

SHREE H. N. SHUKLA INSTITUTE OF PHARMACEUTICAL EDUCATION
AND RESEARCH



B.PHARM
(SEMESTER –VI)

SUBJECT NAME: HERBAL DRUG TECHNOLOGY

Chapter 3.Herbal Cosmetics

SUBJECT CODE: BP603TP

Content

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:

Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

HERBAL COSMETICS

- The word cosmetic was derived from the Greek word “kosmtikos” meaning having the power, arrange, skill in decorating.
- Using various permissible cosmetic ingredients to form the base in which one or more herbal ingredients are used to provide defined cosmetic benefits only, shall be called as “herbal cosmetics”

DRUG AND COSMETIC ACT 1940:

Any Article or preparation intended to rubbed, poured, sprinkled or sprayed on or introduced to or applied to any part of human body for cleaning, perfuming, beautifying, promoting, attractiveness or altering the appearance and includes any article intended for use as component of cosmetics.

Cosmetic used to perform the following actions:

- To clean
- To perfume
- To change the appearance
- To protect
- To keep in good condition
- To correct the body odor etc.,

and field of application of cosmetic remains to the epidermis, hair system, nails, lips, teeth & mucous membrane of oral cavity.

Natural and Synthetic:

The use of natural ingredients in personal and health care product has been practiced since time immemorial leading to increased use of herb with a curative value.

- Modern research proves that herbs while being effective are also mild and soothing.
- Potent synthetic preparation and chemicals, though effective, constitute a toxic burden to human body.

"As the science advances, man made his life easy. Despite its harmful effect on long term usage. As he started realizing serious effect of these he looked back into the olden life style.so the ultimate example for this is Ayurveda/Herbal Usage".

COSMECEUTICALS:

- Cosmeceuticals is the fastest growing segment of the personal care products these are
- cosmetic products which contain biologically active principles or ingredients of plant origin.
- There is an increased demand for the use of natural substances in cosmetics in recent years due to their mild action and nontoxic in nature in many cases they are found to be quite effective.

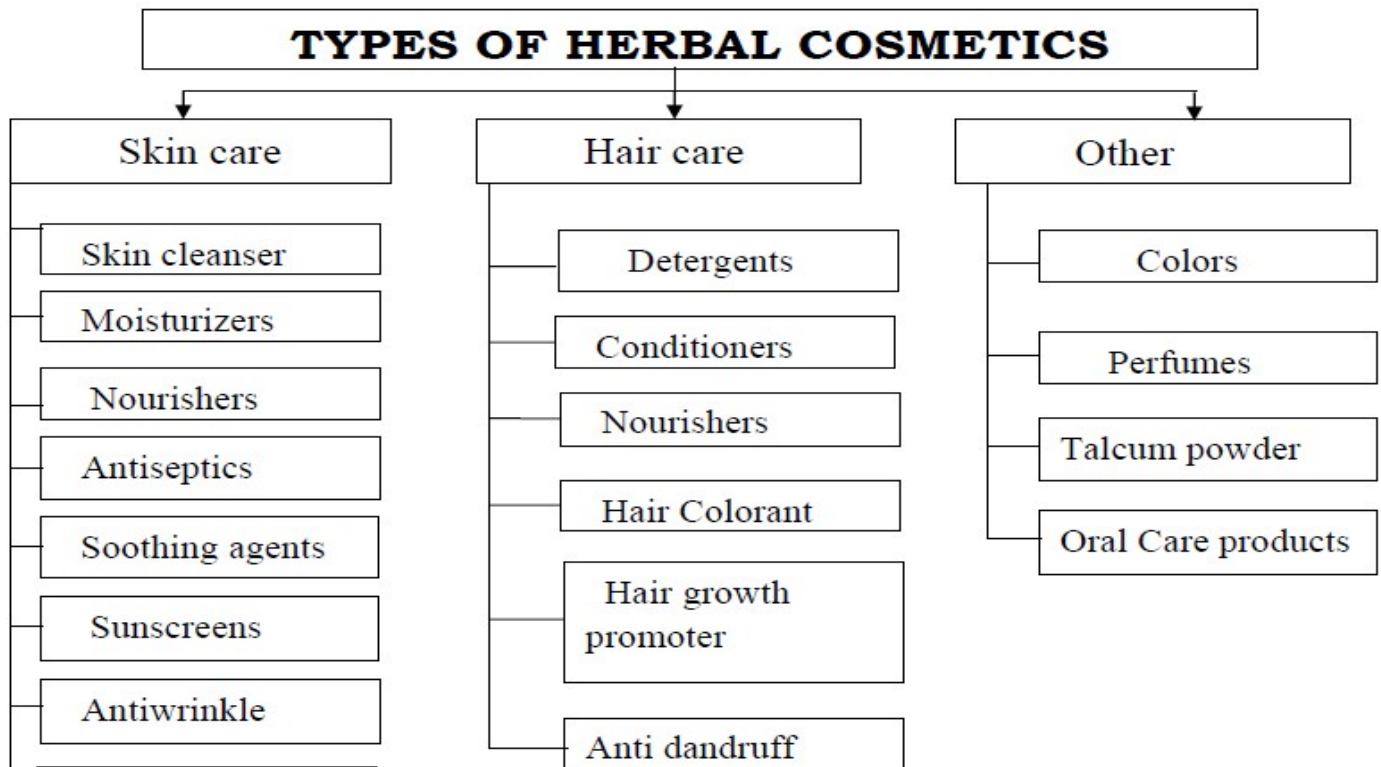
COSMETIC-PHYTOGNOSEY:

