified as a department of horticulture[9].

Conventional dyeing effects of cotton using tin mordant with aqueous extract from salvia bulbs. CIELab values were determined as well as the K/S values and rapidity properties of the dyed fabrics. The coloration demonstrated good effects and acceptability for commercial coloration. Tin mordant was chosen particularly because it gave the extract stability and the color content was increased[3].

1.1.1. Canna indica

Canna indica is a robust, annual, upright, herbal plant up to three and a half meters in height (see Figure 2). Rhizome is horizontally wedged with fleshy parts resembling corms, coated with scale leaves and thick, fibrous root up to 60 cm long and 10 cm in diameter. The rhizome stalk, typically 1-1.5 m long, sometimes tinted by purple, is fleshy. Leaves arranged spirally with big sheaths open, often shortly small, blades narrowly ovate, up to 60 cm dais, entire base rounded to cuneate, eventually marginally diminishing to the sheath, apex acuminate, conspicuous, sometimes slightly vaporous on the underside. The leaves are arranged spiraling with wide-open sheaths. In different tropical and subtropical climates, Canna indica grows well[3, 4].

It appears to be neutral throughout the day since it rises and flowers in a wide array of environments. Drought affects it but tolerates so much moisture (but not water logging). It is highly shaded tolerant. Temperatures above 10°C normal development happen, but extreme temperatures of 30–32°C still endure. Normal development is at temperatures higher than 10°C, but moderate temperatures of 30–32°C still withstand and mild frost tolerance. Deep loams, full in humus, are the favorite soils of Canna indica. This hybrid species provides plenty of flowers with strong natural dyes. The other benefit of this cannabis plant is that it propagates itself[4].

The simplest studied method was the easy solubilization of canna dye in ethanol and its

effect on dye exhaustion and fastening to cotton cloth.

Previous laboratory report shows that canna dye extract is used in acidic materials with ecologically-friendly mordants for cotton, but a large proportion of the colorant was found to be waste. Thus, a way to better solubilize this partially soluble dye was developed to increase color strength and it is important to note that microemulsion systems can be very easily and effectively used for the solubilization of such dispersion[3].

During application, water-insoluble natural dyes can cause problems and cause uniform and irregular dyeing. In water, the solubility of canna dye is low. Attempts to dissolve partly insoluble natural canna dye in various means have also been developed. The solvent solution used for this plant was aqueous, methanol/ethanol, and oil/water microemulsion. The easiest solution to ethanol cannabis dye and its effect on cotton fabric dye and fixation was shown[2].



Fig. 1. photograph of Salvia splendens.



Plant: Canna indica

Family: Cannaceae

Genus: Canna

Part used: flower (red)

Fig. 2. photograph of Canna indica.

1.1.2. Rhododendron arboretum

The rhododendron rose, a strut, or small tree showing brilliant red flowers (see Figure 3).Rhododendron arboretum, is an evergreen tree. It can be found in Thailand, Bhutan, China, India, Myanmar, Nepal, and Sri Lanka. In India, the tree of Uttarakhand and the state flower of Himachal Pradesh and the Nagaland, Rhododendron Arboretum is the national flora of Nepal. It likes damp but well-drained, leafy, high in humus, acidic soil in dim shade. It has broad, dark green leaves, 7-19cm (3-7in) in length, underneath which are silver, fawn or brown. In the early and mid-spring, the blossoms are red, pink, or white and range in size from 15 to 20 bells. They have black nectar bags and black dots. For the dyeing of the red variety of rhododendron [6].

Rhododendron Arboretum is one of the most impressive and majestic kinds of rhododendron. The properties of the structure, rigidity, flower color and leaves are highly different. The treelike name of the genus refers to arboretum. Originally found in northeastern Central India, this location ranges from Kashmir to Bhutan in the Assam and Manipur Mountains in the Himalayas. It stands at around 40-50 ft and is amazing in bloom. It climbs to around 40-500 ft. This is a flower of rhododendron. It is observed that, in its lower elevations, this rhododendron is generally brilliant red [8].

The plant generates light soils (sandy) to medium soils (loamy) and requires extremely acidic and moist soils. It can or may not grow in semi-finish or darkness, requiring a location in the green House or conservatory against the scorching sun in the afternoon. The flowers are esthetically appealing as they are regarded as sacred and decorated in temples.

A vital and commercially used hilly herb is rhododendron arboretum. The plant has antiinflammatory, hepatoprotective, antidiarrheal, antidiabetic and antioxidant properties due to the incorporation of flavonoids, saponins, tannins and other phytochemicals. Fresh petals are treated in order to produce a popular product on the market.

Young leaves are acidic and produce enormous quantities of poisoning. The plant is very significant in the cultural and economic life of the people. It may be found in temples and venerated sites. Medicinal and decorative characteristics are also found in the grass [10].

The effect of metal ions on red pigments obtained from the fruit of Mulberry and rhododendron flowers, both containing red pigments, was studied by several investigators. These red pigments have been described as anthocyanidin substance and can be used as a red food coloration. The red pigment changed from the rhododendron flower to Fe³⁺ and Sn²⁺; the redness increased with Al³⁺, Zn²⁺, Cu²⁺ and Ca²⁺cation was not efficient. Conventional cotton cloth dyeing uses rhododendron flowers in aqueous form (red variety) with the aid of metal mordants: FeSO₄, SnCl₂, CuSO₄, SnCl₄, K₂Cr₂O₇, and alum. The coloring showed positive effects and industrial training acceptability [3].



