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| Semester | VI |
| Subject /Course | Herbal Drug Technology |
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| Module No. | III |
| Module Title | Herbal Cosmetics |
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## Learning Outcome of Module-III

| LO | Learning Outcome (LO) | Course Outcome Code |
|---|---|---|
| LO1 | To know about the herbal cosmetics and their uses | BP603.3 |
| LO2 | To know the natural sweeteners and herbal excipients | BP603.3 |
| LO3 | To understand about the methods for preparation and evaluation methods of herbal cosmetics | BP603.3 |
| LO4 | To know about the novel drug delivery systems like Phytosomes | BP603. |

## Content Table

| Topic |
| --- |
| • Sources and description of raw materials of herbal origin<br>• Introduction of Skin care, Hair care and oral care products<br>• Herbal excipients and their significance<br>• Natural colorants, sweeteners, binders, diluents, flavoring and perfuming agents<br>• Introduction of Herbal formulations like herbal syrups and herbal tablets<br>• Introduction of Novel drug delivery system and Phytosomes |

# Herbal Cosmetics

## Introduction

The concept of beauty and cosmetics dates back to ancient mankind and civilization. Generally herbal cosmetics are also referred to as natural cosmetics. Herbal cosmetics are formulated, using different cosmetic ingredients to form the base in which one or more herbal ingredients are used to cure various skin ailments. Plants are highly used for development of new drug products for **'cosmeceuticals'** and pharmaceutical applications.

Herbal cosmetics are the products in which herbs are used in crude or extract form. Herbal Cosmetics, referred as Products, are formulated, 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". Herbs do not produce instant cures. They offer a way to put the body in proper tune with nature. A huge number of cosmetic and toiletry formulations have been designed and developed based upon Indian Herbs recently. Other than traditionally documented applications, some modern trials have also been using the utility of Indian herbs in Personal Care products. The demand of herbal medicines is increasing rapidly due to their skin friendliness and lack of side effects.

The best thing of the **herbal cosmetics** is that it is purely made by the herbs and shrubs and thus is side-effects free. The natural content in the herbs does not have any side effects on the human body; instead provide the body with nutrients and other useful minerals. The term Cosmeceuticals was first used by Raymond Reed founding member of U.S Society of Cosmetics Chemist in 1961. He actually used the word to brief the active and science based cosmetics.


The herbal cosmetics may contain one or more ingredients in the formulations from the following classes:

**Fixed oils:** Castor oil, coca butter, coconut oil, olive oil, basil , argan, Jijobal oil, tea tree oil. Rosemary oil, Peppermint oil.

**Waxes**: Bees wax, berry wax , candelilla wax, carnauba wax, ceresine wax ,green tea wax.

**Gums:** Acacia gum , tragacanth, guar gum.

**Colors**: Henna, turmeric, walnut, curcumin, red sorrel, apigenin

**Perfume**: Rose, Narcissus Gardenia Lavender oil

**Anti-oxidants**: Green tea, Haldi, Amla, Grape seed, almond, Golden root Min tree, Sweet chestnut, Piper betal cranberry etc.

## Advantages of Herbal Cosmetics over Synthetic

Herbal cosmetics are the modern trend in the field of beauty and fashion. These agents are gaining popularity as nowadays most women prefer natural products over chemicals for their personal care to enhance their beauty as these products supply the body with nutrients and enhance health and provide satisfaction as these are free from synthetic chemicals and have relatively less side-effects compared to the synthetic cosmetics

**The benefits of herbs may include the following**

• Enhance physical and mental well-being in individuals.

• Strengthen the immune system of individuals.

• Detoxification to remove toxins.

• Aid in sleeping, breaking down.

• Increase stamina level and mainly reduce fatigue etc.

**Herbal cosmetics**: The name itself suggests that herbal cosmetics are natural and free from all the harmful synthetic chemicals which otherwise may prove to be toxic to the skin. Instead of traditional synthetic products different plant parts and plant extracts are used in these products, e.g. aloe-vera gel and coconut oil. They also consist of natural nutrients like Vitamin E that keeps skin healthy, glowing and beautiful. For example, *Aloevera* is a herbal plant species belonging to liliaceae family and is naturally and easily available. There are a rising number of consumers concerned about ingredients such as synthetic chemicals, mineral oils who demand more natural products with traceable and more natural ingredients, free from harmful chemicals and with an emphasis on the properties of botanicals. Recently the use of botanicals in cosmetics have increased mainly due to the mild action and non-toxic nature. In cosmetics, both natural and phyto-ingredients are used. Natural products include oils, extracts, secretions etc. Phyto-ingredients include pure constituents obtained by various process.

**Classification of herbals in cosmetic preparations**

Novel Herbal extracts and its products have a wide utilization in the formulation of cosmetics. The cosmetics herbal preparations can be classified as follows:

**1. Herbal Cosmetics for hair care:** These include herbal ingredients which are beneficial to hair growth and impart shine to the hair. For instance, *Lawsonia inermis* (Henna), *Cyamopsis tetragonolobus* (Guar Gum), *Acacia concinna* (Shikakais), *Bacopa monnieri* (Brahmi)

**2. Herbal Cosmetics for Skincare:** These include herbal care creams, body powders, silk soaps body soaps, etc.


**3. Herbal cosmetics for eye care:** Herbal cosmetics include eye gloss, eye shadows, eye gloss, and liquid liners.

**4. Herbal Cosmetics as oils:** These herbal oils are utilized in various hair problems such as hair thinning, hair baldness, hair fall, itching in the scalp.

**5. Herbal Cosmetics for lip care:** Lip care formulation includes lipsticks, plumper, balms, and glosses of herbal origin.

