Bio Friendly Herbal Excipients-Colouring Agent and Dyes

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INTRODUCTION

Herbal Excipients

The Herbal or natural excipients have a great advantage over their synthetic analogues as these are non- toxic, less expensive and freely available. The increasing awareness about this herbal excipient, which are manly polymers of natural origin, the pharmaceutical industries is getting more inclined towards their use in formulation development. The plant derived gums, mucilage's Tromp astral jounces like carrageenan, traumatic, lard, storax, agar, gum acacia, tragacanth and many more to make comply with many requirements of pharmaceutical excipients. These can be preferred for formulation development as being stable and involving less regulatory issues as compared to their synthetic counter parts. They can also be easily modified to meet the specific needs, thereby being potent and economic vehicle for delivering active pharmaceutical Ingredient in formulation. Thus, present study aims to throw light on the potential of natural which can be proposed to be used as diluent, binder, Disintegrants as well as lubricant in various types of formulations as they are biocompatible and capable of giving additional nutrition to the developed dosage form. Excipients are defined as the substance used as a medium for giving a medicament. [1] The specific application of natural polysaccharide polymers in pharmaceutical formulations include to aid in the processing of the drug delivery system during its manufacture, protect, support or enhance stability, bioavailability or patient acceptability, assist in product identification, or enhance any other attribute of the overall safety, effectiveness or delivery of the drug during storage or use [2]. Several pharmaceutical excipients of plant origin, like starch, agar, alginates, carrageen an, guar gum, xanthan gum, gelatin, pectin, acacia, tragacanth, and cellulose find applications in the pharmaceutical industry as binding agents, disintegrates, sustaining agents, protective's, colloids, thickening agents, gelling agents, bases in suppositories, stabilizers, and coating materials [3]. As plants sources are renewable and can be cultivated or harvested in sustainable manner, can supply constant availability of raw material. Waste from food industry can be achieved as a raw material to extract herbal excipients. These are other reasons for increase in demand of herbal material as excipients. However, substances from plant origin also pose several potential challenges such as being synthesized in small quantities and in mixtures that are structurally complex, which may differ according to the location of the plants as well as other variables such as the season. This may result in a slow and expensive isolation and purification process. Another issue that has become increasingly.

Pharmaceutical Excipient:

Pharmaceutical excipients can be defined as non-active ingredients that are mixed with therapeutically active compounds to form medicines. The ingredient which is not an active compound is regarded as an excipient. Excipients affect the behavior and effectiveness of the drug product more and more functionality and significantly. The variability of active compounds, excipients and process are obvious components for the product variability [4].

2. CLASSIFICATION OF EXCIPIENTS

Excipients are commonly classified according to their application and function in the drug products • Binder and Diluent

- Lubricants, Guidant’s, Disintegrants
- Polishing film former, Coating Agents
- Plasticizer, Coloring agents, Dyes
- Suspending Agent, Preservatives
- Flavored, Sweeteners, Taste Improving Agent

- Printing Ink, Dispersing Agent Gum [5]

3. A] ADVANTAGE OF HERBAL EXCIPIENTS:

1. Biodegradable- Naturally occurring polymer produced by all living organisms. They show no adverse effects on the environment or human being.
2. Biocompatible and Nontoxic- Chemically nearly all of these plant materials are carbohydrates in nature and composed of repeating monosaccharide units. Hence they are non-toxic.
3. Economic- They are cheaper and their production cost is less than synthetic material.
4. Safe and devoid of side effect-They are from a natural source and hence, safe and without side effects.
5. Easy availability-In many countries they are produced due to their application in man [6].

B] DISADVANTAGES OF HERBAL EXCIPIENTS:

1. Microbial contamination- During production, they are exposed to external environment and hence, there are chances of microbial contamination
2. Variation- Synthetic manufacturing is controlled procedure with fixed quantities of ingredients while production of natural polymers is dependent on environment and various physical factors.
3. The uncontrolled rate of hydration-Due to differences in the collection of natural materials at different times, as well as differences in region, species, and climate conditions the percentage of chemical constituents present in a given material may vary.
4. Slow Process- As the production rate is depends upon the environment and many other factors, it can't be changed. So natural polymers have a slow rate of production
5. Heavy metal contamination- There are chances of Heavy metal contamination often associated with herbal excipients [6] [7].