Plant: Rhododendronarboretum Family: Ericaceae Genus: Rhododendron Part used: flower (red)



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1.1.3. Cosmos sulphureous

Cosmos is a perennial, rapidly growing and floweringplant (see Figure 4).Cosmos is a tender year which easily grows from seed and grows in any typical well-drained soil. The best plant is grown in sun-dry soils and nutrition, helping to prevent diseases. The plant has green leaf and peach, rose, red and orange blooms[11].

The C sulphureous variety, however, is tender, orange-yellow, but can easily be grown directly by seeding. The flowers of the cosmos are usually collected two to three times a week and are just literally frozen as we grouped them in plastic bags and grouped them a lot. Cosmos creates numerous flowers in the season[12].

C. sulphurous was used in the investigation of new flora dyeing cotton from natural colorants. The dyeing was made using both alcohol and aqueous extracts. A study on wool fine-tuning with aqueous extract of cosmos petals has been produced. The orange cosmos in the mustard is pH receptive and, if the pH is high, are redder. Ammonia is used to raise the pH after exhaustion of the flowers. Until applying wool yarn and premordant aluminum sulfate, ammonia is applied at the original coloring baths[7].

For this analysis C. sulphureous was used in the hunt for newer flora dyeing cotton from natural dyes. The dyeing consisted of both alcoholic extract and aqueous extracts. Alum, stannic chloride, stannic chloride and iron sulfate were used in the murders. Methods of sonicator and microwave teething have been tested and compared with traditional dyeing. In methanol extract dyeing, dyes absorption was stronger while microwaves showed faster tint absorption in teething mode[3].

1.1.4. Tagetes erecta L.

Description of morphology: Tender, herbaceous houseplants are frequently grown (see Figure 5). It is a tiny shrub with orange-yellow blooms. It grows up to 180 cm in height. The inflorescence is a single end head. When touched or crushed, leaves and blossoms are aromatic. The leaves are simple and hefty, causing stalks to shatter. The flower head features tubular flora and flora of the Center, and a strap around the perimeter. Mordants: Alum, Copper sulphate, Stannous chloride and Potassium dichromate. [13]

Chemical components: Tagetes are composed mostly of carotenoids and flavonoids [13]. Flowers are also separated from Lutein and Pituitrin [13]. The primary Xanthophyll, i.e., xanthophyll, creates orange marigold color. Pituitrin is the coloring agent of flavonoid glycosides found in the flora [14].

Dye extraction: Wash the sample of the flower with water to prevent contamination. Divide the petals and keep them dry. Until that time weigh, wash and rinse in a mordant suitable for approximately a day or two, according to the fabric and color necessary. When the petals dry, pick them in 100 ml water around 20 g of petal dip. Remove the fiber, remove all surplus fluid and drain it. Boil the petal and water combination at 50-60°C for approximately 1 to 1.5 h. Prepare the color bath until the petal partially loses color. Now dip the pre-mordanted tissue in the tea pot and cook and tea the tissue. Do not cook the bath over, do it until it cooks[9].



Fig. 4. photograph of Cosmos sulphurousflower .



Plant name: Tagetes erecta L.

Common Name: African marigold

Family: Asteraceae

Plant part used: Flower

Colour: Yellow

Fig. 5. Photograph of Tagetes erecta L. flower.

1.1.5. Ixora coccinea L.

It's an ordinary floral shrub. The seedling is a thick stemming, often 4-6 feet. This shrub. The leaves are sessile in short, bright, leathery and oblong with whole limbs and are placed in pairs or whorl on the stem (see Figure 6). Flowers are tiny, sessile and tubular and are clustered in a dense, circular cluster, with short, triangular, persistent calyx lobe, meaty and reddish black fruits. [15]Mordants: Cooking salt, vinegar, $K_2Cr_2O_7$, and Alum. Chemical ingredients: The color of the pigment created by anthocyanins, berets and carotenoids interactions.

Dye extraction: fresh petals were crushed in the water and dissolved. This extract will then be cooked for 2 hours in water at 80°C. The flowery petals are so supported to release colors from the water[15]. The more petals the color strength and color depth will increase. The solution is then screened for further application. The cooked fiber is then treated with a 1:40 ratio of water and material containing a color extract. Wash the material with cold water after dying and rinse off the excess color.

1.1.6. Alcea rosea L.

Hollyhock grows 4-8 ft tall, functions as a two-year reseeding [13]. In the sun, in deep and rich drained soils they thrive nicely. The flowers of a rosette, single or double flora are stunning spires with a variety of colors (see Figure 7). There are 5 petals in the single flora. There are several hues from pink to black pastel. The floral petals produce a scarlet dye.Mordants: Alum, SnCl₂, CuSO₄, K₂Cr₂O₇, andFeSO₄. Chemical Components: cyanide-3-glucoside, delphinidine-

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3-glucoside and malvidin-3, 5-diglucoside are discovered in the flora. [16].