**6. Fragrances and perfumes of herbal origin:** These include scents of flowers, chypre, and fruits containing citrus characteristics such as those of lemon, mandarin, orange, *etc.*

**7. Cosmetics for oral product:** It includes Dentrifices & mouth washes, Tooth pastes, Cosmetics for teeth & mouth washes.

## Skincare Products

### The Requirement for the Basic Skin

• **Cleansing agent**: which remove the dust particles, dead cells and dirt from skin that chokes the pores on the skin. Some of the common cleansers include vegetable oils like coconut, sesame and palm oil.

•**Toners**: The toners help to tighten and toning the skin and keep it from being exposed to many of the toxins that are floating in the air or other environmental pollutants. witch hazel, geranium, sage, lemon, ivy burdock and essential oils are some of the herbs used as toners.

• **Moisturizing**: The moisturizing helps the skin to become soft and supple

Skin is the most exposed part of the human body is often referred to as the defensive line from foreign matters. Skin aids in guarding the bones, muscles as well as the vital organs in the body. The skin ranges from oil, sensitive, dry skin. Various herbal ingredients are employed in skin care including Vitamin C, E, Vitamin B complex and beta carotene are utilized various bacterial, skin infections. Also, they impart day to day skin care effects.

The utilization of various bioactive herbs and phytochemicals, obtained from different biological sources accomplish different skincare functions: Care of body skin and as an important component to influence the skin's biological function, giving the supplements to healthy skin. These herbal compounds are rich source of essential oils, vitamins, proteins, antioxidants, terpenoids, and other active components. Different composition of these extracts has a different activity, depending on their nature. There is a remarkable increase of phenolic oxidation inhibitor agent in the most recent decade because of their high ability to scavenge free radicals. Herbal compounds rich in phenolic components can be utilized for skin protection.

Phenolics and tocopherols represent 59% of the oxidation inhibitor action. It is particularly esteemed in the traditions of Central and Eastern Europe and the Middle East for its healthful advantages and is utilized in both the ways either orally or topically for medicinal value. Because of its potency and rich odor, it is just utilized in little extents in topical products. Mineral oil dissolves the secreted sebum from the oil glands, thus helps in skin protection and assists skin evaporation. Herbal excipients are especially incorporated as an essential ingredient in skincare cosmetics because of several desirable properties, for example, anti-inflammatory, antioxidant, and antimicrobial antiseptic properties. The natural components, all in all, or part, have been utilized for different infirmities of the skin.

**Dry Skin Treatment**

**Coconut oil**: It is produced by crushing copra, the dried kernel, which contains about 60-65% of the oil. Coconut oil contains a high amount of glycerides of lower chain fatty acids. Coconut oil is derived from the fruit or seed of the coconut palm tree *Cocos nucifera*, family Arecaceae. The melting point of coconut oil is 24 to 25°C (75-76ºF) and thus can be used easily in liquid or solid forms and is often used in cooking and baking. Coconut oil is excellent as a skin moisturizer and softener.

**Sunflower oil:** It is the non-volatile oil extracted from sunflower seeds obtained from *Helianthus annuus*, family Asteraceae. Sunflower oil contains lecithin, tocopherols, carotenoids and waxes. It has smoothing properties and is considered non-comedogenic. A simple yet cost-effective oil, well tried and tested for generations in a wide variety of emulsions formulated for face and body Products.

**Jojoba oil:** It is a mixture of long chain, linear liquid wax esters extracted from the seeds of the desert shrub *Simmondsia chinenesis*, family Simmondsiaceae. Jojoba oil is easily refined to remove any odor, color it is oxidatively stable, and is often used in cosmetics as a moisturizer and as a carrier oil for exotic fragrances. Human sebum and jojoba oil are virtually identical.

Sebum protects and moisturizes the skin and hair but is stripped away by chemicals, pollutants, sun and the aging process, resulting in dry skin and hair. Jojoba oil replenishes what skin and hair lose and restores them to their natural pH balance.

**Olive oil**: This oil is a fixed oil extracted from the fruits of *Olea europaea*, family oleaceae. The major constituents are triolein, tripalmitin, trilinolein, tristearate, monosterate, triarachidin, squalene, β-sitosterol and tocopherol. It is used as skin and hair conditioner in cosmetics like lotions, shampoos etc. It is a potent fatty acid penetration enhancer.

**Aloevera:** Aloevera is a herbal plant species belonging to liliaceae family that is found only in cultivation, having no naturally occurring populations, although closely related aloes do have presence in northern Africa. It is an ingredient in many cosmetics because it heals, moisturizes, and softens skin. Simply cut one of the aloe vera leaves to extract the soothing gel. Aloe vera contains amino acids like leucine, isoleucine, saponin glycosides that provide cleansing action, vitamins A,C,E,B, choline, B12 and folic acid and provide antioxidant activity.

**Anti-aging Herbs**

***Rhodiola rosea-*** It is commonly known as **Golden root**, roseroot, Aaron's rod, arctic root, king's crown, lignum rhodium, orpin rose. It is a plant in the Crassulaceae family that habitats in cold

regions of the world. Traditional folk medicine used *R. rosea* to increase physical endurance, work productivity, longevity, resistance to high altitude sickness, and to treat fatigue, depression, anemia, impotence, gastrointestinal ailments, infections, and nervous system disorders. *R. rosea* is rich in phenolic compounds, known to have strong antioxidant Properties.

**Carrot**: It is obtained from the plant *Daucus carota* belonging to family Apiaceae. It is a valuable herb since ages as due to its richness in Vitamin A along with other essential vitamins. Carrot seed oil is used as anti-aging, revitalizing and rejuvenating agent. The carrot gets its characteristic and bright orange colour from β-carotene, and lesser amounts of α-carotene and γ-carotene. α and β-carotenes are partly metabolized into vitamin A in humans.

