Natural Dyes

Prepared By

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BOTANY (DSE 2) DISSERTATION REPORT PRESENTATION

Plant based colour and their industrial applications

By Ayman Khatun

Certificate

Certified that dissertation entitled brief review “Plant based colour and their industrial applications” has been carried out entirely by Ayman Khatun, student of SEM VI, B.SC. (Gen) in the department of Botany, M.U.C. Women’s College, Burdwan University under my supervision. It is further certified that the candidate has fulfilled all the conditions necessary for the partial fulfillment of her B.SC. (Gen) degree achievement under this University and this work has not been submitted anywhere for any other degree to the best of my knowledge.

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I have immense pleasure in presenting this project on Plant based colour and their industrial applications . Thank you Dr Pritam Chattopadhay sir for give this Dissertation topic (Plant based colour and their industrial applications) The subject is an interesting one .It gave me an opportunity to have detailed study on the subject and showed how thing work in the practical world . I came to understand and analyze the importance and the role of Plant based colour and their industrial applications, I had a great time working on the project and I have provided information to the fullest of knowledge and findings .

Ayman Khatun

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Introduction

Dyes definition: Dyes are colored organic compounds that are use to color various substances like fabrics, paper, food, hair and drugs etc. With regard to their solubility, organic colorants fall into two classes, viz. dyes and pigments. The key distinction is that dyes are soluble in water and/or an organic solvent, while pigments are insoluble in both types of liquid media. Dyes are used to color substrates to which they have affinity. Pigments can be used to color any polymeric substrate but by a mechanism quite different from that of dyes, in that surface only coloration is involved unless the pigment is mixed with the polymer before fiber or molded article formation. To be used dye must possess these four properties. (i) Color (ii) Solubility in water and/or an organic solvent. (iii) Ability to be absorbed and retained by fiber (substantivity) or to be chemically combined with it (reactivity). (iv) Ability to withstand washing, dry cleaning and exposure to light.

NATURAL DYES

Natural dyes are derived from naturally occurring sources such as plants (e.g., indigo and saffron)

- Insects (e.g., cochineal beetles and lac scale insects)
- Animals (e.g., some species of mollusks or shellfish)
- Minerals (e.g., ferrous sulfate, ochre, and clay)

without any chemical treatment.

- A spectrum of beautiful natural colors ranging from yellow to black exists in the above sources.
- These colors are exhibited by various organic and inorganic molecules (pigments) and their mixtures are due to the absorption of light in the visible region of 400-800 nm.
- This absorption of light depends on the structure or constituents of the colouring pigment/ molecules contain various chromophores present in the dye yielding plant to display the of colors

- The use of natural products together with their therapeutic properties is as ancient as human civilization and for a long time, mineral, plant and animal products were the main sources of drugs
- The current preference for naturally derived colorants is due to their healthfulness and excellent performance.
- Several synthetic colorants have been banned because they cause allergy-like symptoms or are carcinogens.
- Nowadays, natural dyes are commonly used in the cosmetic industry due to no side effects, UV protection and anti-aging properties.
- In India, there are more than 450 plants that can yield dyes. In addition to their dye-yielding characteristics, some of these plants also possess medicinal value.

- Natural dyes are environment friendly for example, turmeric, the brightest of naturally occurring yellow dyes is a powerful antiseptic which revitalizes the skin, while indigo gives a cooling sensation.
- Many of the plants used for dye extraction are classified as medicinal and some of these have recently been shown to possess antimicrobial activity.
- Many other common natural dyes are reported as potent antimicrobial agents owing to the presence of a large amount of tannins.

TURMERIC

Scientific classification

Kingdom : Plantae
Division : Magnoliophyta
Class : Liliopsida
Subclass : Zingiberidae
Order : Zingiberales
Family : *Zingiberaceae*
Genus : *Curcuma*
Species : *C. longa*

Turmeric is commonly known as Indian saffron. It consists of dried, as well as fresh rhizomes of the plant *Curcuma longa* Linn.

Chemistry of pigments:

Turmeric contains about 5% of volatile oil, resin and yellow colouring substances known as curcuminoids. The chief component of curcuminoids is known as "curcumin". Chemically curcuma species contain volatile oils, starch and curcumin (50 – 60 %).Curcumin and other related curcuminoids are reported to be responsible for yellow colour of the dye.

Structure of curcumin

Uses

- ✓ Curcumin from *Curcuma longa* has antioxidant, anti-inflammatory, anti cancer and Hepatoprotective.
- ✓ The pharmacological activities of cucrcumnoids are due to unique molecular structure.
- ✓ The phenolic yellow curry pigment curcumin used in the Alzheimer's disease,
- ✓ It has anti-inflammatory effects in arthritis, possibly inhibits prostaglandin synthesis pathway of Cox-2 without causing ulcers in the GI tract.
- ✓ it has anti-platelet, anti viral, anti fungal, anti bacterial effects (inhibits Helicobacter Pylori) and powerful antiseptic agent

SAFFRON

Scientific classification

Kingdom : Plantae
(unranked) : Angiosperms
(unranked) : Monocots
Order : Asparagales
Family : *Iridaceae*
Subfamily : Crocoideae
Genus : *Crocus*
Species : *C. sativus*

It is commonly known as crocus, it consists of dried stigmas and upper parts of styles of plant *Crocus sativus* Linn. It is a widely used as natural dye in food and cosmetic industry.