Extraction of dye: pink plant hollyhocks have been chosen, broken and dissolved in distilled water. They have been held over water for 3 hours in a beaker for rapid extraction. After three hours, the whole color is generally taken off the bloom. For immediate usage, the solution is filtered. The flowers were also dried in the beginning, following pickup, right after plucking in thin layers of warm air. They are deep pure black when dried. These dried flowers can be used as necessary. In heated water, this blossom is easily colored. Sometimes flowers also are frozen and then immersed in warm water for maximal dye extraction in 30 min.[16]

1.1.7. Carthamus tinctorius L.

A branching, annualthistle or winter plant, with multiple spines on leaves and bracts. Safflower is a winter plant. The stems stretch swiftly and gently branch. Each stalk terminates in a spherical flora surrounded by a spiny clasping bract (see Figure 8). The normally white acenes with a thick pericorpus are smooth and on four sides. In its whole seeds, it possesses a significant oil content. Mordants: Potassium carbonate, citric acid, alum, CuSO₄, SnCl₂, FeSO₄, and K₂Cr₂O₇. Chemical components: Safflower florescence contains natural colours of yellow and red cone/quinoa. These calcons constitute the primary components of safflower glycosylated flavonoids[17]. The coloring components in the flora which comes out as a red or yellow scarlet pigment are carthamine and Carthamone[14]. It comprises 30% of the yellow pigment of carthamidine and 0,83% of the red pigment of carthamine.



Plant name: Ixora coccinea L. Common name: Jungle geranium / flames of woods / Jungle of flame Family: Rubiaceae Plant part used: Flower

Fig. 6. Photograph of Ixora coccinea L. flower .





Fig. 7. Photograph of Alcea rosea L. flower .

Extraction of dye: Collect the floral material as necessary to avoid any dirt or contamination and then wash it carefully. Keep floral petals dry till you have a dried petal of safflower. In a 2-hour ratio of 1:100, mix the dry safflower with the water distilled, using a steady bathing temperature two times. [18, 19]. Mix and filter the first and second excerpts. Now focus the mixture at 65°C up to 10% of the original volume. If the dyes powder is required, dry it at -40°C.[18, 19]. The dried safflower is then pH-specific following a removal from the safflower with an added 1:10 ratio of watery potassium carbonate, shaking at 400C for 120 minutes, once or many times generating an extract of red pigments. The pH is adjusted by adding a watery potassium carbonate solution. A red pigment extract will then be combined with citric acid to modify pH between 4 and 6 and to freeze red pigment extract to make red pigment powder if required [18, 19].

Natural Flowers Applied to Silk Fabrics

There has been a growing demand for cheap natural dyes with decent speed in all the dyeing industries. Globally, an increasing awareness of sustainable value for environmentally sustainable products has led to a revived market interest in using textiles (preferably natural fiber such as silk) teased with environmentally friendly natural dyes[3].

Pure silk munges and pure white and plain silk, usually in dyeing use, have been chosen. The market procured the standard brand of pure silk. Different natural dyes have been used to paint pure silk to get several colors[20].

1.1.8. Hibiscus-rosa sinensis

Hibiscus rosa-sinensis is a large shrub or tree that grows to 4.7 meters high, also known by the common name red hibiscus (see Figure 9). The Hibiscus genus comprises about 200 species in tropical and subtropical areas[21]

This plant can have a varying stature straight or wide and significant uses. On the branch (larger at the base than at the tip) they have a distinct form and grow 5 to 15 cm long. It may measure up to 15 cm of red blossoms and is quite huge[22]. The stems (structures that

create pollen) and the shape are, like every other Hibiscus flora, supplied into a long column which is carried out from the center of the petals[23]. In the cultivated variety the petals can be single or double and smooth. Different anthers (which are made of pollen) may partly be seen upward, and five round stigma lobes at the top of the column (which are made of polen)[24].

Anthocyanins are natural hues in the nature, of a wide range of colours. The principal fruit and flowers in vascular plants ranges from orange, pink, red, violet to blue are compounded by anthocyanins. They are safe and water-soluble and helpful as water-soluble natural colors[23]. Due to its relatively high volatility and low percentage extracts, their utilization decreased despite the high potential uses of anthocyanins in the dairy, pharmaceutical and cosmetic industries [3].

They are only of limited utility in textiles as they have no fiber affinity and are unable to tolerate washing. Anthocyanins are, however, a fine colour, because in these applications color speed qualities do not play a significant part in garment applications[24]. Many researchers are now striving to overcome the issues of isolating and stabilizing, purifying, detecting and ending anthocyanin. The wool was tested with flora H. rosa-sinensis. Hibiscus was gathered with flower anthocyanin and silk was treated with different colored metal mordants [25].

1.1.9. Delonix regia

Delonix is in the Leguminaceae family. It is a royal poinciana flamboyant, flame tree that grows fast up to 20 m high, and has 15–20 cm long bipinnate leaves and 0,5–1 cm long fibres (see Figure 10). The most colorful tree in the world,

it says. It is surrounded by exuberant clusters of flame-red, 4-5 in. across for several weeks in the spring and summer. In April to July, when the tree gets leafless, the scarlet red flowers are found[26].