**Gingko:** In China and Japan, the leaves and nuts of the *Ginkgo biloba* tree have been used for thousands of years to treat various medical conditions, including poor blood circulation; hypertension; poor memory, and depression, particularly among the elderly; male impotence. In addition, it is gaining a similar reputation as an antioxidant and anti-inflammatory agent. *Ginkgo biloba* belongs to family Ginkgoaceae, which grows to a huge size.

**Ginseng:** Ginseng is incorporated as an anti-maturing component in facial creams. A few therapeutic examinations have demonstrated its viability in defending wrinkles because of ginseng's capacity to support skin-firming collagen. The suppression of UV-induced apoptosis and an increase in the level of type I collagen production results in aging of the skin. The ginsenoside Rb1 is beneficial to exhibit anti-aging activities and promote youthful skin. The herb additionally goes about as a skin lightning component, giving a more vibrant and younger appearance to the skin. Red ginseng extricate is accepted to have oxidation inhibition, anti-aging, and immuno-stimulatory properties. This is the foremost controlled investigation of red ginseng extract on a human to investigate its impacts on photoaged skin, or damaged skin due to sun introduction. The facial skin of healthy mature volunteers above the age of 40 years was tested before and after the extended duration of treatment using a mixture of red ginseng extract with other herbs.

**Rosemary:** Rosemary is one of the essential components against aging that can assist the human skin in a few ways. Utilizing rosemary holds the nourished content of the skin, consequently keeping the skin firm and thus prevents the fine lines appear on the facial skin. Rosemary is also helpful for shielding your skin from ecological components and supporting the insurance of collagen in the skin. Counting rosemary as one of the essential components in your healthy skin routine can provide you a smooth and resilient skin.

**Skin protection**

**Calendula:** *Calendula officinalis* (Marigold) is reported to have a remarkable antioxidant activity, anti- inflammatory activity and wound healing activity. A previous study demonstrated that the essential oil of Calendula consists mainly of α-thujene, α-pinene, 1,8-Cineole, dihydrotagetone and T-muurolol .

**Green and Black Tea:** Tea (*Camellia sinensis*) is normally utilized as one of the natural remedies for sunburn. Theobromine and tannic acid are the chief components of tea, which are enabled to remove heat from sunburns. The Chinese prescribe that application of cooled black tea on the skin surface soothe sunburn. Another major component of tea known is catechin, which helps to avert and repair the damage of skin and may even help to counteract radiation and chemical initiated skin malignancies.

Various polyphenolic compounds in tea give an indistinguishable defensive impact on the skin as for inner organs. These polyphenolic compounds have been discovered to balance biochemical pathways that are essential for multiplication of cell, provocative reactions, and reactions of tumor promoters. Green tea has been found to provide antioxidant and anti-inflammatory activity in both animal and human skin.

**Almond oil:** The almond oil is one of the safest oil that can be used in cosmetic products, since it has the less acidic reaction than any other oil. The oil has been used for skin protection against the dry and hot climate of desert regions. Almonds have special property to whiten the skin which is used in fairness creams.

**Avocado:** The avocado oil has a rare vitamin D, known as the sun-ray vitamin which can nourish theskin. The oil has unusual property that penetrates through the dermis and epidermis effectively to rejuvenate the skin from within. For those who have been denied of sunlight due to illness, this herb proves to be a boon.

**Sandalwood:** Sandalwood is used in cosmetic products to freshen and revitalize dull skin. Sandalwood paste is known not only to have curative powers to heal skin problems, but also a glow to the skin which is unmatched by any other product. Sandalwood is also used for face packs and scrubs.

**Saffron:** Saffron was considered to be one of the most beneficial herbs for skin ailments and cleansing of skin by ancient Indian physician Charaka. The herb is used in cosmetics in production of fairness creams, cleansers and anti-blemish lotions.

**Turmeric:** Turmeric is used in many celebrations of Hindus. Especially in Hindu wedding brides would rub with turmeric on their bodies for glowing look. New born babies also rubbed with turmeric on their forehead for good luck. Traditionally women rub turmeric on their cheeks to produce a natural golden glow.

**Chandan:** It is used as scrubs and face packs that are applied onface and whole body to remove dead cells, regenerate growth of new cells and give young look.

**Multani Mitts (Fullers Earth):** It is Mother Nature's own baby powder. Clay was one of the earliest substances to be used as a beauty mask to draw oils from the skin, natural moisturizers for hairs, teeth, gums and hair. To remove pimple marks, treating sunburn, helps unclog pores, to cleanse the skin of flakes and dirt.

**Citronella Oil**: It is one of the essential oils obtained from the leaves and stems of different species of Cymbopogon family Cardiopteridaceae. The crisp, rich citrus or lemon like aroma of this oil drives away body odour and is used deodorants and body sprays, although in very small quantities, since it heavy doses it may give skin irritations. It can also be mixed with the bathing water to have a refreshing, body odour ending bath.

**Oat (*Avena sativa*):** It is a species of cereals grain grown for its seed, it is not only consumed for nutritional purposes, but is also recognized as possessing healing and soothing properties. Oat oil is rich in antioxidants and natural emollient property. Oat oil is used in many lotions , creams and facial oils.

**Hair care Products**

**Amla**: Amla is the name given to the fruit of a small leafy tree *(Emblica officinalis*), which grows throughout India and yields characteristics. edible fruit. It is highly praised both for its high vitamin C content and for the precious oil, which is extracted from its seeds and pulp and used as a treatment for hair and scalp problems. It is used in eye syndromes, hair loss, and children ailments etc.

**Arachis Oil:** This is also a fixed oil obtained from the seeds of the *Arachis hypogea* belonging to the family Leguminoseae. The oil is pale yellow in colour, with a faint nutty odour. It is used in the preparation of hair oils.