4. A] COLORING AGENTS:

Colorant/color additives a substance that is added or applied in order to change the Color of a material or surface. Colorants can be used for many purposes including printing, painting, and for Coloring many types of materials such as foods and plastics. Colorants work by absorbing varying amounts of light at different wavelengths (or frequencies) of its spectrum, transmitting (if translucent) or reflecting the remaining light in straight lines or scattered. Most colorants can be classified as dyes or pigments or containing some combination of these. Typical dyes are formulated as solutions; while pigments are made up of solid particles suspended and are generally suspended in a vehicle (e.g., linseed oil). The color a colorant imparts to a substance is mediated by other ingredients it is mixed with such as binders and fillers are added, for example in paints and inks. In addition, some colorants impart Color through reactions with other substances Colorants, or their constituent compounds may be classified chemically as inorganic (often from a mineral source) and organic [8].

4. B] 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 [9].
"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 coloring pigment/ molecules contain various chromospheres 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 [10].

Natural Colorants

Source	Compound	Color Shade
Carotenoids		
Capsicum annum (Capsicum)	Capsanthin	Orange-Red
Crocus sativus (Saffron)	Crocin	Yellow-Orange
Tagetes erecta (Marigold)	Lutein	Yellow
Bixa oellana (Annatto)	Bixin	Yellow-Orange
Indol derivatives		
Murex brandaries (Mollusk)	Bromoindigotin	Tyrian purple
Indigo tinctorial (Indigo)	Indigotin	Blue
Oxyindol glycoside		
Beta vulgaris (Beet root)	Betanin	Red
Diaryl heptanoids		
Curcuma longa (Turmeric)	Curcumin	Yellow
Benzopyrones		
Haematoxylon (Logwood)	Haematin	Black

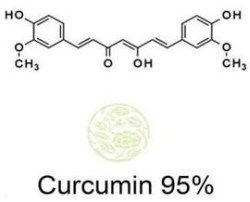
Natural Colorants

Source	Compound	Color Shade
Anthraquinones		
Dactylopius coccus (Cochineal)	Carminic acid	Red
Rubia tinctorum (Madder)	Alizarin	Red
Coccus laccae (Lac)	Laccaic acid	Red
Kermes ilicis (Shiled louse)	Kermisic acid	Scarlet
Naphthoquinones		
Lawsonia inermis (Henna) Lawsonia alba	Lawsone	Orange
Juglans regia (Walnut) Juglans nigra	Juglone	Brown
Lithospermum erythrorhizon (Shikone)	Shikonin	Violet

5. CLASSIFICATION

- Natural dyes obtained from plants - Berry, flower, bark, leaf, seed etc. (e.g. Catechu, Indigofera, Myrobalan and Pomegranate).
- Natural dyes obtained from insects - Cochineal and lac.
- Natural dyes obtained from animal - Mollusk, murex snail, cuttlefish and shellfish.
- Natural dyes obtained from mineral - Clay, ochre and malachite. [11] [12]

1. Turmeric:
Scientific classification
Kingdom: Plantae
Division: Magnoliophyta
Class: Liliopsida
Subclass: Zingiberidae
Order: Zingiberales
Family: Zingiberaceae
Genus: Curcuma
Species: C. longa



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

Geographical source:
The plant is native to southern Asia and is cultivated extensively in temperate rigion.it is grown in Pakistan and Malaya, India, china, East Indies.

Cultivation and collection:
It can be grown from sea level to 1500m in the heels, at a temperature range of 20-30 degree c. with a rainfall of 1500-2250mm per annum. It is also grown as an irrigated crop.

Morphology:
It reaches about 1m (3.3feet) in height and bear long simple leaves with long petioles (leaf stem). The leaves emerge from the branching rhizomes that lie just below the soil surface. Older rhizomes are somewhat scaly and brown in color, while young rhizomes are pale yellow to brown orange.

Chemistry of pigments:
Turmeric contains about 5% of volatile oil, resin and yellow coloring 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 [13].

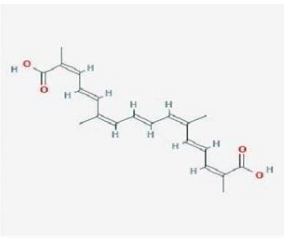
Chemical tests:
Take some turmeric powder in transparent glass and add a few drops of water and conc. HCL to it. Next, shake it vigorously. A pink to the mixture indicates the presence of metanil yellow. If the mixture release

small bubbles, it indicates the presence of chalk powder.