Chemistry of pigments: The main constituents of saffron are crocin, crocetin, picrocrocin and safranal. α-crocin is a carotenoid pigment which is primarily responsible for saffron's golden yellow-orange colour. The bitter glycoside picrocrocin is responsible for saffron's flavour. It is a union of an aldehyde sub-element known as safranal, which is responsible for the aroma of the saffron

MEDICINAL IMPORTANCE

- Saffron is used in folk medicine as an antispasmodic, eupeptic, gingival sedative.
- Anticatarrhal, nerve sedative, carminative, diaphoretic, expectorant, stimulant, stomachic, aphrodisiac and emmenagogue.
- Its active constituents have anticonvulsant, antidepressant, anti-inflammatory and antitumor properties, radical scavenger as well as learning and memory improving properties and promote the diffusivity of oxygen in different tissues.
- *Crocus sativus* has been shown to have antidepressant effects; two active ingredients are crocin and safranal.

SAFFLOWER

Scientific classification

Kingdom : Plantae
Phylum : Magnoliophyta
Class : Magnoliopsida
Order : Asterales
Family : *Asteraceae*
Genus : *Carthamus*
Species : *C. tinctorius*

Safflower (*Carthamus tinctorius* L.) has a long history of cultivation as an oilseed crop and as a source of red dye (carthamin).

Chemistry of pigments: The main constituents of the safflower are carthamin and carthamidin. And other constituents are safflor yellow, arctigenin, tacheloside, N-feruloyl tryptamine, N-feruloylserotonin, steroids, flavonoids, polyacetylenes. Carthamin is responsible for to produce water-insoluble red dye and carthamidin for water-soluble yellow colour dye

MEDICINAL IMPORTANCE

- Carthamin is extracted from its flowers and it is used for treatment in the form of infusion for circulatory system related diseases.
- In addition to the colouring properties, safflower petals are used for curing several chronic diseases such as hypertension, coronary heart ailments, rheumatism, male and female fertility problems.
- The chief constituent Carthamin has uterine stimulating, coronary dilating and hypertensive.
- It also has the cytotoxic, antigenic and anti-platelet activities

ANNATO

Scientific classification

Kingdom : Plantae
(unranked) : Angiosperms
(unranked) : Eudicots
(unranked) : Rosids
Order : Malvales
Family : *Bixaceae*
Genus : *Bixa*
Species : *B. orellana*

Among the naturally occurring colourants, an important one is annatto. It is a carotenoid based dye, extracted from the outer coatings of the seeds of *Bixa orellana* L. The images of the annatto plant and dye

Chemistry of pigments: Phytochemicals investigations have revealed the presence of several carotenoid derivatives including bixin and norbixin,some terpenoid, tocotrienols,arenes and falvonoids (including luteolin and apigenin) in *Bixa orellana* seeds. The reddish orange colour dye of the annatto is mainly comes from the resinous outer covering of the seeds of the plant (*bixin, norbixin* and their esters).

MEDICINAL IMPORTANCE

- ✓Annato seeds are used as purgative, antipruritic and for buccal tumours.
- ✓These are also used as cordial, astringent, febrifuge and a good remedy for gonorrhea.
- ✓The seed extracts have been reported to exhibit chemo preventive and antioxidant activity.
- ✓Bixin has also been found to have anticlastogenic activity

POMEGRANATE

Scientific classification
Kingdom : Plantae
Division Magnoliophyta
Class : Magnoliopsida
Subclass : Rosidae
Order : Myrtales
Family : *Lythraceae*
Genus : *Punica*
Species : *P. granatum*

It consists of fresh and dried fruits of the plant *Punica granatum.*

Chemistry of pigments

- Anthocyanins are water-soluble pigments primarily responsible for the attractive red purple colour of pomegranate juice.
- It contains chief constituents such as punicalagin, punicalin, gallagic and ellagic acids.
- It also contains alkaloids like isopelletierine.
- Punica granatum dye and many other common natural dyes are reported as potent
- antimicrobial agents owing to the presence of a large amount of tannins.

MEDICINAL IMPORTANCE

- ✓ Pomegranate fruit not only used as natural dye it also having traditional medicinal value is now supported by data obtained from modern science showing that the fruit contains anti-carcinogenic, anti-microbial and anti-viral compounds.
- ✓ Recent Biological studies have proven that certain compounds contained in pomegranate juice, which has been shown to reduce blood pressure, are anti-atherosclerotic and significantly reduce LDL oxidation.
- ✓ These activities are attributed to the pomegranate's high level of antioxidant activity and high total Phenolic content It is also used as bactericide and stimulant.
- ✓ Because of their tannin content, extracts of the bark, leaves, immature fruit and fruit rind have been given as astringents to halt diarrhea, dysentery and hemorrhages. It also shows hypertensive, antispasmodic and anthelmintic activity in bioassay of leaves, seeds, roots and bark.

TOMATO

Scientific classification

Kingdom : Plantae
(unranked) : Angiosperms
(unranked) : Eudicots
Order : Solanales
Family : *Solanaceae*
Genus : *Solanum*
Species : *S. lycopersicum*

It is widely used in worldwide food industry and it has potent anti cancer property. It consists of fresh ripen fruits of plant *Solanum lycopersicum*.

CHEMISTRY OF PIGMENTS

The major constituents of the tomato are lycopene, α and β-carotene, lutein, zeaxanthin and b-crypto xanthin Lycopene is a carotenoid that is present in tomatoes is responsible red colour of the fruit. It constitutes about 80–90% of the total carotenoid content of red ripe tomatoes.carotene, the yellow pigment of the carrot is the isomer of lycopene.