Flowers are big, red and orange, with multiple huge terminal clusters at the terminals of the branches. Each single flower has five huge, widespread petals, one inch and one inch, and a white and yellow streaky petal with a flora and moderate Indian environment in the early summer that lasts many months[27]. While Delonix flowers for seasonal training are freely available[28]. Flaming flowers are seen seasonally in thick clusters, sometimes in the midst of the summer. There are four pigment-like or orange-red petals with a length of between 8 and 15 cm, and one petal is a somewhat bigger upright one (standard). The batons are smooth and wooden, up to 70 cm long and 7 cm broad and they are made of dark-brunettes[3].

It is around 2 cm long, with yellow to dark brown seed between 18 and 45 cm. Scientists in D. regia used several components such as petals, calyx and whole flowers to teach cotton and silk yarn using a metal-purpose agent. First utilized with a bio mordant and silk-dyeing enzyme in Delonix flower extract [29].

For the first time D. regional red flowers have been investigated with the express aim of preventing silk dyeing from metal mording, so that biomordants and enzymes are used for a natural silk color. This enhances the environmental friendliness of wool dilution. The thesis was designed to evaluate the potential for color qualities in this natural source and to substitute metallic enzyme or biomordancy[27, 30].



Fig. 8. Photograph of Carthamus tinctorius L. flower.



Plant: Hibiscus rosa-sinensis Family: Malvaceae Genus: Hibiscus Part used: flower (red)

Fig. 9. Photograph of Hibiscus rosa-sinensisflower.



Plant: Delonix regia Family: Fabaceae Genus: Delonix Part used: flower

Fig. 10. Photograph of Delonix regiaflower.

1.1.10. Plumeria rubra (pink)

Plumeria (pink champa) comes from India's humid tropical zones. Plumeria can be big shrubs or even small trees (see Figure 11). Plumeria can exceed 30-40 ft and half as wide in tropical regions. They have small spacing, oval or pointing succulent, long leather, fleshy leaves in clusters close to the tips of the branches. Blätters are sensitive to frost, because they are leafy, and sometimes collapse early in the winter[30]. In early summer, showy, waxy flowers cover the shrub with their very fragrant. The sweet aroma of plumeria with jasmine, oranges, cinnamon, gardenia and other indestructible smells is totally non-existent. there's none. Their longevity and colors include the blacks, yellows, pinks, reds and several pastels of these flowers. Blossoming will last up to 3 months and every day produce new blooms[31].

Plumeria rubra grows to 2-8 m (5-25 ft) in height and the same breath as a breeding bush or a little tree. It has a robust, succulent trunk and a thin, gray bark resembling sausage on its limbs. The branches are extremely sensitive and brittle and exude a white latex when it's broken, which can irritate the skin and mucous membranes. 5 The large, green leaves, organized with great visibility and strong aroma and five petals, can be 30 to 50 cm long. The lees are strongly flavored. The hues are in the center of the blossom among the classic rose and white. The flora was initially tubular between 5 and 7.5 cm (2–3 inches) in diameter till opening [32].

At the tips of the wine are the flowers clustered. The bloom is tubular, 2 cm diameter and, with a golden base, five largely or narrowly oval. On the exterior there are reddish or reddish flowering stems, buds and petals. The buds appear before the blooms in the spring [33, 34].

Once picked, a flower will remain in the water for a few of days without withering. Plasteria dark-pink was chosen for the coloring sample. The shrub grows best in the full sun, on a rich, deep, well-drained soil. The petals are crimson and pink. The research demonstrates that the flowers may be utilized for coloring purposes both fresh and dried [3].

The floral pigment plumeria or rose Champa was extracted and utilized in silk color. The dark-pink teeth have extremely good speed characteristics in the sonicator system compared to traditional teeth which display good teeth in just 1 hour[34]. Plastic pigments contain routine and quercitrin. The color changes from olive to purplish gray for 2-4 percent of metal mordants[33].

1.1.11. Combretum indicum

It is known as the Rangoon creeper/ Madhumalti or Combretum indicum. This wine is found in Asia with dark-rosa flowers. It is found elsewhere in the world, but in India it is a very common herb (see Figure 12). The creeper is a ligneous wine up to 8 m long. The flowers are odorless and tubular, and they vary in color from white, pink, and dark-rosa to the same range.

Combretum is a member of the Combretaceae family. It is a large timber-tree. It is native to tropical Africa and the region of Indo-Malaysia. It was introduced in India presumably because

it was not found elsewhere to grow wild. It is a tough creeper that usually is cultivated for shiny, colorful flowers in gardens[35].

The plant flowers abundantly during the years from March-May-November to September-November. Flowers in decreasing numbers are in constant succession; they open at night as white flowers and gradually assume a rose tinge in the morning, and gradually become deep red late in the afternoon. The flowers have a gentle, floral and astringent, characteristic fragrance which penetrates into the environment[36].

The traditional dyeing of silk textiles was done using aluminum, ferrous sulfate and potassium dichromate with an aqueous extract of the C. indicum variety flowers[3]. It is established the CIE L*a*b*, the K/S and the quickness characteristics of the teared fabrics[20]. The coloration showed positive results and appropriate commercial coloring. This is an overview of the use of natural colorant C. indicum[37].



Fig. 11. Photograph of Plumeria rubraflower.