Toxicology:
In the present study, toxicity of 200 chemicals of compounds from turmeric were predicted (includes bacterial mutagenicity, rodent carcinogenicity and human hepatotoxicity). Marketed products: turmeric fresh, turmeric dry, ground turmeric, turmeric oil, turmeric oleoresins, curcumin, curry powder.

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 [13].

2. Saffron:
Scientific classification
Kingdom: Plantae
(Unranked): Angiosperms
(Unranked): Monocots
Order: Asparagales
Family: Iridaceae
Subfamily: Crocoideae
Genus: Crocus
Species: C. sativus

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

Geographical source:
It is found in France, Italy, Persia, Australia, and china, Germany, Iran and India (Kashmir).

Cultivation and collection:
It thrives well in cold region with warm or subtropical climate. It requires reach, well –drained, sandy or loamy soil.

Morphology:
It is small bulbous, perennial, cultivated for its scented, blue or lavender flower. The flowers have a trifid, orange colored stigma which along with the style-tops yields saffron of commerce.

Chemistry of pigments:
The main constituents of saffron are crocin, crocetin, picrocrocin and safranal. A-crocin is a carotenoid pigment which is primarily responsible for saffron's golden yellow- orange color. 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. Crocin analogs isolated from saffron significantly increased the blood flow in the retina and choroid as well as facilitated retinal function recovery and it could be used to treat ischemic retinopathy and/or age-related macular degeneration. Picrocrocin and safranal in patients with coronary artery disease indicates the potential of saffron as an antioxidant. Antiparkinsonian effect of Crocetin, which is an important ingredient of saffron, may be helpful in preventing Perkinsonism [14].

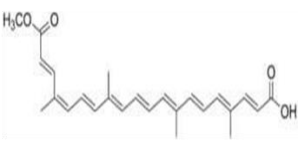
Chemical tests:
a. Reaction with sulphuric acid: genuine saffron yield indigo blue color immediately on application of sulphuric acid to the extract dried pigments.
b. Reaction with ammonia pigments with genuine saffron imparts yellow orange color with ammonia while as the fake one imparts light brown color.

Toxicology:
Toxicological data of saffron safety is not uniform. Findings exhibited that LD50 values of saffron stigma and petals extracts were 1.6 and 6 g\kg, respectively in mice after IP exposure (18). The LD50 value of saffron was 4120±556 mg\kg after oral administration in BALB\c mice [15].

Marketed products:
saffron desert powder, saffron cream, caramel powder, saffron beverage powder, saffron cake mix, saffron cream powder.

Uses:
It helps in boosting memory. Helps in preventing obesity. It helps in fighting hair fall.

3. Annatto:
Scientific classification
Kingdom: Plantae
(Unranked): Angiosperms
(Unranked): Eudicots
(Unranked): Rosids
Order: Malvales
Family: Bixaceae
Genus: Bixa
Species: B. Orellana

Biological source:
It is a carotenoid based dye, extracted from the outer coatings of the seeds of Bixa Orellana L. Among the naturally occurring colorants, an important one is annatto. The images of the annatto plant and dye.

Geographical source:
Annatto is a native plant from South America, more specifically of the amazon region.

Cultivation and collection:
The plant can be propagated by seeds or through stem cuttings. Seedlings are raised in polythene bags containing a mixture of soil, sand and manure. Seeds germinate in about 8-10 days and only one seedling is grown in each bag. Filled with a mixture of soil and compost before the onset of monsoon.

Chemistry of pigments:
Phytochemicals investigations have revealed the presence of several carotenoid derivatives including bixin and norbixin, some terpenoid, tocotrienols. arenes and flavonoids (including luteolin and apigenin) in Bixa Orellana seeds. The reddish orange color dye of the annatto is mainly comes from the resinous outer covering of the seeds of the plant (bixin, norbixin and their esters) [16].

Marketed products:
it is mainly used for coloring edible materials like butter, ghee, cheese, vanaspati, chocolates, and cosmetics.

Medicinal importance:
Annatto seeds are used as purgative, antipruritic and for buccal tumors. 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.