MEDICINAL IMPORTANCE

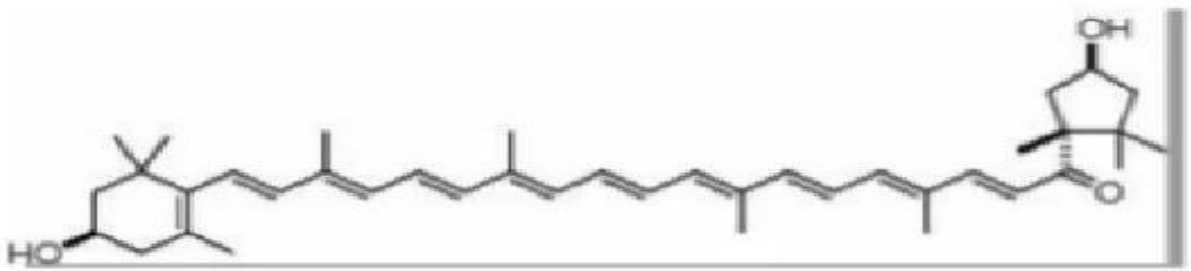
- ✓ In recent studies serum and tissue levels of lycopene were shown to be inversely associated with the risk of breast cancer and prostate cancer and also it is used to prevent all types of cancers in the body.
- ✓ Lycopene is the most efficient antioxidant among carotenoids through its quenching activity of singlet oxygen and scavenging of peroxyl radicals.
- ✓ Tomatos are also used for the rich source of Vitamin-A.

PAPRICA

Scientific classification

Kingdom : Plantae
(unranked) : Angiosperms
(unranked) : Eudicots
(unranked) :Asterids
Order : Solanales
Family : *Solanaceae*
Genus : *Capsicum*
Species : *C. annuum*

Paprica is obtained from the fruits of selectively bred varieties of 'sweet peppers', *Capsicum annuum* L. The fruits are large, fleshy with an intense red colour and it has many medicinal uses.



Structure of Capsanthin

MEDICINAL IMPORTANCE

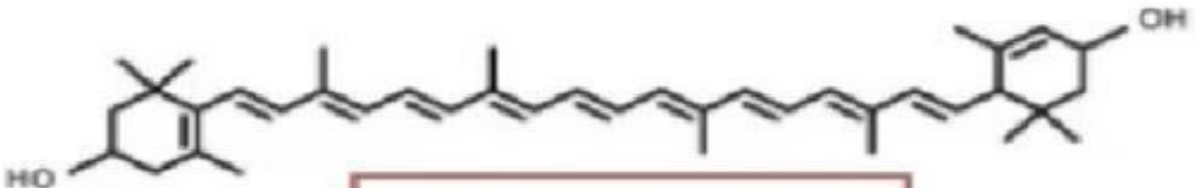
- ✓Paprica is employed in medicine, in combination with Cinchona in intermittent and lethargic affections, and also gout, dyspepsia accompanied by flatulence, tympanitis, paralysis etc.
- ✓It is used as a carminative, an appetizer, stomachic and also used in spices.
- ✓Externally it is used as a counter irritant in the treatment of rheumatism, lumbago and neuralgia

TAGETUS

Scientific classification

Kingdom : Plantae
(unranked) : Angiosperms
(unranked) : Eudicots
(unranked) : Asterids
Order : Asterales
Family : *Asteraceae*
Genus : *Tagetes* Species :*T. erecta*

Tagetes is popularly known as marigold, it contains carotenoid pigments from *Tagetes* erecta are useful in food coloring and it has medicinal activities.



structure of lutein

Chemistry of pigments: The principle colouring component of marigold flower is lutein, a fat-soluble carotenoid, which is responsible for the yellow to orange colour of the dye. It also contains galenine, lycopene, α-carotene, β-carotene and γ-carotene.

HENNA

Scientific classification

Kingdom : Plantae
Subkingdom : Tracheobionta
Division : Magnoliophyta
Class : Magnoliopsida
Order : Myrtales
Family : *Lythraceae*
Genus : *Lawsonia*
Species : *L.inermis*

Henna is widely used in the cosmetic industry as dyeing agent. It consists of fresh or dried leaves of the plant *Lawsonia inermis*.It has medicinal importance along with dyeing property

chemistry of pigments:

The active constituents of the leaf is lawsone(0.5- 1.0%).Other constituents are 5-10% gallic acid,white resin, tannin and xanthones are the other contents of the leaves.The **'Lawsone'** is principally responsible for the colourant property of the henna leaves.

INDIGO

Indigofera is a large genus of over 750 species of flowering plants belonging to the family Fabaceae. They are widely distributed throughout the tropical and subtropical regions of the world *Indigofera tinctoria*

Scientific classification

Kingdom: Plantae

(unranked): Angiosperms

(unranked): Eudicots

unranked): Rosids

Order: Fabales

Family: Fabaceae

Subfamily: Faboideae

Tribe: Indigofereae

Genus: ***Indigofera***

CHEMISTRY OF PIGMENTS

A galactomannan, composed of galactose and mannose in molar ratio of 1:1.52,Glycoside(Indian),Coloring matter(Indigotin),Flavonoids,terpinoids,alkaloids&glycosides,Indigotine,Indiruben,rotenoids.