Fig. 12. Photograph of Combretum indicumflower.

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1.1.12. Ixora coccinea

The traditional medicinal plant Ixora coccinea is grown all over India. In Ayurvedic medicine is widely used. This plant isolated a number of chemical compounds (see Figure 13). The literature describes the different medical uses of this herb based on its chemical, and its pharmacology[36]. Ixora grows as a 4-8 ft high shrub often known by common names including forest flame, jungle flame, crimson king or jungle geranium, a rounded, bushy shrub that is a prominent settlement in some subtropical regions for a long time[38].

Ixora's are small plants that flourish with careful treatment mainly in the summer and the rest of the year. The various shades, including rose, white, peach, and red, are Ixoras. There are four petals in the single flower. Plants can grow and bloom in shade, but in full sun, acid soil and well-drained organic moist mix most Ixoras do well[36]. The petals produce a reddish color. The study shows that flowers can be used in both fresh and dried for coloring purposes[3, 20].

Ixora flower coloring pigment was harvested and used for silk dyeing. Dyeing with Ixora has fairly-to-good rapidity at 1 h in the sonicator and has a good color absorption relative to traditional dyeing. The flavone and chrysene 5-O- β -d, 4',5,5-trihydroxyflavone 4'- β -d, glucopyranoside was found to produce the pigment. In the presence of 2 – 4 percent of mordants, the hue varies from green to purple[39].

Natural Flowers Applied to Wool Fabrics

Various natural sources for dyeing pure wool yarn were found to be suitable. If the need for such environmentally sustainable wool yarn increases, large numbers of new dye sources from the new natural dye are available. Many new natural coloring sources are mentioned in the following text. These natural coloration sources are considered to be extremely appropriate for wool yarn[3, 27].

1.1.13. Celosia cristata

The celosia cristata is an unexplored natural wool yarn dyeing class, mostly betalanes. C. cristata belongs to the Amaranthaceae family and for longer time Celosia has been flowering (see Figure 14). This exotic community of plants has recently been renewed for various purposes[40]. For natural dyeing studies, any light colored flora is considered. The objective of using this plant supply was to find new sources of natural dyes based on the chemical composition of the dye[41]. Innovative pretreatment and mordants have been used to improve the absorption of wool varns. In full sun and in rich modified soil for a full bloom, deep-red celosia flowers emerge. The flowering period is August-November and lasts for a long time, as the flowers have sun-dried petals with dry conditions[42].

Celosia is a grass that grows or is grown extensively and spread throughout the tropical and humid regions of India. Four species in India are widely cultivated. A showy plant that is mostly grown for ornamental purposes in gardens, an escape in the plains and up to a height of 5000 feet in the Himalayas.

Color is a significant food and medicinal component, since each food is related to a certain color category. Color is needed to make food look attractive and appealing. The aglyconic red-violet dye, betatianines as betanide, isolated from beta vulgaris initially. A violet-red dye, an extract of Celosia cristata flors, can be used as pot herbs in



Plant: Ixora coccinea Family: Rubiaceae Genus: Ixora Part used: red flowers



foods such as other beta-cyanines. Beta-cyanine is the main ingredient of the violet-red flowers of C. cristata. The recognized dye extraction method has shown the existence of celosianin and isocelosianin (both C-15 diastereomers) and isocelosianine mixture by alkaline hydrolysis gives a deatelated substance described as an amarantine-isoamarantine blend[40, 41].

This method provided an improved process in which betacyanin dye from C. cristata flowers was extracted to get beta-cyanine dye, with a total of 15%–22% dry weight of the dye[43]. This source was used to thin wool yarn with metallic salts, including aluminum salt, stannic chloride, stanned chloride, and ferrous sulphate[44].

1.1.14. Nerium oleander

An evergreen shrub up to 4 meters above sea level. Length, thin, dented and short stalked, dark or gray-green leaves are between 10 to 22 cm (see Figure 15). Any cultivars have white or yellow leaves. All leaves with a conspicuous midrib are of "leathery" texture and normally come from the stem in three pairs[45]. The plant grows terminal flower heads, normally pink or white, but there are 400 cultivars, which display various floral colors: deep to pale pink, lilac, carmine, lard, salmon, apricot, copper, orange and white[46].

Each flora has a diameter of approximately 5 cm and a diameter of 6–8 mm; it is available to scatter the fluffy seeds. In cultivated plants, fruiting is rare. When the branch or twig is snapped or removed, the plant is exuding a thick white sap. Where the species is found in the wild, it takes place along watercourses, gravel sites and humid ravines. It is widely grown, particularly in warm temperate and subtropical areas, in parks, gardens and on roadsides[46].

In ultrasonic wool dyeing, N. oleander flor was used. Nerium flowers soon turn out to be colored in hot water[47]. In addition, the dyeing with Nerium provided fair-to-good speed characteristics for sonicator dyeing[48, 49].

Natural Flowers Applied to Cotton, Silk, and Wool Fabrics

Many natural resources were identified as very well for the thinning of all three kinds of pure cotton, silk fabrics and wool yarn[16]. With growing demand for such eco-friendly garments there are large areas for new natural dyes sources. Many new natural dye origins will be mentioned in the following text. These natural coloring sources can also well be used for these three pure textiles and yarns[36, 49].