4. Henna:
Scientific classification
Kingdom: Plantae
Subkingdom: Tracheobionta
Division: Magnoliophyta
Class: Magnoliopsida
Order: Myrtales
Family: Lythraceae
Genus: Lawsonia
Species: L.inermis


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

Geographical source:
Henna is mostly grown in states of Rajasthan, Gujarat, and Madhya Pradesh. It is indigenous to Africa and is largely cultivated in Egypt, Sudan, Caribbean islands, Florida, India.

Cultivation and collection:
It will not grow in the moist regions receiving heavy rainfall. After three to four years of cultivation henna starts accepting fruits and flowers which are collected in clusters once a year. Henna plant is very easy to grow and cultivate small quantities of fertilizers are required and use as henna shrubs.

Morphology:
Henna is tall shrub or small tree, standing 1.8-7.6 m tall (6-25 feet). Henna flowers have four sepals and a 2mm (0.079 in) calyx tube, with 3mm (0.12 in) spread lobes. Its petals are ovate, with white or red stamens found in pairs on the rim of the calyx tube.

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 colorant property of the Henna leaves [17].

Chemical tests:
Clean a small area on the inner fold of the elbow or behind ear, extending into the partly into the hair line or upon the inner surface of the forearm with soap and water. Dry the area properly. Prepare a test solution/paste by mixing a few drops of exact color with water. Apply paste to that area dry to it and allow it to dry.

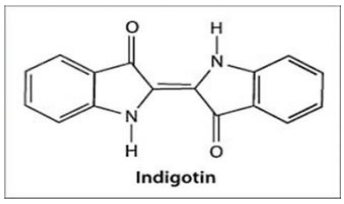
Toxicology:
Local application of PPD (para-phenylenediamine) in vulnerable individuals may results in dermatitis, asthma, arthritis, lacrimation, exophthalmos, or even permanent blindness when applied to the eyes.

Marketed products:
mehendi cone, henna oil, henna stencils, henna tube, mehendi tattoo stickers, henna paste, henna body tattoos, henna kit.

Uses:
In manufacturing, henna is used in cosmetic, hair dyes, and hair care products. It is also used as dye for nails, skin, and clothing.

Medicinal importance:
Henna is worldwide known as cosmetic agent with ant carcinogenic, anti-inflammatory, analgesic and antipyretic properties. Alcoholic extracts of henna leaves showed mild antibacterial activity against Escherichia coli. The tannin and the Gallic acid seem to have a complimentary beneficial effect.

5. Indigo:
Scientific classification
Kingdom: Plantae
(Unranked): Angiosperms
(Unranked): Eudicots
(Unranked): Rosids
Order: Fabales
Family: Fabaceae
Subfamily: Faboideae
Tribe: Indigofereae
Genus: Indigofera



Indigotin

Biological source:
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

Geographical source:
Natural indigo can be derived from a wide variety of plants species, genera, and families representing many different geographical results, ranging from temperate (e.g., isatis spp.) used in Europe to sub- tropical and tropical (e.g., indigofera ssp.)

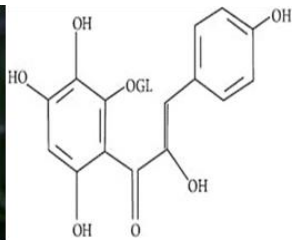
Cultivation and collection:
Within the system on nij cultivation, the planters produce indigo in land that he directly controlled. He either bought the land or rented it from zamindars and produced indigo by directly employing heard labourers. Indigo could be cultivated only on fertile land, and this were all already densely populated.

Morphology:
It is a perennial plant reaching a height 1-2m upon maturity. Branches are spreading or ascending and are often woody. The leaves are pinnate. It is one of the major source of deep blue dye.

Chemistry of pigments:
Galactomannan, composed of galactose and a 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 ns well as prepare medicated hair oil. Leaf powder is used as natural black color dye for hair. Indigofera make your hair more manageable, moisturized, and protected with radiant shine. Dye is obtained from the processing of the plant's leaves, Indigo is among the oldest dyes or textile used for 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 [18].

6. Safflower:
Scientific classification
Kingdom: Plantae
Phylum: Magnoliophyta
Class: Magnoliopsida
Order: Asterales
Family: Asteraceae
Genus: Carthamus
Species: C. tinctorius

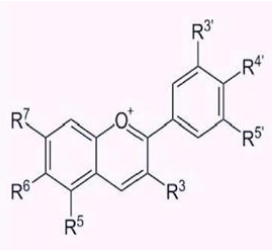


Biological source:
Safflower (Carthamus tinctorius L.) has a long history of cultivation as an oilseed crop and as a source of red dye (carthamin).