**Castor Oil**: This oil is obtained from the seeds of Ricinus communis belonging to the family, Euphorbiaceae. It is used as an emollient, in the preparation of lipstick, hair oils, creams and lotions.

**Rose Oil:** There are mainly four species of roses for oil production. These are *Rosa damascena* Mill., *R. gallica* L., *R. moschata* Herrm. and *R. centifolia* L. Rose oil and rose water have many therapeutic effects. Rose oil helps soothe the mind and heals depression, grief, nervous stress and tension. It also helps to heal wound and skin health.

**Eucalyptus Oil**: There are around 700 different species of Eucalyptus in the world, of which at least 500 produce a type of essential oil. It is produced by steam distillation from the leaves of Eucalyptus species. They are widely used in the preparation of liniments, inhalants, cough syrups, ointments, toothpaste and also as pharmaceutical flavors. The European Pharmacopoeia monograph for Eucalyptus oil sports a chromatographic profile: 1,8-cineole (eucalyptol; not less than70%), limonene (4- 12%), α-pinene (2-8%), α- phellandrene (less than 1.5%), β-pinene (less than 0.5%), camphor (less than 0.1%) .

**Grape seeds:** It promotes proliferation of hair follicle cells invitro and that they possess remarkable hair cycle converting activity from the telogen phase to anagen phase invivo.

**Ginkobiloba**: This leaf extract also promotes hair regrowth through combined effects on proliferation and apoptosis of the cells in the hair follicle, thus suggesting potential as a hair tonic.

**Aloe:** Aloe gel is used traditionally for hair loss and for improvement in hair growth following alopecia. Aloenin is the major constituent responsible for promoting hair growth without irritating the skin.

**Dandruff treatment**:

**Henna**: Henna comes from the plant *Lawsonia inermis* family Lythraceae, which contain a dye molecule called Lawsone, which when processed produces Henna powder. Besides lawsone other constituents present are gallic acid, glucose, mannitol, fats, resin (2%), mucilage and traces of an alkaloid. Leaves yield hennatannic acid and an olive oil green resin, soluble in ether and alcohol. Lawsone osisolated from the leaves of L.inermis has shown significant antifungal antibiotic effect.

**Neem:** Neem or Margosa is a botanical relative of mahogany. It belongs to the family Meliaceae. The Latinized name of Neem *Azadirachta indica* is derived from the Persian. Azad=Free, dirakht=Tree, i-Hind=of Indian Origin. The common treatment for the dandruff is Neem as it produces antifungal, antibacterial, pain-relieving, and anti- compounds that would treat dandruff.

**Shikakai:** *Acacia concinna* Linn. (Leguminosae) is a medicinal plant that grows in tropical rainforests of southern Asia. The fruits of this plant are used for washing hair, for improving hair growth, as an expectorant, emetic, and purgative. The powder of *Acacia Concinna* Linn shows the presence of saponins, alkaloid, sugar, tannin, flavanoids, anthraquinone glycosides.

## Oral care

Oral health/dental health is an inseparable part of general health. Oral health has an effect on general health as it causes considerable pain and suffering. It has an impact on a person's speech, selection of food, quality of life, and well-being. In view of the prevalence of oral diseases, their impact on individuals and society, and the expense of their treatment, oral diseases may be considered a major public health problem and they are listed among the most common of the chronic diseases that affect mankind. Oral diseases are the fourth most expensive diseases to treat in certain countries. According to the World Health Organization (WHO) report, dental caries, though exhibiting a declining trend in many parts of the industrialized world, is still an important public health concern in many developing countries. The statistics suggest that dental caries affect 60-90% of schoolgoing children in developing countries. Loss of teeth because of periodontitis often causes discomfort, and compromises the esthetics and function. Moreover, recent studies suggest an association between chronic low-grade infections such as periodontitis and systemic health problems (preterm low birth weight, cardiovascular diseases, diabetes mellitus, and chronic obstructive pulmonary disease).There is an immediate need for promoting preventive strategies that are socially acceptable, easily available, and at the same time be cost-effective. This calls for the evolution of innovative strategies that are robust, efficient, and feasible**.**

***Clove oil:*** Cloves are the aromatic flower buds of a tree in the Myrtaceae family, *Syzygium aromaticum.* In the past cloves were used as a remedy to ease the pain of toothache. Clove oil has a local anaesthetic effect and temporarily numbs and relieves pain. It is used in the preparation of some tooth pastes and in Clovacaine solution, a local anaesthetic used in oral ulceration and inflammation. Eugenol, which is extracted from essential oils including clove oil, is also mixed with zinc oxide to form temporary tooth restorations.

***Eucalyptus saligna*** mouthwash gargle is used in Cameroon to treat mainly toothache, sore throat and halitosis. It has been shown that the essential oil of the leaves of *Eucalyptus globulus* has antimicrobial activity against gram-negative bacteria (*E. coli*) as well as gram-positive bacteria (*S. aureus*) which are found in the oral cavity.

***Moringa oleifera*** roots are also used to treat toothache in Cameroon by direct application on the tooth cavity. This plant has been found to be specific against *Staph. Aureus*, *Vibrio cholerae,* and *Escherichia coli* and have no antifungal activity. Its antibacterial activity is responsible for its ability to calm toothache.

***Allium sativum:*** It is one of the most extensively researched medicinal plants with a typical odor. Its antibacterial activity depends on allicin produced by enzymatic activity of allinase on allicin produced by enzymatic activity of allinase on allicin after crushing or cutting garlic clove. Garlic extract inhibits the growth of *Streptococcus mutans*, and therefore can be used as an effective remedy in the prevention of dental caries when used it is used as a constituent in toothpaste or mouthwash.