- Which deals with biochemical and physicochemical properties of plant derived ingredients to be used in cosmetics.
- Basically, six different types of plant derived ingredients are used in herbal cosmetics.

Type of plants derived ingredients are used in herbal cosmetics

1. Fresh materials
2. Dried materials
3. Acellular product (oils, resins, gums)
4. Galenical preparation (infusions, decoctions, extracts)
5. Processed extracts
6. Pure isolated compounds

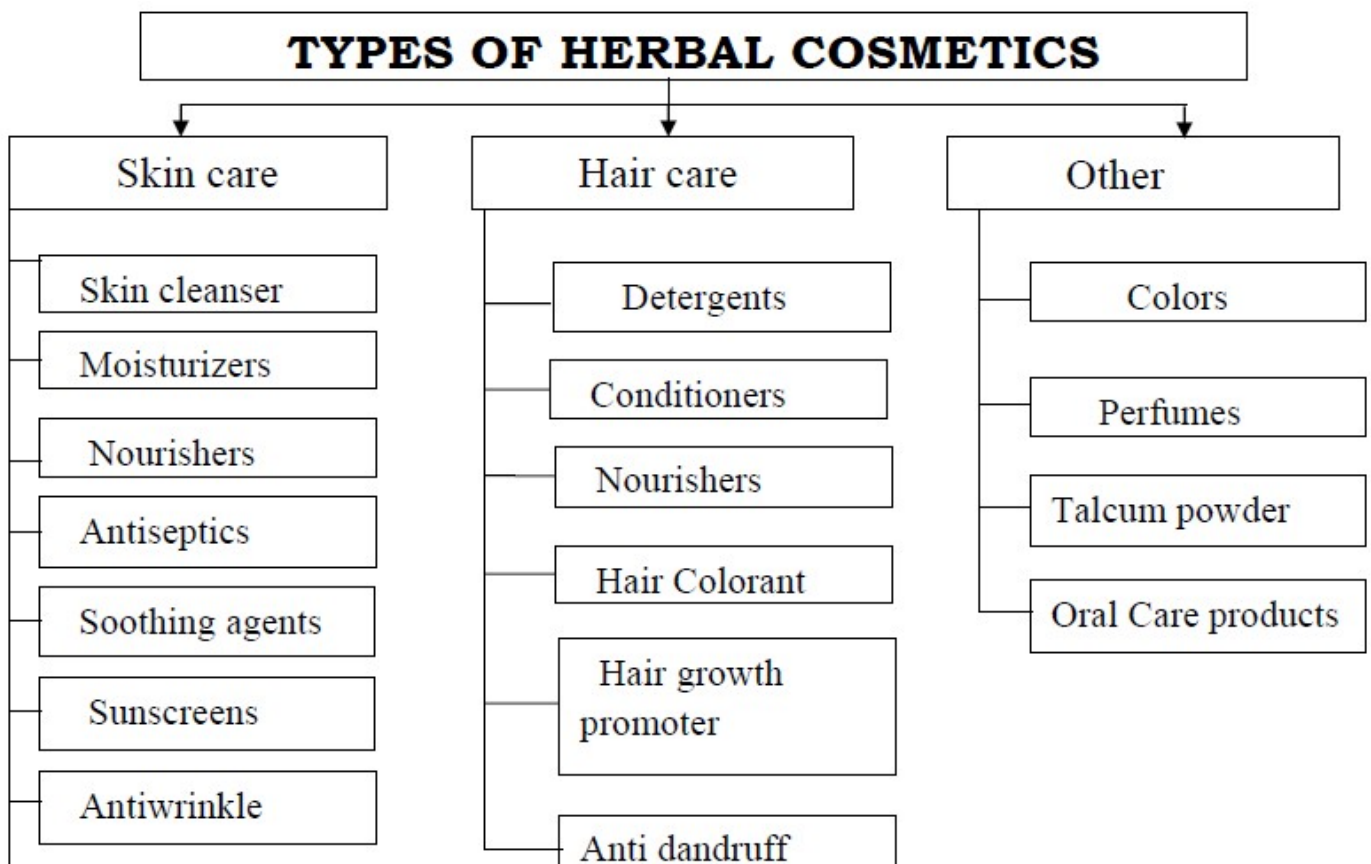
~~7. Cosmetic Phytognosy is a new terminology for the science of functional plant derived cosmetic ingredients~~