1.1.15. Alcea rosea

Alcea Rosea grows 4–8 ft tall; in deep, fertile and well drained grounds, it grows best in the light (see Figure 16). Any species serve as biennials of reseeding. Blowers in a colorful range are dramatic rosette spires, single and double flowers. There are five petals in the single flowers. From pastel pinks to nearly black, several colors are available. Petals produce a reddish coloring. The research indicates that the flowers can be used both fresh and dried for food coloring. The flowers are believed to contain red anthocyanin as litmus[50, 51].

The flowers in both colors render a pink dark color on aluminum and tartar crème mordant fibers. The black floral variation gives purplish shadow. Changing the pH of the pigment is more colorful, like blue, green, and brown. Fresh plant leaves were also used for the production of green dyes[52].



Plant: Celosia cristata Family: Amaranthaceae Genus: Celosia Part used: magenta flowers

Fig. 14. Photograph of Celosia cristataflower.



Plant: Nerium oleander Family: Apocynaceae Genus: Nerium Part used: dark pink flowers

Fig. 15. Photograph of Nerium oleanderflower.

Plant flowers have been pulled down and dissolved in distilled water and have been kept over a water bath for a quick 3-hour boil in a beaker. By the end of 3 hours the whole color was removed from the flowers. For immediate usage, the solution was purified. The flowers were dried in thin layers and directly after picking in a stream of warm air. They're a rich, pure-black until they get dry. These flowers may be used whenever necessary. The dyes showed a significant high, at a maximum level of 296.33 nm (flavonoids) and 547.96 nm (UV)[3, 50].

Flowers were extracted and used for dyeing wool yarn, silk and cotton textiles from the Coloring Pigment of Hollyhock (Alcea rosea). The hollyhock dyeing reveals good rapidity in the sonicator in 1 hour and good dyeing in comparison to traditional dyeing. Cyanidine-3-glucoside, delphinidine-3-glucoside and 5-diglucoside are known to be contained in this pigment[51]. In the presence of 2%–4% mordants, the color varies from green to brown[52].

1.1.16. Hibiscus mutabilis (Gulzuba)

Gulzuba/Cotton rose/Hibiscus mutabilis is a large, multi-stretched tree that grows to a height of 15 feet (4.6 m) with a spread of approx. 10 ft (3 m). No real hibiscus, no rose (it's the Hibiscus family of Malvaceae, see Figure 17)[3]. Hibiscus mutabilis is obvious as it flows completely from late summer to autumn[53]. The flowers are pure white and color change in 3 days before they become deep rose and then assume a dark "bluepink" color when they die. The most noteworthy feature of this flowering bush is that flowers of three different colors emerge at the same time as the flowering color cycle is apart from each other[54]. There are two single and double-floral variations, all of which have wide flowers of 3 to 5 inches (8-13 cm) in width. After a rond, furry capsule has been flowered, drying and releasing fluffy seeds, the characteristic inspired by the common name of one of the plants, rose the cotton as buds look like the boll of this popular hibiscus family. The broad leaves are between 5–7 inches (13-18 cm) in size and shining green. They convey a gritty texture that gives the plant an attractive look[53, 55].

The market for the cotton rose in the garden centers, when in full bloom, is ever high, for it is one of the most impressive and rare flowering plants. This shrub really looks after itself and can be adapted to most locations and soil conditions. Little maintenance is taken. Shifting shadow from sun or light. The tubing is thriving on daily irrigation, although it is optional since it is very resistant to drought and is easy to root gulzuba[56].

Petal color variations: At midday, and at evening, the petals of this plant changed from ivory in white to light. A study of petals over three cycles found that all three of the flavanol glycosides were isoquercitrin, hyperoside, rutin, quercetin 4'-glucoside, and quercitrin, and quercetin free aglycon. In the morning, no anthocyanin, but in the other two, cyanidin 3, 5-diglucoside and cyanidin were available, and cyanidin 3-rutinoside-5-glucoside was used as free aglycon. The content was three times higher than that at midday in the evening. Since flavanols did not decline during the day, the anthocyanin was obviously autonomously synthesized[57].



Plant: Alcea rosea Genus: Alcea Family: Malvaceae Part used: Flower Hollyhock

Fig. 16. photograph of Alcea roseaflower.

The H. mutabilis flowers appear white or ivory at opening in the morning. Since anthocyanin-3-sambubioside aggregation shifts the flower's color in red by late afternoon[58]. Phenylalanine ammonia-lyase production (PAL) in petals is steadily increasing to 7 times their initial level at the start and during the fast accumulation process, and then decreases during floral senescence[56]. The synthesis of anthocyanin thus depends on the de novo cinnamic acid production. In the red petals, cyanidine 3-xylosylglucoside (ilicicyanin) and cyanidine 3-monoglucoside (chrysanthemine) were found two types of anthocyanins which were present in the 8:2 ratio. The white and red flowers in the hydrolyzed petal extracts contained quercetin and kaempferol 7:3[55]. When the white petals separated and floated with water in the light and (or) dark, a substantial amount of anthocyanins was released[58]. Metabolic inhibitors have significantly inhibited and somewhat facilitated the development of pigment in separated petals[59].