**Tulsi (*Ocimum sanctum*):** Tulsi consists of tannins (4.6%) and essential oil (up to 2%), eugenol (up to 62%), methyleugenol (upto 86%), and α- and β-caryophyllene (up to 42%), methylchavicol, linalool and 1,8-cineole. It has got antihelminthic, analgesic, antipyretic, immune stimulatory, antiulcer, antimicrobial, anti – inflammatory property. Used in periodontitis. Contraindicated in pregnant and lactating women, used with caution in children.

**Green Tea (*Camellia sinensis*):** Green tea contains polyphenol contents comprising catechin (C), epicatechin (EC), gallocatechin (GC), epigallocatechin (EGC) epicatechingallate (ECG), and epi-gallocatechingallate. It is anti-inflammatory, antibacterial, anti-viral. Used in the treatment of periodontal disease.

**Marigold (*Calendula officinalisL.*)** It is native to the Mediterranean areas. It is used for the treatment of skin disorders and pain, to facilitate healing after oral surgery and in oral cavity inflammations. It has also anti-edematous activity.

**Grape Seed Extract:** Grape seed extract contains pro-anthocyanidins (PA) which are potent antioxidants and are known to possess anti-inflammatory, antibacterial and immune-stimulating effects. It has been reported to strengthen collagen based tissues by increasing collagen cross-links. In a study conducted to determine re-mineralizing effects of grape seed extract on artificial root caries, results showed that is a promising natural agent for noninvasive root caries therapy.

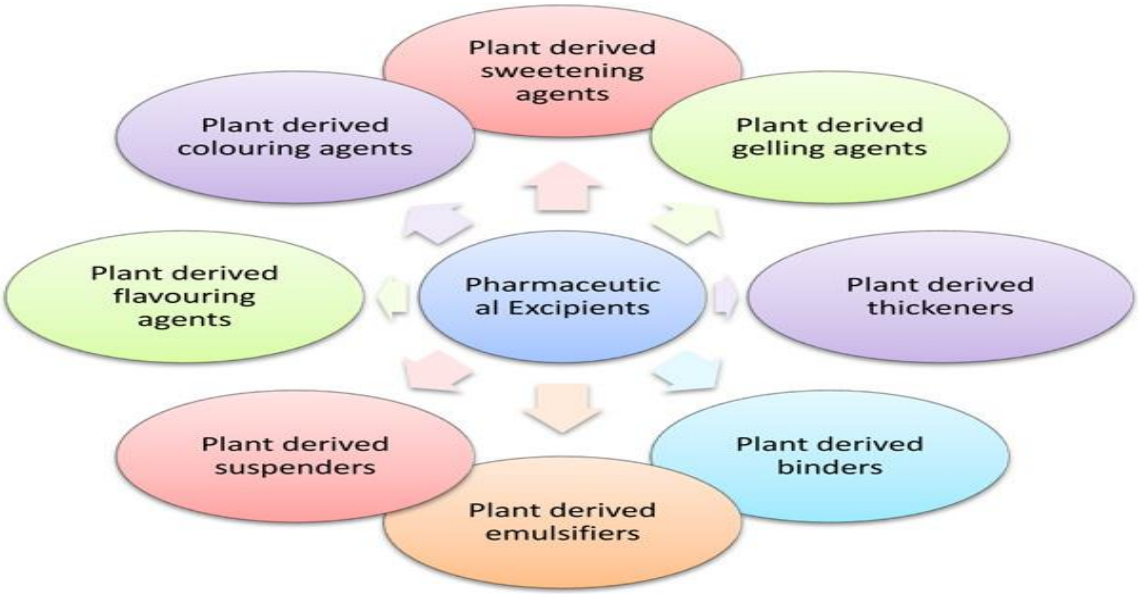
**Papaine:** Papaine is a proteolytic enzyme that comes from the latex of the leaves and fruits of the green adult papaya. It has an anti-inflammatory, bacteriostatic, bactericidal characteristic and is effective against gram positive and gram negative organisms. Similar to human pepsin, papaine acts as a chemical debridement ant-iinflammatory agent, which does not damage healthy tissues and accelerates cicatrization process. Papaine acts only in infected tissue as it lacks a plasmatic antiprotease called α-1-anti-trypsin.

**Meswak:** It is a derivative from Arak tree, is used by many people in different cultures as traditional toothbrush for oral hygiene. The meswak extract has also found its way into the

dentrifrices in the recent years as antiplaque and antigingivitis agents. Chewing sticks should be obtained from fresh stems of medicinal plants.

**Herbal Excipients**

Excipients are defined as 'the substance used as a medium for giving a medicament. 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. 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.




**ADVANTAGES OF HERBAL EXCIPIENTS**

**Biodegradable**: Naturally occurring polymers produced by all living organisms. They show no adverse effects on the environment or human being.

**Biocompatible and non-toxic**: Chemically, nearly all of these plant materials are carbohydrates in nature and composed of repeating monosaccharide units. Hence they are non-toxic.

**Economic:** They are cheaper and their production cost is less than synthetic material.

**Safe and devoid of side effects**: They are from a natural source and hence, safe and without side effects.

**Easy availability**: In many countries, they are produced due to their application in many industries.

**CLASSIFICATION OF EXCIPIENTS:**

Excipients are commonly classified according to their application and function in the drug products:

- ✓ Herbal Sweeteners
- ✓ Binders, diluents
- ✓ Disintegrants
- ✓ Colorants
- ✓ Viscosity builders
- ✓ Perfumery agents
- ✓ Flavoring agents

**Herbal sweeteners**

1. **Stevia**: It is a very popular low-calorie sweetener. It's extracted from the leaves of a plant called *Stevia rebaudiana*. Several sweet compounds are found in stevia leaves. The main ones are stevioside and rebaudioside A. Both are hundreds of times sweeter than sugar, gram for gram. Therefore, stevia is very sweet but has virtually no calories. Additionally, a few human-based studies suggest stevia has health benefits. Stevia can lower high blood pressure in people with hypertension by 6–14%. However, it has no effect on blood pressure that is normal or only mildly elevated. Stevia has also been shown to lower blood sugar levels in people with diabetes.
2. **Erythritol:** It is another low-calorie sweetener. It's a sugar alcohol found naturally in certain fruits. However, powdered erythritol available for purchase is most likely made via an industrial process. It contains 0.24 calories per gram, or about 6% of the calories in an equal amount of sugar, with 70% of the sweetness. Erythritol doesn't spike blood sugar or insulin levels and has no effect on blood lipids like cholesterol or triglycerides. It's absorbed into the body from the intestine but eventually excreted from the kidneys unchanged.