1. Skin Care Products

- Skin is constantly exposed to dirt, microbes, irritants, radiation and toxins which can affect the skin in many ways.
- Hence to protect the skin cleanse it and restore the tone, sothen it and prevent tanning, wrinkle and scar formation, various preparations are used which are enlisted.

- **EXAMPLE**
- **Skin cleansers :**
Eg: Milk, cucumber, citrus peels, aloe.



1. Skin Care Products

- Skin is constantly exposed to dirt, microbes, irritants, radiation and toxins which can affect the skin in many ways.

- Hence to protect the skin cleanse it and restore the tone, soo then it and prevent tanning, wrinkle and scar formation, various preparations are used which are enlisted.

EXAMPLE**Skin cleansers :**

Eg: Milk, cucumber, citrus peels, aloe. ➤ □

Moisturizers:

Eg :Aloevera, almond oil ,rose

Nourishers:

Eg:Honey, carrot peach wheat germ oil.

Antiseptics:

Eg :Neem, turmeric, tulsi, lavender oil.

Soothing agents (Emollients):

Eg: Sesame oil, almond oil, aloevera

Sunscreens:

Eg: Aloevera, chamomile, calendula, cucumber

AntiWrinkle&antiAging:

Eg: peach, liquorice, papaya, aloevera, apricot, turmeric

Antiacne :

Eg: cucumber gel, vetiver.

2. Hair care product:

- Hair complexion, color and style play an important role in people's physical appearance.
- Hair care preparations are applied topically to the scalp and hair.
- These contain ingredients which either clean, condition or nourish the hair or prevent dandruff formation.
- The following are the various hair care preparations.

EXAMPLE:**Detergents:**

Eg: Soap nut, shikekai, reetha.

Conditioners:

Eg: Henna, amla , hibiscus, rosemary, tea

Nourishers:

Eg: brahmi, bringraj, eggs, coconut oil, sesame oil

Hair colorants:

Eg: Henna

Hair growth promoters:

Eg: Brahmi, hibiscus, coconut oil, amla, sesame oil

Anti dandruff:

Eg: Soap nut ,shikekai, lemon, thyme, Aloe-vera

3. Other cosmetic

These are used to prepare various cosmetic products like lipstick, nail polishes, eye products.

Eg: Anthocyanins, saffron, turmeric, carotenoids, indigo, capsicum, chlorophyll.

Perfumes:

Eg: Volatile oils of plants like rose , lavender, jasmine, sandalwood

Talcum powders:

It contains talc with added plant extracts to impart the desired flavour and odours.

Eg: sandalwood, rose, jasmine, lavender, etc..

Oral care (Hygiene) products:

- Oral care products like tooth pastes, powder, mouth wash, mouth freshners etc.
- Various herbs and their extracts are incorporated into these preparations in order to achieve antimicrobial, antiseptic, anti-plaque, antiinflammatory and mouth freshening properties.

Eg: Neem, mentha, chamomile, sage, myrrh, nutmeg, chitosan, calendula, rosemary, etc.

STUDY OF DRUGS USED IN COSMETICS:**1) Soapnut (Ruth)**

It consists of pods of *Sapindustrifoliatus*, *Sapindusmukorassi*.

• Family:

Sapindaceae.

• Description

It is a shrub with linear pods, the dried powder of the pods is brown in color and have soap like properties.

• Chemical constituents:

➤ It contains saponins (10-11.5), mucilage, gums, proteins.