A natural tint that has been used to teint textile is produced by the family Malvaceae, Hibiscus muabilis (Gulzuba)/Cotton Rose. Gulzuba Flowers water extract gives shades of strong speed characteristics. The coloring has a decent size in the industrial cotton teinting market, silk for the clothing industry and tapestry wool yarn. Dyeing with gulzuba has shown strong color results in the present study. Pre-treatment with 2-4% metal mordants and the M:L ratio of one to four is optimized, demonstrating very strong strength characteristics for cotton, silk and wool dyed fabrics for the weight of fabric to plant extract[3, 59].

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Extraction methodsof Natural dyes

As the natural dyes material contains only a small percentage and many other plant and animal elements, including water-insoluble fibers, carbohydrates, proteins, chlorophyll and tannins, extraction is a key step not only in the preparation for purified natural coloring but also is required of raw dyes material users. As natural coloring products are not a single chemical unit, and the vegetable matrix often includes many nondyed plant components, it is a complex method to remove natural dyes. Until using an extraction method, the nature and solubility features of the coloring materials should be determined. Various coloring substance extraction techniques are[60]:

- Aqueous extraction
- Alkali or acid extraction
- Microwave and ultrasonic assisted extraction
- Fermentation
- Enzymatic extraction
- Solvent extraction
- Super critical fluid extraction

Aqueous extraction

Water extraction has traditionally been used to remove colors and other compounds from plants. The material is broken into small fragments or pulled to boost extraction efficiency. In this procedure fiberglass is first cut into little fragments[61]. The cell system is usually loosened by the water in clay containers, wood or metal (ideally in copper or in stainless steel) for lengthy periods of time throughout the night and then baked, so that a coloring solution is drained to remove the rest of the plant from the cell. The process of boiling and filtration is repeated to limit the color maximum [62].



Plant: Hibiscus mutabilis Family: Malvaceae Genus: Hibiscus Part used: Flower

Fig. 17. Photograph of Hibiscus mutabilisflower.

When extracting clean teeth, vessels should be utilized in stainless steel and the amount of substances that are soaked into water may be long shortened by boiling the solution[62]. In general, centrifuges are employed for the isolation of waste. Fine vegetable particles may be removed using trickle fillers and the natural pure dye is more soluble. This procedure is able to easily add the extract to textiles as most teeth are performed on aqueous media[61].

The downside of this extraction technique is long mining time, high water needs, high temperature consumption and low color yields, with water-soluble components eliminated and many colors without water solubility. Other water-soluble chemicals like sugar and the like are further gathered with the pigment, which must be separated for the purpose of refinement and powder extraction. The output of hot-sensitive coloring compounds at boiling temperatures is so restricted that in such circumstances lower temperatures can be employed for extraction[60].

Acidic or Alkaline Extraction Process

As certain glycoside dyes may be removed under acidic or alkaline dilution conditions. The addition of alkaline or acid promotes glycoside hydrolysis, which leads to a better extraction and greater coloring material efficiency. The extraction of dye from tesu (Butea monosperma) flowers takes place using an acid hydrolysis technique. Acidified water is also used to remove flavone dyes in order to avoid oxidation[63].

The extraction of alkaline is appropriate for dyes that have phenolic groups as it is soluble in alkali that enhances color yield. The use of acids can later cause dyes precipitation. This technique can be used to remove dye from annatto seeds. This procedure is used to remove lake dye from secretions of lakes and red dye from petals of safflower[60].

This method has the downside of allowing certain coloring products to be dissolved in alkaline conditions because some of the natural dyes are susceptible to pH. As the natural colors are normally a combination of different chemical compounds, the addition of acid or alkali in pH of the extractor will contribute to the extraction of different coloring elements by S. Saxena and A. S. M. Rajato, which may lead to differing color hues after subsequent dyeing and colorfastness variations[63].

Ultrasonic and Microwave Extraction

They are mainly microwave and ultrasonic extraction techniques, as extraction efficiency is increased by using an ultrasound or microwave, lowering the necessary amount, duration and temperature of the solvent[64]. When the natural dye containing the substance of a plant is processed with water or other solvent, extremely small bubbles or cavitation in the liquid is formed in the presence of ultrasound. These are bigger and cannot keep form until a specific size is exceeded[65]. High pressure and temperature lead to a cavity collapse or bubbles erupt. As this happens, millions of bubbles are forming and falling per second[60].

Extraction is improved due to the high temperature and stress during extraction within a short time[64]. Also at lower temperatures, this approach may be used for improved extraction of heat sensitive thinner molecules. A number of academics have lately reported the usage of this extraction technique through ongoing research on new color sources and efforts to further optimize the color extraction process.[66].

In microwave extraction, natural sources are treated with minimum amounts of solvent in the presence of microwave energy sources. Microwave increases the process pace so that the extraction may be done in a shorter time with a higher return. Microwave energy dye extraction was also proven by Sinha et al. Their group answered before that microwave help was used to remove the blue pigment from the butterfly. Extraction of microwaves and ultrasound may be employed as green methods as the reduction in extractor temperature, solvent intake and duration lead to decreased energy consumption[64].