USES

- The Indigo Leaves are used to make hair dye as well as prepare medicated hair oil. Leaf powder is used as natural black color dye for hair. Indigofera make your hair more manageable, moisturized, protected with radiant shine.
- Dye is obtained from the processing of the plant's leaves, Indigo is among the oldest dyes to be used for textile dyeing and printing.
The root is crushed and prepared into decoction, and given for abdominal disorders,leucorrhoea,all types of toxicities etc.The leaves are crushed, prepared into decoction and given for toxicities,fever,arthritis etc.
- The leaf juice is given in the dose of 10-20ml along with honey twice daily for jaundice, inflammation of liver etc.For poisonous bites the samoolam or the whole plant is ground and applied as a paste over the bitten area. Also the leaf juice is given internally to the patient.

Table1

Botanical name	Family	English name	Parts used	Colour obtained	Responsible pigment	Origin and distribution	Remarks
Curcuma longa L.	Zingiberaceae	Turmeric	Rhizome	Yellow	Curcumin	Originated in the Indo-Malayan region but widely distributed in the tropics of Asia to Africa and Australia. Grown generally as an annual crop, cultivable from sea level up to 1200 m.	Percentage of curcumin varies from 4.0 to 9.0.
Capsicum annuum L.	Solanaceae	Paprika, red pepper and sweet pepper	Fruit	Red, dark red, purple red, reddish orange and yellow	Cryptoxanthin lutein, zeaxanthin, capsanthin, capsorbin and violaxanthin	Native to New World tropics, now widely cultivated in the temperate zones as well as the tropics. Shrubby perennial, usually grown as herbaceous annuals.	
Crocus sativus L.	Iridaceae	Saffron	Flower	Yellow and orange	Crocin and crocetin	Autumn-flowering perennial plant of the eastern Mediterranean. A corm survives for only one season; upon flowering, it averages less than 30 cm in height, having crimson stigma. The plant can tolerate cold winters, surviving frosts as cold as −10°C and short periods of snow cover.	
Bixa orellena L.	Bixaceae	Annatto	Seeds	Yellow/orange and red	Bixin, norbixin and carotenoids	Indigenous to tropical America and the West Indies, now cultivated in the rest of the tropics, particularly Mexico, Brazil, Guiana and the Antilles; naturalized in the hotter parts of India; small evergreen tree (about 5 m); thrives at elevations of 600–900 m.	Dye content varies from 5 to 6% by weight of seeds. However, bixin occupies 70–80% in each seed.
Daucus carota L.	Apiaceae	Carrot	Root	Orange	β-Carotene	Native to Europe and southwestern Asia; grown all over the world; biennial plant; cool season crop; stout taproot stores large amounts of sugars for the plant to flower in the second year; prefers moist, loose, well-drained light loamy soils.	Contains about 16,700 IUs of β-carotene.
Beta vulgaris L., Beta *vulgaris* var. *conditiva* L.	Chenopodiaceae	Beet root, red beet	Root	Red, red–violet and yellow	Betanins (betanidin, betacyanin and betaxanthin)	Native to the Mediterranean but spread eastwards into West Asia. An erect herb with thick, fleshy root.	

Table 2

Vitis vinifera L. and *Vitis romanetii* Romanet. ex Foex	Vitaceae	Grape (European) and black grapes	Fruit	Red, purple, yellow and blue	Anthocyanins (cyanidin, pelargonidin, peonidin, delphinidin, petunidin and malvidin)	Believed to have originated near the shores of Caspian sea and spread to other parts of the world (*V. romanetii* from E. Asia – China); grown under semi-arid and subtropical climatic conditions; perennial vine; woody climbing by coiled tendrils; ellipsoidal fruits with a solid flesh and relatively thin skin (epicarp).
Fragaria virginiana, *Fragaria chiloensis* (L.) Duchesne, *Fragaria daltoniana* J. Gay	Rosaceae	Strawberries	Fruit	Red	Anthocyanin	Native to Europe and the Americas; grown extensively in most temperate and in some subtropical countries (*F. daltoniana* native to Asia – temperate (China) and tropics (Indian subcontinent and Indo-China)); perennial herbs with short, woody stems or stocks with rosette leaves.
Rubus idaecus L.	Rosaceae	Raspberries	Fruit	Red and purple	Anthocyanin	Native to Europe, widely grown in all temperate regions of the world; traditionally, a mid-summer crop, but now obtained year-round; requires ample sun and water for optimal development.
Vaccinium corymbosum L.	Ericaceae	Blueberries	Fruit	Blue	Anthocyanin	Native to North America, eastern Asia and Northern Europe and spread to Germany, Poland, Italy and other countries of Europe; grow in semi-shade (light woodland) or no shade; shrubs varying in size (10 cm to 4 m tall); initially, fruits are pale greenish, but turn to reddish-purple, and finally dark purple on ripening; the crop requires about 50 000 beehives for pollination.