➤ Saponins contain sapindosides A, B, C and D, diosgenin, gitogenin, chlorogenin and rusogenin.

• Uses:

➤ It is used as detergent, hair cleanser, hair growth promoter and antidandruff agent.

2) Amla (Indian gooseberry)

It consists of dried and fresh fruits of *Phyllanthusemblica*.

• Family: Phyllanthaceae**• Description:**

➤ It is a small tree with a number of globular fruits which are yellowish green in color.

➤ They have a sour and astringent taste.

• Chemical constituents:

➤ It is a rich source of ascorbic acid (Vitamin C), other constituents include tannins, minerals such as iron, calcium, phosphorous.

➤ It is also rich in pectin.

• Uses:

➤ Amla is used as a hair growth promoter, hair nourisher hair conditioner and colorant

3) Henna (Mehendi)

It consists of fresh and dried leaves of *Lawsoniainermis*

• **Family:** Lythraceae.

• **Description:**

➤ It is a flowering plant and its leaves are used to color and decorate the skin and hair

• **Chemical constituents:**

➤ Henna contains a soluble component known as lawsone

➤ It is responsible for the colour.

➤ It also contains xanthones, tannins, flavonoids and coumarins

Uses:

➤ Henna is used as hair colorant, hair dye, hair conditioner and nourisher.

➤ It produces a cooling effect on the skin.

➤ It is also used to treat burns and wounds

4) Hibiscus (Jaswand)

It consists of dried flowers and leaves of *Hibiscus rosasinensis*,

Family: Malvaceae.

Description :

➤ Red and white varieties are generally used in hair care preparations.

Chemical constituents:

➤ It contains Vitamins, flavonoids, anthocyanins, quercetin, mucilage and albumin.

Uses :

➤ It is used as hair growth promoter, anti greying agent, hair conditioner, hairrinsers.

➤ It gives smoothness and shine to the hair.

5) Tea (Chai)

It consists of dried leaves of *Thea sinensis* and *Camellia sinensis*,

Family:

➤ Theaceae

• Description:

➤ The leaves are collected, dried and made into the form of tea dust

• Chemical constituents:

➤ Tea contains polyphenols, catechinepicatechin, caffeine, theophylline, theobromine

• Uses:

➤ It is used as hair conditioner, colorant.

➤ It gives Smoothness and shine to hair.

6) Aloe (Kumari)

It consists of dried or fresh mucilage of *Aloe vera*

• **Family:** Liliaceae,

• Chemical constituents:

➤ It contains anthraquinones like rhein, aloin, emodin, minerals and mucilage.

➤ Chemically mucilage is a polysaccharide consisting of salts of poly uronicacids.

• Uses:

➤ Aloe has good wound healing properties.

➤ It is used in skin care and hair care cosmetics,

➤ ☐ It is used to treat radiation burns,

➤ ☐ It is also used as a hair conditioner and nourisher.

➤ ☐ Aloe is used as an ingredient in various sunscreen c and skin moisturizer

Creams.

7) Liquorice (Glycyrrhiza)

It consists of dried roots and stolons of *Glycyrrhiza glabra*,

• **Family:** Leguminosae.

• **Chemical constituents:**

➤ Liquorice contains saponin glycosides, glycyrrhizin.

➤ It also contains flavonoids, liquiritin and isoliquiritin

Uses:

➤ The ammonium and sodium salts of glycyrrhizinic acid are widely used in cosmetics.

➤ It has skin improving properties hence used in skin care cosmetics.

8) Turmeric (Curcuma)

It consists of dried and fresh rhizomes of *Curcuma longa*,

• **Family:** Zingiberaceae.

• **Chemical constituents:**

➤ It contains volatile oils, resins, curcuminoids like curcumins

• **Uses:**

➤ Antiseptic and anti-inflammatory, skin conditioning and antioxidant properties

➤ It is used in skin care cosmetics.

➤ It is also used as a colouring agent, antimicrobial and wound healing agent.

➤ It is incorporated in ointments & creams.

9) Bhringraj

It consists of the entire herb of *Ecliptaalba*,

• **Family:** Asteraceae.

• **Chemical constituents:**

➤ It contains alkaloid ellipticine, amyirin, wedelolactone, wedelic acid and luteolin.

Uses:

- Antiinflammatory.
- It improves the skin complexion.
- It is also used as a dentifrice.

10)Sandalwood

It consists of heart wood of Santalum album,

• **Family:** Santalaceae.