Chemistry of pigments:
The main constituents of the safflower are carthamin and carthamidin. And other constituents are safflower yellow, arctigenin, tacheloside, N feruloyl tryptamine, N-feruloylserotonin, steroids, flavonoids, and polyacetylenes. Carthamin is responsible for to produce water-insoluble red dye and carthamidin for water-soluble yellow color 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 coloring 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 [19].

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



Biological source:
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 color of pomegranate juice. It contains chief constituents such as punicalagin, penicillin, 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 [20].

8. Tomato:

Scientific classification

Kingdom: Plantae

(Unranked): Angiosperms

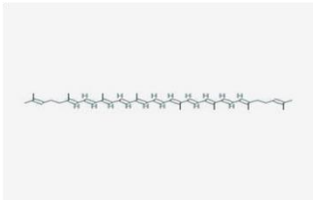
(Unranked): Eudicots

Order: Solanales

Family: Solanaceae

Genus: Solanum

Species: S. lycopersicum



Biological source:

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, A and B-carotene, lutein, zeaxanthin and b-crypto xanthin Lycopene is a carotenoid that is present in tomatoes is responsible red color 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.

9. Paprica:

Scientific classification

Kingdom: Plantae

(Unranked): Angiosperms

(Unranked): Eudicots

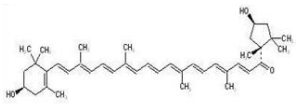
(Unranked): Asteradeae

Order: Solanales

Family: Solanaceae

Genus: Capsicum

Species: C. annuum



Biological Source:

Paprica is obtained from the fruits of selectively bred varieties of 'sweet peppers, Capsicum annuam L.

The fruits are large, fleshy with an intense red color and it has many medicinal uses.

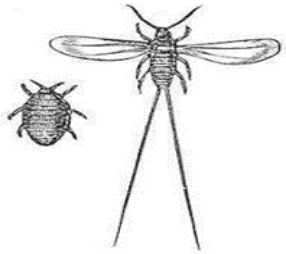
Chemistry of Pigments:

The pigments present in paprika are a mixture of carotenoids, in which Capsanthin and capsorubin are the main compounds responsible for the red color of the dye. The pungent compounds of the Capsicum fruit are called capsaicinoids such as capsaicin and its

analogs. It has a long history as a source of biologically active compounds, such as flavonoids, phenols, carotenoids, capsaicinoids and vitamins. Capsicum fruits contain coloring pigments, pungent principles, resins, protein, cellulose, pentosans, mineral elements and very little volatile oil, while seeds contain fixed (non-volatile) oil [21].

10. Carmine:

The cochineal is a scale insect, from which the crimson-colored dye carmine is derived. A primarily sessile parasite native to tropical and subtropical South America and Mexico known as Dactylopius coccus [22].



Chemical constituent & uses:
Carmine is today primarily used as a food coloring
And for cosmetics, especially
As a lipstick coloring

NATURAL DYES FROM MUSHROOMS
Color inducer iron pot/ammonia saltwater ammonia
Color created greyish-green yellowish green Color depends on fungus's color Mushroom
Oyster mushroom Horse mushroom Meadow mushroom Turkey tail

NATURAL DYES FROM SEA SNAILS
TYRIAN PURPLE: Tyrian purple also known as royal purple, imperial purple or imperial dye, is a reddish-purple natural dye. Which is a secretion produced by a certain species of predatory sea snails in the family Muricidae a type of rock snail by the name Murex. This dye was possibly first used by the ancient Phoenicians as early as 1570 BC. The dye was greatly prized in antiquity because the color did not easily fade, but instead became brighter with weathering and sunlight.

NATURAL DYES FROM MINERALS

PURPLE PIGMENTS
Aluminum pigments Ultramarine violet
Silicate of sodium and aluminum containing sulfur.
Copper pigments Han Purple: BaCuSio Cobalt pigments Cobalt Violet: cobalt phosphate.