Table 3

Botanical name	Family	English name	Parts used	Colour obtained	Responsible pigment	Origin and distribution	Remarks
Aronia arbutifolia (L.) Pers.	Rosaceae	Chokeberry or red fruit (Aronia)	Fruit	Bright red, red and orange	Anthocyanin and carotenes	Native to eastern North America and most commonly found in wet woods and swamps; deciduous shrubs grow usually up to 2–4 m tall, red fruits persisting into winter.	Anthocyanins combat oxidative stress and urinary tract infections, stimulate circulation, lower cholesterol levels and are beneficial to cardiac health.
Ribes nigrum L.	Grossulariaceae	Black currant	Fruit	Purple–black	Anthocyanin	Native to Eurasia; distributed mainly in temperate regions of Europe, Asia and North and South America; small shrub growing to 1–2 m tall; fruit very dark purple in colour edible berry, with a glossy skin and a persistent calyx at the apex.	
Sambucus spp.	Adoxaceae	Elderberry	Fruit	Dark red	Cyanidin	Native to temperate to subtropical regions of both the Northern Hemisphere and the Southern Hemisphere; more widespread in the Northern Hemisphere, with Southern Hemisphere occurrence restricted to parts of Australasia and South America; shrubs or small trees.	
Solanum lycopersicum L. (syn. *Lycopersicon esculateum* L.)	Solanaceae	Tomato	Fruit	Red	Lycopene	Originated from Peru–Ecuador–Bolivia area of South America but domesticated from central Mexico and spread to other warm temperate and tropical countries of the world. Short-lived perennial, but cultivated as annual.	
Allium cepa L.	Alliaceae	Onion	Bulb	Brown	Quercetin	Probably, originated from central Asia and Near East; spread to other parts of the world. Bulbous perennial, grown as annual.	

Table 4

Medicago sativa L.	Fabaceae	Alfalfa grass and Lucerne	Leaf	Green	Chlorophyll/ chlorophyllin	Native to Iran; spread to Central Asia, Greece, Chile to the United States; widely grown throughout the world as forage for cattle, and most often harvested as hay; wide range of adaptation from the very cold Northern Plains to high mountain valleys, and from rich temperate agricultural regions to Mediterranean climates and searing hot deserts; perennial plant cultivated as an important forage crop.
Brassica oleracea L. var. *capitata* L.	Brassicaceae	Green/red cabbage	Leaf	Green, reddish-purple/ purplish red	Chlorophyll and anthocyanin	Native of the Mediterranean region as well as southern England, Wales and northern France. Widely grown in temperate regions and of great importance in Europe; well adopted to cool, moist climate of the temperate zones; biennial; grown as annual.
Urtica dioica L.	Urticaceae	Nettle and stinging nettle	Leaf	Natural green, yellow and orange	Chlorophyll/ chlorophyllin, xanthophyll and carotene	Native to North America; widespread throughout the eastern USA and in most counties in Ohio; grows in moist, shady spots, in flood plains, woodlands and along streams and river banks; spread in temperate and tropical wasteland areas around the world; naturalized in Brazil and other parts of South America; perennial robust herb (2–4 m) with pointed leaves.
Apium graveolens L.	Apiaceae	Celery	Leaf	Green	Chlorophyll/ chlorophyllin	Native of temperate Europe, from England to Asia Minor; widely grown in temperate countries; strong-smelling glabrous biennial herb; requires a cool climate with moist sandy loam soils.

Table 5

Botanical name	Family	English name	Parts used	Colour obtained	Responsible pigment	Origin and distribution	Remarks
Petroselinum crispum (Mill.) Nym. Ex Hill	Apiaceae	Parsley	Leaf	Green	Chlorophyll/ chlorophyllin	Native to the Mediterranean area; a bright green, biennial herb but grown as annual; very common in Middle Eastern, European and American countries; flat leaves valued for their strong flavour; requires an ordinary, good well-worked soil, but a moist one and a partially shaded position.	
Spinacia oleracea L.	Chenopodiaceae	Spinach	Leaf	Green	Chlorophyll/ chlorophyllin	Originally from Persia, dispersed to various parts of Asia, Spain, spread to the rest of Europe; herbaceous biennial; grown as annual of variable habitat with arrow-shaped or more rounded thick leaves fused into a rosette.	
Hibiscus sabdariffa L.	Malvaceae	Roselle, Jamaican sorrel and Hibiscus	Calyx	Bluish red and purple (pink)	Anthocyanins	Native to the Old World tropics, probably in the East Indies; now cultivated throughout the tropics; suitable for tropical climates from sea level to about 600 m altitude; annual or perennial herb or woody-based sub-shrub (up to 3 m tall); fruit consists of the large reddish calyces surrounding the small seed pods.	Calyces contain 6.7% proteins by fresh weight and 7.9% by dry weight.
Tagetes erecta L.	Asteraceae	Marigold	Petal	Yellow/ orange	Xanthophyll (lutein)	Native to Mexico; adopted to tropical, subtropical and temperate regions; herbaceous annual; grown in gardens for its bright attractive flowers.	
Gardenia augusta (L.) Merr. (syn. *Gardenia jasminoides*)	Rubiaceae	Gardenia and cape jasmine	Fruit	Yellow and dark reddish violet	Carotenoids and xanthophyll?	Native to southern China, Taiwan, Japan and nearby regions of the subtropical; mostly evergreen shrubs or small trees; grown as an ornamental plant in cold and warm climates (sunny or partly shaded position); glossy evergreen foliage and fragrant flowers.	

5

Importance in industrv

Color plays a significant role in the food production and processing sector, contributing to the sensory attribute of food. It signifies freshness, nutritional value, safety, and aesthetic value of a food, directly affecting the market value of the colored food product.

Normal constituents of cells or tissues, that impart color. It has other properties, i.e. energy receptor, carriers of O2, protects against radiation.