3. ***Glycyrrhiza glabra***: Liquorice roots, which are wrinkled and brown on the outside and yellow on the inside, contain glycyrrhizin, a compound that is 50 to 150 times as sweet as cane sugar.

4. **Thaumatin:** The Thaumatins are a family of very sweet proteins present in the fruits of the tropical plant Thaumatococcus danielli (marantaceae) a bushy plant.Thaumatin elicits a very sweet taste that is rated to be 2000 to 10000 times sweeter than sucrose, depending on purity and concentration.Thaumatin I and II are soluble in water and dilute alcohol. Thaumatin is effective at masking bitter notes often associated with pharmaceuticals or vitamins.


## Natural Binding agents

A binding agent (or binder) is a substance that holds or draws other materials together mechanically, chemically or as an adhesive, to form a cohesive whole.

**Pectin:** Pectins are non-starch, linear polysaccharides extracted from the plant cell walls. In the food industry, folic acid incorporated microcapsules were prepared using alginate and combinations of alginate and pectin polymers so as to improve stability of folic acid. The blended alginate and pectin polymer matrix increased the folic acid encapsulation efficiency and reduced

leakage from the capsules as compared to those made with alginate alone; they showed higher folic acid retention after freeze drying and storage.

**Guar gum:** Guar gum comes from the endosperm of the seed of the legume plant Cyamopsis tetragonolobus. Refined guar splits are obtained when the fine layer of fibrous material, which forms the husk, is removed and separated from the endosperm halves by polishing. Strong acids cause hydrolysis and loss of viscosity, and alkalies in strong concentration also tend to reduce viscosity. It is insoluble in most hydrocarbon solvents.

**Khaya gum**: Khaya gum is a polysaccharide obtained from the incised trunk of the tree Khaya grandifoliola (family Meliaceae). The fact that the gum is naturally available, inexpensive and non-toxic has also fostered the interest in developing the gum for pharmaceutical use. Further work has also shown its potential as a directly compressible matrix system in the formulation of 61 controlled release tablet.

Different starches like rice, maize, corn wheat are also used a a natural binding agents. They are added to the tablet formation to increase inter-particulate bonding strength in the tablets. The binder is added either in dry mix or mix in granulating liquid and form matrix with fillers and drug embedded in it.

**Herbal diluents:** Natural diluents include starches, hydrolyzed starches, and partially pregelatinized starches. Common diluents include anhydrous lactose, lactose monohydrate, and sugar alcohols such as sorbitol, xylitol and mannitol. Diluents provide better tablet properties such as improved cohesion or to promote flow.

**Classification of diluents**: Diluents are classified on the basis of chemical nature and solubility.

Organic materials Carbohydrates and modified carbohydrates are the major examples. i.e. lactose, starch and pre-gelatinized starch, sucrose, mannitol, sorbitol, powdered and microcrystalline cellulose.

**Methyl-cellulose:**

Methylcellulose is the organic material used as a diluent in the pharmaceutical formulation.

It is the cellulose derivative. On the long term use as a diluent in the pharmaceutical formulation it causes the various side effects . Mostly it causes the abdominal fullness, difficulty swallowing, nausea, rectal bleeding, stomach pain, and vomiting .

**Dicalcium phosphate**: Dicalcium phosphate (DCP) is a combination of positively charged particles of calcium and negatively charged particles of hydrogen phosphate which is interchangeable with the phosphate in the body. Long term use of DCP

results in upset in the balance of phosphates and other chemicals in the body. According to the material safety data sheet, the powdered form of DCP may irritate skin. Prolonged skin contact may lead to dry or chapped skin.

**Binders:** Excipients are also known as additives, which are used with active pharmaceutical ingredients to convert in to a pharmaceutical dosage form for suitable administration. As name indicates, Binders are the excipient which is use to bind or hold all ingredients used in formulation of the dosage form. Binders are mixed in formulation to convey plasticity or to increase the bonding strength between the particles in formulation. The griping of ingredients in tablets and granules is very important which is enhanced by binders. They ensure that the formulations are manufactured according to required physical strength and quantity. Binders are used either in a solution or in a dry form depending on the ingredients in the formulation & the method of preparation of dosage form. Generally, binders are used in solid or semi-solid formulations. Examples of dosage form in which binders are used are as follow: Tablets, Pills, Pallets, Granules, and Pastes etc.

**Viscosity builders:** These are substances, which added to mixture, to increase its viscosity without substantially modifying its other properties, such as taste.They increase stability. It is desirable to increase the viscosity of dosage form to provide or to improve palatability or pourability.

**Flavoring agents:** Flavors are the mixed sensation of taste, touch, smell & sight. Nowadays, many artificial flavors are manufactured with the help of technology in flavoring industries. Many pharmaceutical industries use flavors in many formulations like: cough syrups, sedatives, anti-malarial and anti-biotic. Flavors are used as taste masking agents which hides the unpleasant taste or order of dosage form. A flavor enhances the likelihood of medicine and makes them more compatible for patient's administration. Due to the use of flavors in dosage form children take medicines without any problem. Flavoring agents may be artificial or natural. Artificial flavoring agents are synthesized in laboratories while natural flavoring agents are extracted from plants. Sweetening agents also separated from plants and also manufactured synthetically. Examples of dosage form in which flavoring agents are used are as follow: Tablets, Pills, Pallets, Capsules, Pastes, Syrups, Emulsions, Suspensions, Mouth washes etc. Examples of flavoring agents are Black pepper, Cardamom, Fennel, Ginger, Peppermint, Nutmeg and saffron.