Fermentation

The technique leverages enzymes secreted by environmentally or naturally occurring microorganisms for the extraction process. Indigo extraction is the most well-known example of this extraction process. Recaptured indigo leaves and branches are discharged to warm water (about 320). The glucoside-containing indigo found on the leaves is split into glucose and indoxy by the indimulgent enzyme, which also exists on the leaves[67].

The fermentation takes place at around 10-15 h and is carried to the vats where indoxyl is oxidized air into the insolvable blue indigothin in the bottom floor. After removal of superfluous water, it is collected, purified and pressed into cakes. The extraction of indigo from other indigo-containing plants such as wood [64] is also included in fermentation [60]. It can also be used to extract some other colors, such as annatto. Aquatic extraction is similar to the fermentation procedure, except that this approach requires high temperatures. The material coloring breaks the microbes down naturally. Some of the inconveniences of this procedure [71] are the necessity to remove colors right after harvest, to smell bad owing to microbial activity, etc.[67].

Enzymatic Extraction

Some researchers use commercial enzymes such as cellulase, amylase, and pectinase to loosen the surrounding material which leads to the extraction of coloring molecules under more mild conditions, since plant tissues contain cellulose, starches and pectin as binding materials[68]. This method can be useful in removing teal from materials such as bark, raciness and the like of hard plants[60].

Solvent Extraction

The usage of organic solvents such as acetone,

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petroleum ether, chloroform and gasoline will also make natural dyes based on their character, or combination of solvents such as ethanol and Methanol blends. Water/alcohol can be removed from the plant resources, water-soluble chemicals and water-insoluble products during extraction. The rate of extraction is higher in contrast to the aqueous procedure, with more chemicals and coloring ingredients eliminated. Acid or alkaliare also supplied to permit hydrolysis and release of glycosides by alcoholic solvents[60]

The distillation is easier to remove and re-use solvents by cleaning the pigment collected. The extraction takes place at a lower temperature and is thus less prone to deteriorate. The disadvantages of the approach are that toxic residual solvents develop and greenhouse effect [69]. Another drawback is the fact that the extracted material is not readily soluble in water and the following step is conducted in aqueous solutions. The coextraction of substances such as chlorophylls and wax compounds also presents problems[60].

Supercritical Fluid Extraction

Supercritical fluid extraction is an emerging field for the extraction and purification of natural products. A gas behaves above the critical temperature and pressure values as a supercritical fluid. Somewhere between that of a liquid and a gas, such a fluid has physical properties[60]. They can spread more quickly around the surface than a true liquid, since the surface friction is much smaller than liquids. As their viscosity is poor, the diffusiveness is very high and thus their contact with the substrate is higher. Around the same time, a supercritical fluid is capable of dissolving several compounds such as a liquid when a solution has better solubility at higher pressure and at greater temperature. Such conditions are necessary to keep the gas in a supercritical state[70].

Supercritical carbon dioxide (CO₂) fluid removal is a successful alternative to solvent extraction, since it is nontoxic, inexpensive, readily accessible, without residues. The critical carbon dioxide temperature and pressures are 31.4°C and 1.070 livres per inch (pp) or 73.8 bar. Supercritical carbon dioxideextractions typically occur between 32 and 49°C at temperatures and between 1070 and 3500 psi at pressures. As CO₂ is a non-polar molecule, it acts as an organic nonpolar solvent. To increase the solubility of the mild polar solutes, a cosolvent or a modifier can be applied[60]. The method is advantageous, because the extract is free from residual solvent residues and heavy metals and is light-colored, owing to the fact that polar polymerizing substances are not available. This process has become more common in food and pharmaceutical extraction of purified natural products[70]. The downside is that the device is expensive and the polar compounds are poorly extracted[60].

Summary

Natural colors, such as roses, are derived from the herb. The hue may be used for all-naturalfibers, such as cotton, wool and silk. plant or animal fibers. By using these colors, pollution caused by chemical dyes is reduced and production is made cleaner. Natural dyes have grown more desirable in textile teething. Many nations have laid down stringent environmental rules as a response to harmful and allergic synthetic color reactions.

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أصباغ طبيعية مختلفة باستخدام بتلات النباتات فى تلوين الأقمشة الطبيعية

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أظهر استخدام الأصباغ الطبيعية في تلوين المنسوجات اهتمامًا متزايدًا. طورت العديد من البلدان قواعد بيئية صارمة للرد على تفاعلات التلوين الاصطناعية الخطرة والحساسية. ونظرًا لوجود حاجة متزايدة للخيوط الصوفية والقطنية والحرير الصديقة للبيئة ، فهناك مناطق هائلة لمصادر ألوان جديدة. في المحتوى التالي ، يتم استكشاف العديد من مصادر الصبغة الطبيعية المبتكرة. كما تم تطبيق ميزات تلوين جديدة مثل السرعة والصباغة الطبيعية. أصبحت النباتات من الأصباغ الطبيعية أكثر شيوعًا في تلوين المنسوجات. وذلك لأن استجابات الصبغة الإصطناعية السامة والحساسية قد فرضت قواعد بيئية صارمة في العديد من الدول. خلال هذه المراجعة تم دراسة استخدام الأصباغ الطبيعية المستخرجة من النباتات وتطبيقها على المواد النسيجية.

الكلمات المفتاحية: أصباغ طبيعية. زهور؛ القطن. صوف؛ الحرير