• **Description:**

- The wood is obtained from main stem and branches.
- It is collected from adult 25 years old trees.

• **Chemical constituents:**

- It contains volatile oils, which contain 95% of two isomeric sesquiterpene alcohols namely alpha and beta santalol.
- It also contains santalal, santene, santanone,santalone and santalene

• **Uses :**

- Sandalwood is used in perfumery, as skin conditioner, in creams, lotions soaps and powders.

11) Sesame oil

It is a fixed oil obtained from Sesamumindicum,

• **Family:** Pedaliaceae.

• **Chemical constituents:**

➤It contains glycerides of fatty acids, mainly oleic, linoleic, palmitic, stearic and arachidic acids. It also contains phenol, sesamol.

- Uses: It is used as nutritive softening agent (emollient)

Used in manufacture of soaps, ointments and pastes

12) Bees wax

It is the purified wax obtained from honeycomb of bees *Apis mellifera*.

- **Family:** Apidae.

- **Chemical constituents:**

It contains esters monohydric alcohols, myricin, myricyl palmitate, cerotic acid, mellisic acid and an aromatic substance cerolein.

Uses: It is used in the preparation of ointments, plasters, cosmetic, creams.

HERBAL EXCIPIENTS

INTRODUCTION:

- Excipients/ Pharmaceutical aids are the substances which are inert and have little or no therapeutic value, but are essential in the manufacture of various pharmaceutical dosage forms such as tablets, capsules, syrups, etc...
- Excipients are mixed with the active ingredients to make up the volume or improve the stability or mask the bitter taste or improve the appearance, odour and other characteristics of the dosage forms.
- Binding agents, suspending agents, viscosity builders, disintegrating agents, etc also constitute pharmaceutical excipients/ aids.

Advantages/ significance of herbal excipients

1. Biodegradable

- Naturally occurring substances show no adverse effects on the environment or other living beings and they are easily biodegradable.

2. Biocompatible and nontoxic

- Most of the herbal excipients are carbohydrates in nature.

- They are compatible and non toxic with most of the ingredients.

3. Economic

- Herbal excipients are cheaper and their cost of production is comparatively lesser.

4. Safe and free from side effects

Naturally occurring excipients are safer and without any side effects.

5. Easily available

- Natural excipients are produced in most of the countries, hence easily Available.

Note:

Biodegradable are the substances which can be easily taken back into the earth naturally without causing any harm to the environment.

Disadvantages of herbal excipients

1) Microbial contamination:

During production, herbs are exposed to external environment hence there are Chances of microbial contamination.

2) Biochemical variation:

Variation in the quality of product may occur due to various environmental factors.

3) Uncontrolled rate of hydration:

This occurs due to biochemical variation and difference in the quality of materials from one batch to another.

4) Heavy metal contamination:

Herbs are always associated with the risk of heavy metal contamination

CLASSIFICATION OF HERBAL EXCIPIENTS

- Colorants
- Sweeteners
- Binding agents
- Diluents

- Viscosity builders
- Ointment bases
- Disintegrating agents
- Flavoring agents
- Emulsifying agents

Note:

Microbial contamination occurs due to improper processing as well as presence of excessive amounts of moisture in the raw material.

EXAMPLE:**>Colorants:**

✓E g: henna, chlorophyll, caramel, amaranth, indigo.

>Sweeteners:

✓E g: glycyrrhiza, honey, stevia.

>Binding agents:

✓E g: acacia, gelatin, tragacanth, starch.

>Diluent:

✓E g: lactose, starch mannitol, sucrose.

>Viscosity builders:

✓E g: pectin, tragacanth, cellulose, guar gum, gelatin

>Disintegrating agents:

✓E g. Starch, isapgol husk, carboxy methyl cellulose.

>Ointment bases:

✓E g:lanolin, bees wax.

> Emulsifying agents:

✓E g. acacia agar, guar gum, methyl cellulose.

> Flavouring agents:

✓E g: cardamom vanilla, lemon oil, orange oil.

> Perfumes:

✓E g: rose, lavender, sandalwood

STUDY OF HERBS USED AS EXCIPIENTS:**1) Henna**

It consists of dried leaves of *Lawsonia inermis*

> Family: Lythraceae.

> Chemical constituents:

• Henna contains lawsone as its chief constituent, Other constituents include phenols, coumarins, flavonoids and tannins.

> Uses:

• Colouring agent.

2) Amaranth

It consists of flowers of *Amaranthus hypochondriacus* and other species of *Amaranthus*

> Family: Amaranthaceae

> Chemical constituents:

• It contains polyphenols, vitamins and flavonoids.