**Coloring agents**: Coloring agents comes under the category of organoleptic agents. Coloring agents are widely used in pharmaceuticals, cosmetics and food industries. Coloring agents

promotes the appearance in pharmaceutical formulations. If any dosage form has unacceptable color, the consumers avoid the dosage form for administration. Coloring agents give the attractiveness to the dosage form. Coloring agents are also used for differentiate of dosage form or for easy identification of dosage forms. Due to the use of coloring agents in dosage forms psychologically patients are attracted towards the dosage forms. Coloring agents are also used as dyes and widely used in cosmetics industries. All coloring agents used in pharmaceutical industries is approved or certified by FDA. Example of dosage forms in which coloring agents are used:- Tablets, Pills, Pallets, Capsules, Pastes, Ointments, Syrups, Emulsions, Suspensions etc.

**Perfumery agents**: An active ingredient is a compound which imparts the aroma to the perfume compositions or enhances the aroma of an existing perfume compostion. Perfumary agents includes Musk, sandalwood oil, Rose oil, Jasmine oil, benzoin, Turpentine and Levender oil.

**Herbal Formulations**

Herbal formulations means a dosage form consisting of one or more herbs or processed herbs in specified quantities to provide specific nutritional, cosmetic benefits meant for use to diagnose, treat, mitigate diseases of human beings or animals, alter the structure or physiology of human beings or animals**.**

**Herbal syrup:** Syrup is a concentrated mixture of sugar in purified water. The oral use of liquid pharmaceutical has generally been justified on the basis of ease of administration to those individuals who have difficulties in swallowing solid dosage forms. Ayurvedic herbal cough syrup comprising goodness of herbs such as Tulsi, Liquorice, Ginger, Vasaka which has been reported to provide effective relief in cough without causing adverse effects like those associated with the use of antihistamines. Combination of these herbs with honey is intended to provide additive benefit in relieving symptoms of acute non-productive cough.

**Preparation of Herbal Syrup:** Herbal syrup is prepared by combining a concentrated decoction with either honey or sugar, and sometimes alcohol. The base of such a syrup is a strong herbal decoction. Mixing a decoction with honey or sugar helps to thicken and preserve the decoction. This increases the shelf life of the decoction and often creates a soothing application that benefits situations such as sore throat, cough, dry irritated tissues, and digestive issues. The added sweetener can also help to increase the palatability of some herbs. Many folks, including children, find syrups to be delicious. The basic proportions you want to use are 2 parts herbal decoction to 1 part honey or sugar. This is called a 2:1 ratio. This means that if you start with your herbs added to 4 cups of water and simmer down the liquid to 2 cups of decoction, then you will want to add 1

cup of honey or sugar to create and adequately preserve your syrup. Some herbalists like to use a 1:1 ratio of decoction to honey/sugar while others find a 1:1 ratio to result in a syrup that is too sweet. The increased amount of honey/sugar relative to decoction in a 1:1 ratio will be better preserved and hence last longer.

**Herbal Tablets:** Tablets may be defined as the solid unit dosage form of medicament or medicaments with suitable excipients and prepared either by molding or by compression. It comprises a mixture of active substances and excipients usually in powder form, pressed or compacted from a powder into a solid dose. The excipients can include diluents, binders, glidants and lubricants to ensure efficient tableting. Disintegrants to promote tablet break-up in the digestive tract; sweeteners or flavours to enhance taste; and pigments to make the tablets visually attractive or aid in visual identification of an unknown tablet.

A polymer coating is often applied to make the tablet smoother and easier to swallow, to control the release rate of the active ingredient, to make it more resistant to the environment (extending its shelf life), or to enhance the tablet's appearance

**Tablet Evaluation:**

Before a tablet is released out into the market it has to pass a few quality checks, which is mandatory. Evaluation of tablet includes the assessment of tablets physical, chemical and biological properties. To studies them the following test are formulated:

- Appearance
- Size and Shape,
- Organoleptic properties,
- Uniformity of thickness,
- Hardness,
- Friability,
- Determination of pH
- Specific gravity
- Stability testing

## Novel drug delivery system

"Novel Drug delivery System (NDDS) refers to the formulations, systems and technologies for transporting a pharmaceutical compound in the body as it is needed to safely achieve its desired therapeutic effects. Drug delivery systems (DDS), are based on approaches that are interdisciplinary and that combine pharmaceutics, bio conjugate chemistry, and molecular biology.It is a novel approach to drug delivery that addresses the limitations of the traditional drug delivery systems. Our country has a vast knowledge base of ayurveda whose potential is only deing realized in the recent years.