Plant Pigments

1. Chlorophylls 2. Carotenoids 3. Flavonoids . Anthocyanins 5. Tannins 6. Betalains 7. Quinones 8. Xanthones

Table 1

Betalains		
Yellow to orange	Beetroot	Beverages, frozen foods, fruit fillings, candies and baked goods
Bluish-red	Beet juice colours (beet root) and opuntia	Fruit preparations, condiments sauces, fillings and candies, condiments, gelatine products, certain powdered beverage products and dairy products
Red–violet and yellow	Red beet root and opuntia	Beverages, frozen foods, food stuffs, fruit fillings, chewing gums, candies, baked goods, medicinal products, colouring red to soybean products
Flavonoids/anthocyanins		
Red, purple and blue	Strawberries, grape skin, black grapes blueberries, raspberries and red perilla	Confectionery, food products and dessert products
Red	Red cabbage	Colouring chewing gum and vegetable juice, making drinks free from nasty smell, and sedimentation
Red	Red-fleshed potato	Colorant used as an additive to foodstuffs, beverages, pharmaceuticals, toiletries, etc.
Deep red	Elderberry	Beverages, fruit confectionery, sorbets and sauces, food colorant, desserts and soft drinks
Bright red–orange to strawberry red	Chokeberry or red fruit (Aronia)	Jelly making, candies, pie and cookie fillings, yogurt, sorbet and flavoured milk
Bright red and purple	Hibiscus	Soft drinks and alcoholic beverages
Reddish-purple	Grape	All beverages, fruit base, sorbets and sauces
Yellow and reddish-orange	Safflower	Colouring food items and soft drinks
Yellow–orange	Tea (flavone)	Beverages, medicines, health-care products and food products
Purple–black	Black currant	Beverages, confectionery, fruit preparations, soft drinks and preserves
Dark violet–blue	Indigo plant	Fruits, dairy products, cosmetics and medicines
Bluish red	Hibiscus	Bakery products and tea-based beverages to enhance the brown tint and colouring food
Purplish red	Bayam (*Amaranthus*)	Colouring beverage of grape juice, jelly and powder juice
Bluish-purple	Litmus moss	Colouring foods and beverages
Blue	Clerodendron	Colouring food