> Uses:

• Dyeing agent

3) Madder

It consists of dried root of *Rubia tinctorum*

➤ **Family:** Rubiaceae,

➤ **Chemical Constituents:**

- Anthraquinone alizarin, the hydrolysis product of ruberythric acid, is the main dye component of Rubiatinctorum.
- It contains several anthraquinone glycosides.

➤ **Uses:**

- Madder root contains the anthraquinone pigment alizarin and has been since ancient times a popular fine red dye plant.

4) Liquorice

It consists of dried roots and stolons of *Glycyrrhiza glabra*,

➤ **Family:** Leguminosae.

➤ **Chemical constituents:**

- It contains glycyrrhizic acid, liquiritin, isoliquiritin.

➤ **Uses:**

- Sweetening agent

5) Stevia:

It consists of the plant *Stevia rebaudiana*

➤ **Family:** Compositae.

➤ **Chemical constituents:**

- It contains stevioside, rebaudioside, steviol

➤ **Uses:**

- Sweetening agent

6) Acacia

It is the dried gummy exudation obtained from the stems and branches of *Acacia Arabica*

➤ **Family:** Leguminosae.

> Chemical constituents:

- It contains sugars like arabinose, galactose, rhamnose and glyceronic acid.

> Uses:

- Acacia is used as binding agent, suspending agent, emulsifying agent and Viscosity builder

7) Saffron

Saffron is the dried stigma and style tops of *Crocus sativus* Linn.

> Family: Iridaceae.**> Chemical constituents:**

- The Saffron contains volatile oil (1.3%), fixed oil, and wax.
- Crocin is the chief colouring principle in Saffron.
- crocetin (an aromatic compound), gentiobiose, α and γ -carotenes, lycopene, zeaxanthin, β -sitosterol, palmitoleic, oleic, linoleic & linolenic acids.

> Uses:

- Saffron is used fever, cold, as colouring and flavouring agent, cosmetic pharmaceutical preparations, and as spice.

8) Gelatin

It is a protein obtained by partial hydrolysis of animal connective tissue like bone skin, tendons and ligaments.

> Chemical constituents:

- Gelatin chemically contains amino acids like glycine, alanine, glutamic acid, proline, arginine, aspartic acid, leucine, isoleucine.

> Uses:

- Binding agent, thickening agent, emulsifying agent, in the manufacture of capsules.

9) Tragacanth

It is the dried exudation obtained from the stem and branches of *Astragalus gummifer*

➤ **Family:** Leguminosae.

➤ **Chemical constituents:**

- It contains gums, tragacanthin and bassorin.

➤ **Uses:**

- Binding agent and Viscosity builder

10) Lactose

It is a natural disaccharide obtained from milk.

➤ **Chemical constituents:**

- It contains sugars galactose and glucose.

➤ **Uses:**

- Diluent in tablets and capsules.

11) Mannitol

It is a saccharine exudation from the stems of *Fraxinus ornus*,

➤ **Family:** Oleaceae.

➤ **Chemical constituents:**

- It is a white, crystalline, odourless, non hygroscopic sweet powder.
- It is freely soluble in water and insoluble in alcohol

➤ **Used:**

- Sweetening agent and diluents.

12) Guar gum

It is the ground endosperm of seeds of *Cyamopsis tragonlobus*,

➤ **Family:** Leguminosae

➤ **Chemical constituents:**

- It contains 85% guran, galactose, mannose .

> Uses:

- Binding agent, disintegrating agent, suspending agent and emulsifying agent

13) Starch

It consists of polysaccharide granules obtained from the grains of maize, rice, wheat potatoes.

> Chemical constituents:

- It contains water soluble amylase and water Insoluble amylopectin, which swells and is responsible for gelatinizing properly of starch.

> Uses:

- It is used as binding agent, disintegrating agent and diluent

14) Sandalwood oil

It is the volatile oil obtained by steam distillation of heart Wood of *Santalum album*,

> Family: Santalaceae**Chemical constituents:**

- It contains sesquiterpene alcohol namely alpha and beta-santalol.

> Uses:

- Used in perfumery industry.

15) Rose oil

It is a volatile oil distilled from fresh flowers of *Rosa gallica* and other rose Species.

> Family: Rosaceae.**> Chemical constituents:**

- Rose oil contains linalool, nerol, citronellal and geraniol

> Uses:

- Used in perfumes and flavouring agent.