BLACK PIGMENTS
Carbon pigments Carbon Black
Ivory Black Vine Black Lamp Black
Iron Pigments Iron black: Fe3O4 Titanium pigments Titanium Black

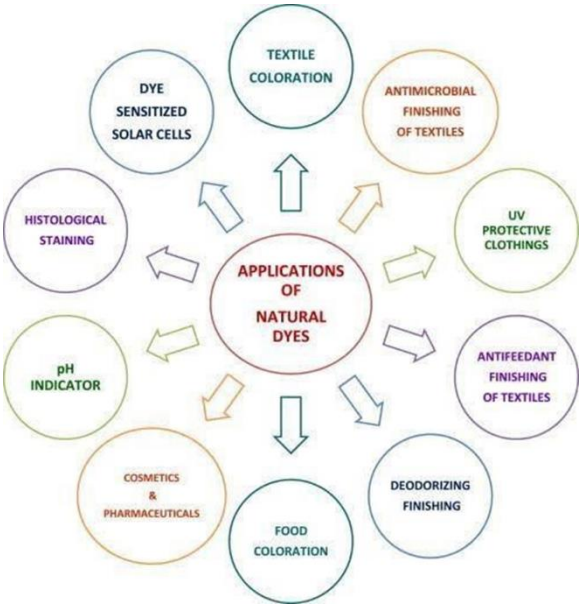
WHITE PIGMENTS
Antimony White: Sb, 0, Barium pigments
Barium sulfate Lead pigments: (toxic)
White Lead: (PbCO.), Pb (OH), Titanium pigments
Titanium White: titanium (IV) oxide TiO, Zinc pigments Zinc White: Zinc Oxide (ZnO)
ORANGE PIGMENTS
Cadmium pigments
Cadmium Orange: an intermediate between cadmium red and
Cadmium yellow: cadmium sulfoselenide. Chromium pigments
Chrome Orange: a naturally occurring pigment mixture composed of lead (II)

BROWN PIGMENTS
Clay earth pigments (naturally formed iron oxides) Raw Umber (PBr7): a natural clay pigment consisting of iron oxide, manganese oxide and aluminum oxide: Fe, 0, + MnO, + nH2O + Si + AIO, When calcined (heated) it is referred to as Burt Umber and has more intense colors Raw Sienna (PB17):
a naturally occurring yellow-brown pigment from limonite clay Used in art since prehistoric times

YELLOW PIGMENTS
Arsenic pigments Orpiment natural monoclinic arsenic sulfide (As S),
Cadmium pigments Cadmium Yellow: cadmium sulfide (CdS)
Chromium pigments Chrome Yellow: natural pigment of lead (II) chromate (PbCro).
Cobalt pigments: Aureolin (also called Cobalt Yellow): Potassium
Cobalt nitrite (Na, Co (NO,). Iron Pigments Yellow Ochre: a naturally occurring clay of hydrated iron oxide (Fe, 0, HO)

GREEN PIGMENTS
Cadmium pigments
Cadmium Green a light green pigment consisting on mix of Cad.com
Yellow (CdS) and Viridian (Cr, 0) Chromium pigments
Chrome Green
Viridian a dark green pigment of hydrated chromium (iii) oxide (Cr0,) Copper pigments
Paris green copper (l) acetoarsenite (C (CH.0), 3Cu (As.), Scheele's Green (also called Schloss Green): copper arsenite Culo
Lead pigments: Naples Yellow (PY41) Titanium pigments:
Titanium Yellow Tin Pigments: Mosaic gold stannic sulfidefSnS

6. APPLICATIONS OF HERBAL EXCIPIENTS (COLORANTS AND DYES)



7. CONCLUSION

Natural excipients development is gaining a lot of attention these days. Polymers play a vital role in the drug delivery. So, the selection of polymer plays an important role in drug manufacturing. Some polysaccharides obtained from plants such as carrageen an alginate, konjac glucomannan, gum arabic, guar gum and locust bean gum have shown excellent potential as carrier materials in matrix type controlled release dosage forms such as microparticles, beads, tablets and cross-linked hydrogels. Excipients that have never been used before must pass formidable regulatory requirements before being incorporated into approved dosage forms. Today the stress is on patient compliance and to achieve this objective there is a spurt in the development of NDDS. As the herbal excipients are promising biodegradable materials, these can be chemically compatible with the excipients in drug delivery systems. In addition herbal excipients are non-toxic, freely available, and less expensive compared to their synthetic counterparts. They have a major role to play in pharmaceutical industry. Therefore, in the years to come, there is going to be continued interest in the natural excipients to have better materials for drug delivery systems.

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