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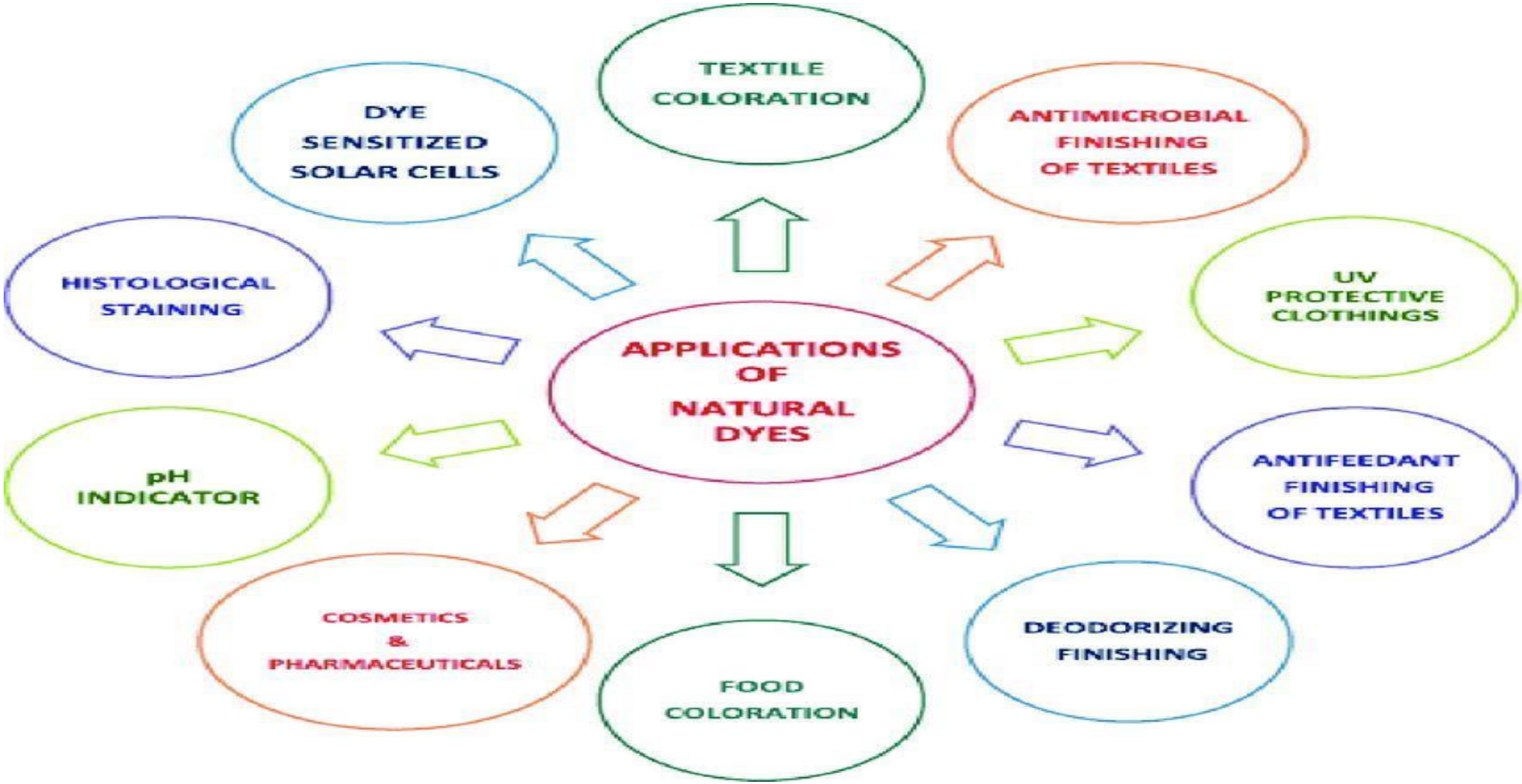
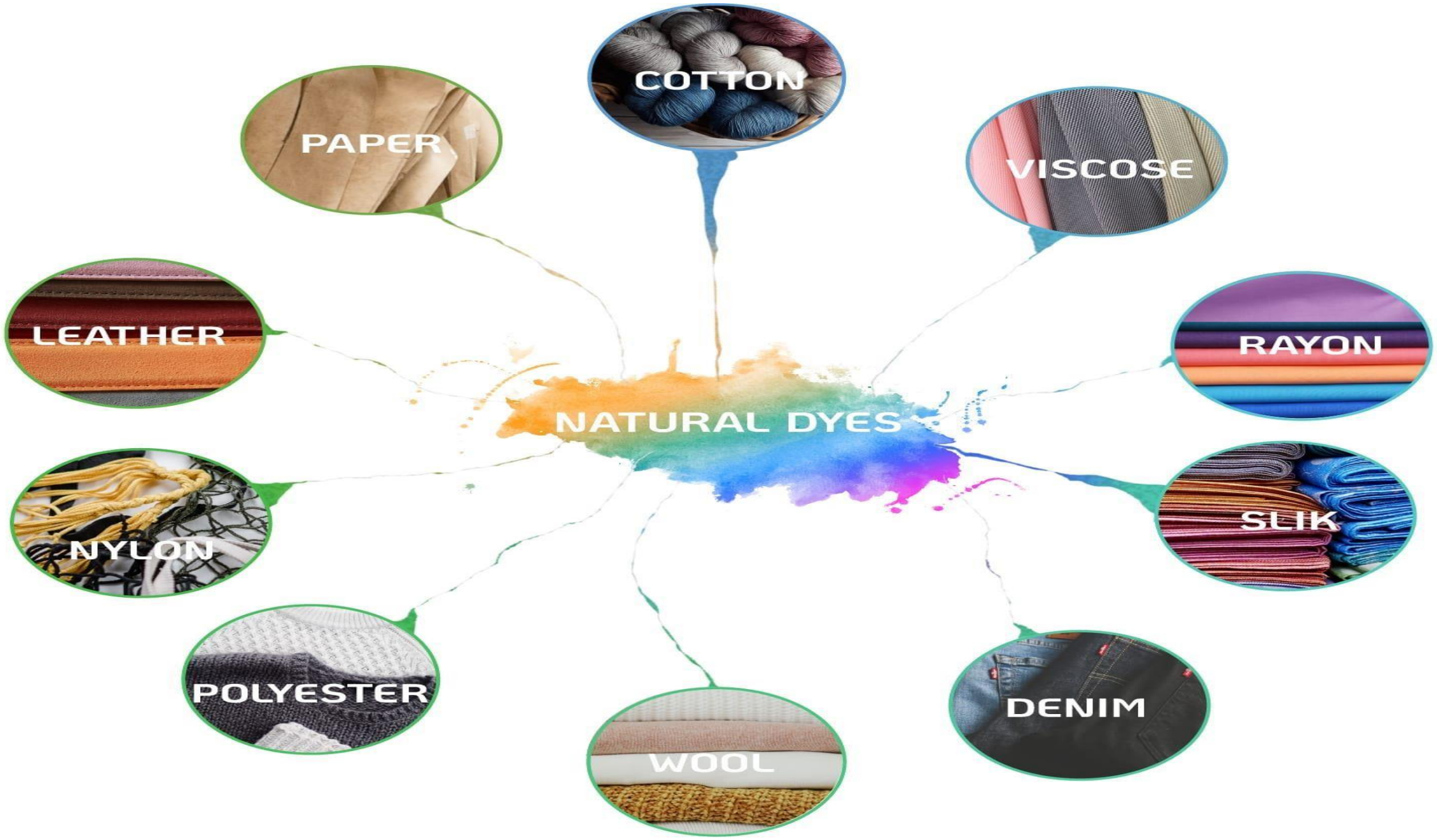
Table 2