16) Cardamom oil

It is a volatile oil distilled from the seeds of *Elettaria cardamomum*,

➤ **Family:** Zingiberaceae.

➤ **Chemical constituents:**

• It contains cineol, alpha terpinyl acetate, terpineol, borneol and sabinene.

➤ **Uses:**

• Used as a flavoring agent

17) Orange oil

It is a volatile oil obtained by expression from fresh peels of the ripe fruits of *Citrus limonis*,

➤ **Family:** Rutaceae.

➤ **Chemical constituents:**

• Orange oil contains limonene, citral, citronellal.

➤ **Uses:**

• Used as a flavouring agent

HERBAL FORMULATION

• Herbs have been used in a wide variety of dosage forms, large number of herbal formulations containing the plants or their extracts with proven medicinal activity are being used.

• With the advances of pharmaceutical technology, modern dosage forms have evolved.

• Herbal formulations/ dosage forms can be broadly

Classified into three categories via:

1. TRADITIONAL DOSAGE FORMS

2. MODERN HERBAL DOSAGE FORM

3. NOVEL DOSAGE FORM

1. TRADITIONAL DOSAGE FORMS

These are derived from various traditional systems of medicines like Ayurveda, Unani, Homeopathy, etc...

Example: pills, powders, semi fluid extracts, pellets, tinctures, etc...

Note: Herbal formulations may contain a single herb or combinations of different herbs.

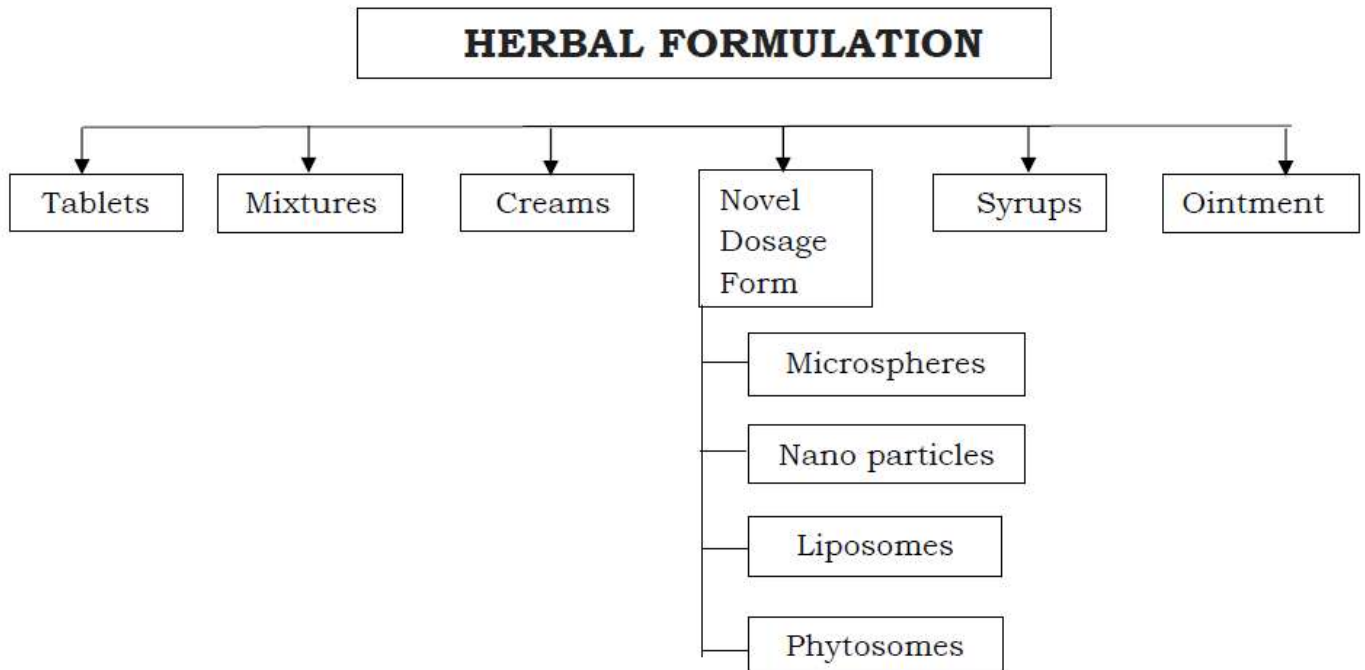
2. MODERN HERBAL DOSAGE FORM

- These formulations are developed from modern technological processes
- Modern herbal formulations offer small dosage size, they are user friendly.
- Convenient and have good absorption characteristics.

Example: tablets, capsules, syrups, solutions, suppositories, injections.

3. NOVEL DRUG DELIVERY STEMS (NDDS) NOVAL DOSAGE FORM:

- With the advancement in different scientific techniques of preparing formulations, novel dosage forms are being developed to overcome the limitations of conventional dosage forms such as tablets, syrups, solutions, etc....
- Many novel dosage forms have been developed successfully which have offered better acceptance by the health system.
- A few novel dosage forms available in the market are transdermal patches, implants, nasal systems, microcapsules microspheres, liposomes, phytosomes, etc,



HERBAL CREAM

These are viscous, semisolid preparations which may be oil in water type (aqueous) creams or water in oil type (oily) creams.

HERBAL MIXTURE

- These are the preparations containing combination of two or more herbal ingredients which are formulated into various formulations like tablets, capsules, ointments, creams, etc...
- These mixtures or combinations of herbal ingredients may have more than one activity and can be used to treat multiple ailments or they may produce additive or synergistic effects for a single disease.

HERBAL SYRUPS

- These are preparations formulated by incorporating sugar solution with plant extracts such as infusions, decoctions, juice, fermented products or simple solutions.
- Honey or unrefined sugar is used to prepare syrups as they act as good preservatives.

- Herbal syrups are made with equal proportions of herbal extracts with honey or sugar solution of known concentration.
- Various flavours like orange, raspberry, menthe can also be added to mask the bitter taste as well as improve the palatability of the formulation.

HERBAL OINTMENTS

- These are semisolid dosage forms meant for external application to the skin or mucous membrane.
- Ointments perform softening (emollient) and protective action.
- Waxes like bees wax, paraffin wax are used as base or carrier.
- Various active herbal ingredients in the form of powders, dried extracts can be incorporated in the bases which provide therapeutic benefits.

HERBAL TABLETS

- These are solid dosage forms of powdered herbs, herbal extracts or their constituents prepared by moulding or compression.
- In addition to the active ingredients, these contain diluents like binding agents which provide strength to withstand normal handling while transportation and storage, colouring agents to improve the appearance, sweetening and flavouring agents to mask the bitter taste, disintegrating agents to facilitate the breakdown and absorption in the gastrointestinal tract are added.

NOVEL DRUG DELIVERY SYSTEMS (NDDS)/ NOVEL DOSAGE FORMS**PHYTOSOMES**

- The concept of Phytosomes is another breakthrough for the development in herbal drug technology.
- Phytosomes contain active herbal ingredients surrounded and bonded by phospholipids.
- They are produced by bonding phosphatidyl choline with the ingredients thereby producing a complex.
- The phospholipids structure has a water soluble choline head and fat soluble body and tail (phosphatidyl portion).

Novel dosage forms usually contain pure isolated compounds.

- Herbal nano particles are colloidal system with particle size of about 1 to 1000 nm.
- The choline head (water soluble) binds with the active compounds (herbal ingredients), while the phosphatidyl portion (fat soluble) comprising of body and tail envelops the choline bound materials (ie, active ingredients) as a result microspheres or vesicles are produced whereby the valuable components of the herbs are protected.
- Phytosomes enhance the absorption and improve the bioavailability of herbal ingredients by enhancing their delivery to the tissues thereby lowering its dose and reducing the side effects,
- They also protect the active herbal ingredients from destruction by the digestive juices and gut bacteria.
- Several studies have shown that the body uses phytosome molecules more effectively than that of non phytosome molecules.

LIPOSOMES

- These are prepared by incorporating the active ingredients inside the microscopic double layered membranes which are made of phospholipids (known as phospholipid vesicles).
- These vesicles are suspended in an aqueous solvent uniformly.
- Drugs incorporated in the liposomes can be delivered to the desired site in desired concentration.
- This novel drug delivery system is especially targeted to liposomal delivery of drugs in cancer chemotherapy, arthritis, haemophilia and diseases of the immune system.

NANO PARTICLES

- These are colloidal particles of the submicron size which act as carriers for drug molecules
- These are used to target various sites in the treatment of cancer, disease of the reticuloendothelial system and enzyme replacement therapy in liver.

MICROSPHERES

- These are small, solid particulate carriers containing the dispersed drug particles either in solution or crystalline form.
- Microspheres are used as carriers for drugs and therapeutic agents especially in cancer treatment and hormonal disorders.