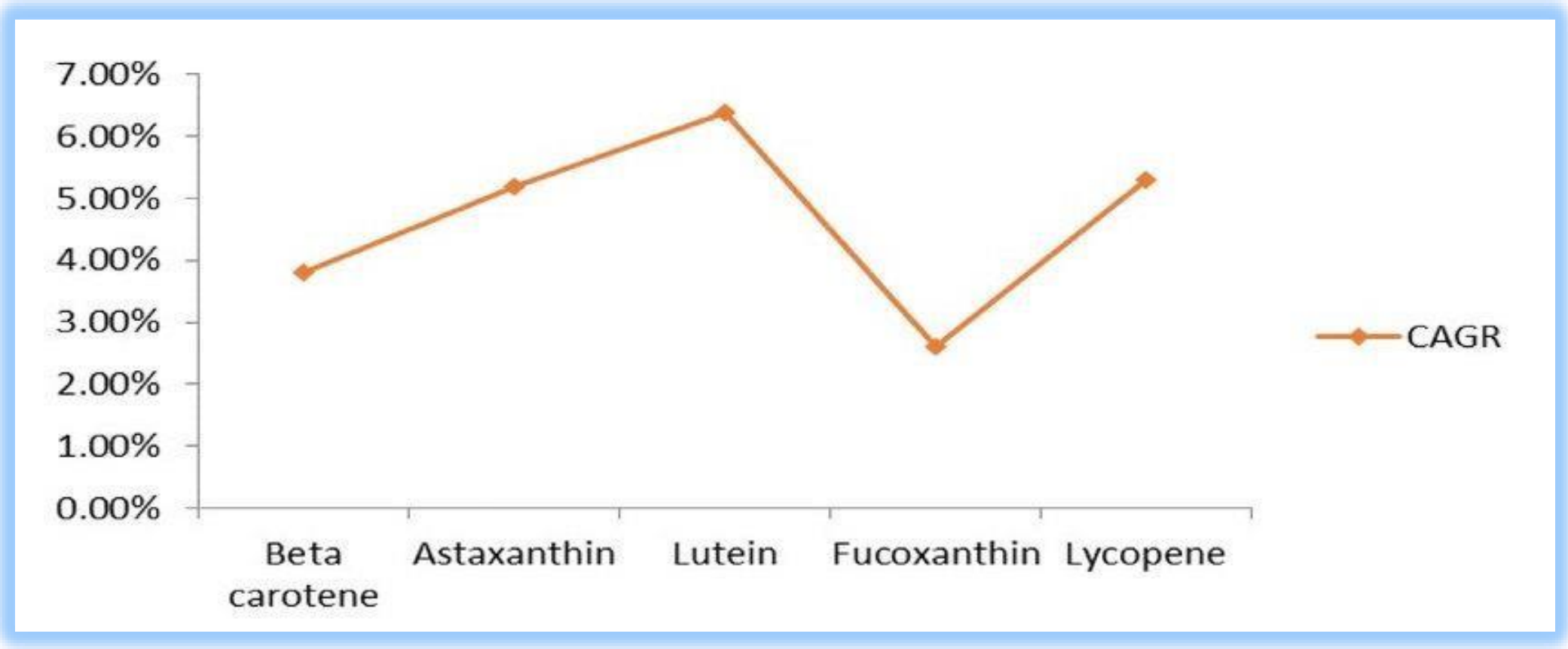
Colour	Pigment	Presence in		Potential benefits
		Cell component	Source	
Green	Chlorophyll (a, b, c and d)	Chloroplast	Herbs and leafy vegetables	Neutralize free radicals
Red, orange, yellow to brown	Carotenoids	Chloroplast and chromoplast	Carrots, fruits and vegetables	Neutralize free radicals
Red	Lutein and lycopene	Chloroplast and chromoplast	Green vegetables, corn and tomato products	Reduce the risk of macular degeneration and prostate cancer
Yellow, red, blue and orange	Phenolics: anthocyanidins, catechins, flavonoids, flavones, lignans and tannins (proanthocyanidines)	Cytosol and vacuole	Fruits, vegetables, tea, citrus, cranberries, cranberry products, pomegranates, cocoa, chocolate, flax and rye	Neutralize free radicals; reduce risk of cancer; prevention of cancer and renal failure; improve urinary tract health; reduce risk of cardiovascular disease
Yellow, orange, red and violet	Betalains	Cytosol and vacuole	Flower, fruits and other parts (as in beet root)	



9/3/20XX
Presentation Title


COTTON
PAPER
VISCOSE
LEATHER
RAYON
NATURAL DYES
NYLON
SLIK
POLYESTER
DENIM
WOOL

Representation



GR Graphical

Conclusion

More interest in natural dyes has been mainly manifested as conservation and restoration of textiles with replacement of synthetic dyes by natural dyes for textiles, food, and safety using mild chemistry. The research and development work in standardization of natural dyes are very less. Very few serious attempts have been made to generate new information on the use of natural dyes. As there is much catching up to do after 150 years of neglect, there is rapid scope for developments. The contributions for standardization of natural dyes are made by some companies like Alps Industries Ltd. that uses Supercritical CO2 plant for extraction of dyes for a step towards standardization. The standardized natural extracts are very much useful for Textiles, food, pharmaceuticals and cosmetics. On the other hand, the uses of natural dyes are often linked to term of fastness properties mainly wash and light fastness. This can be improved by proper selection of natural mordants and extraction along with best application of technology and ecological process. In this way, commercialization of such plant dyes for coloration of textiles material is needed which is highly useful for the local rural dyers and plant cultivators. Thus, natural dyeing of textiles by industrial processes in large scale dyeing unit is now a reality in the textile market of ecofriendly textiles.

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Natural Dye
Wool can be dyed using natural sources like plant leaves, flowers, roots or nuts. Some of these plant mat... find in your own backyar...
Thank you
SHADES OF PINK
STRAWBERRIES
RASPBERRIES
CHERRIES
ROSES
SHADES OF RED
BEETS
SHADES OF ORANGE
MARIGOLDS
CARROT
ONION SKINS
ACORNS
SHADES OF BROWN
WALNUTS
FENNEL FLOWERS
COFFEE GROUNDS
TEA BAGS
ST. JOHN'S WORT
SHADES OF GREEN
CHAMOMILE LEAVES
GRASS
RED PINE
PEPPERMINT
SHADES OF BLUE
CORNFLOWER
MULBERRIES
BLUEBERRIES
BLACKBERRY
JUNIPER BERRIES
SHADES OF PURPLE
HYACINTH FLOWER
POKE BERRY
A dye bath is made from chopped-up plant material and water. The mixture is brought to a boil and then simmered. The wool should simmer in the dye bath for 30 minutes to an hour depending on the dye and the intensity of color desired.