**The therapeutic benefits of these new systems include:**

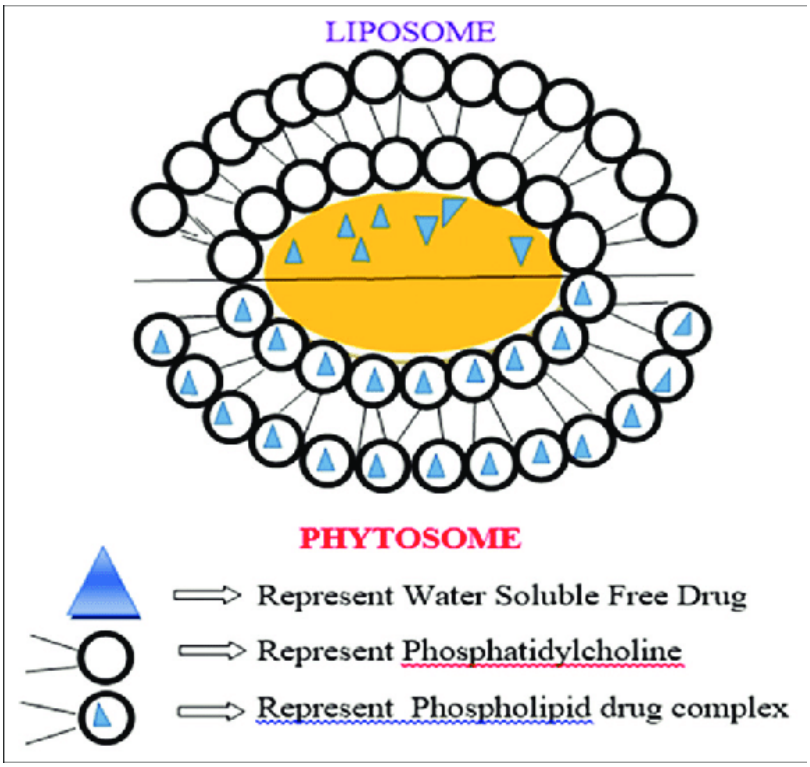
- ✓ Increased efficacy of the drug
- ✓ Site specific delivery
- ✓ decreased toxicity/side effects
- ✓ increased convenience
- ✓ viable treatments for previously incurable diseases
- ✓ Potential for prophylactic application
- ✓ Better patient compliance.

## Phytosomes

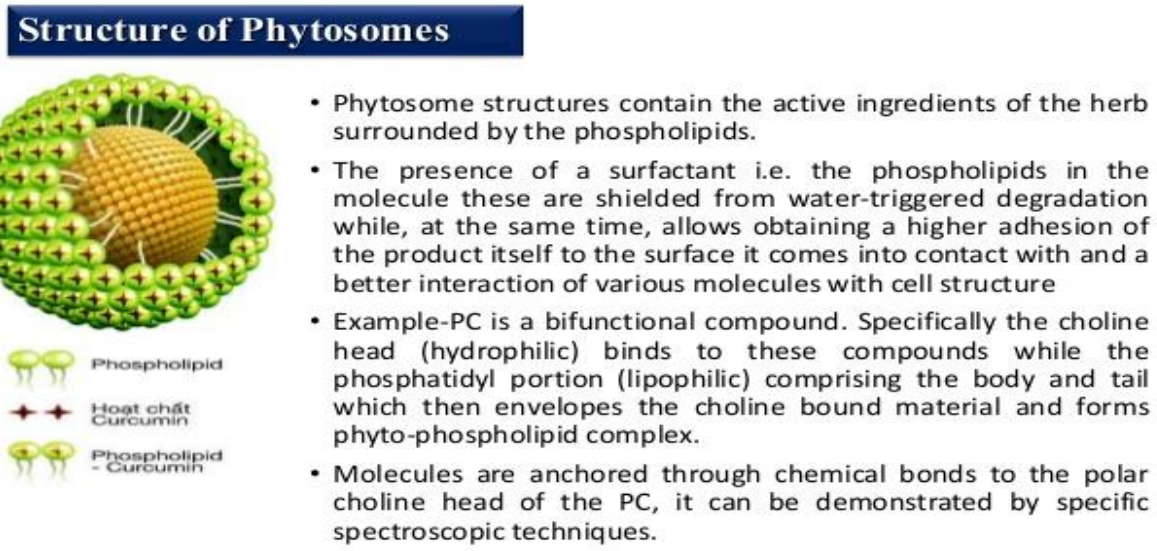
Phytosomes are also known as herbosomes, are recently added herbal formulations that are better absorbed than extracts. Phytosomes are prepared through the attachment of individual ingredients of herbal extracts to phosphatidyl-choline, resulting in a formulation having higher solubility and hence better absorption leading to promoted pharmacokinetic and pharmacodynamic properties compared to the conventional herbal extracts. Various popular herbal extracts including *Ginkgo biloba*, grape seed, hawthorn, green tea, and ginseng have been incorporated in phytosomes. The active components of these herbal extracts were successfully bound to phosphatidyl choline. Phytosomes, also known as phospholipid complexes, are well-known delivery systems that are closely related to liposomes in terms of their structure and configuration. Phytosomes have a higher capacity for nutraceutical compounds to be added to them, as they have a quite stable, chemically bound structure.

Plant extracts can bind quite easily to phosphatidylcholines due to the presence of terpenoids and flavonoids. As delivery systems, phytosomes have proved to be superior to liposomes. The

chemical bonding ensures the stability of phytosomes, enhances the encapsulation efficiency and stability of bioactives, generally at a stoichiometric molar ratio of 1:1 or 1:2 (phospholipids: phytochemicals) Phytosomes were found to improve solubility, permeability rate and bioavailability of active compounds in various cases and inhibit or delay physical and chemical degradation and could be implemented without generating any toxic effects. The choline head of the phosphatidylcholine molecule binds to these compounds while the fat-soluble phosphatidyl portion comprising the body and tail envelops the choline-bound material. The phytosome process also intensifies the action of herbal compounds by improving absorption, increasing biological activity, and enhancing delivery to the target tissue.




**Methods of Preparation:** For the preparation of Phytosomes the phytoconstituents like bioflavonoids, flavolignan and polyphenolic compounds reacting drop by drop by the solution of natural or synthetic phospholipids like Phosphatidycholine with vigorous stirring. Phytosomes of ginsenoside, puerarin and kushenin are prepared in this manner. Another example is the Curcumin phospholipids complexes which can be prepared when the ethanol solution of the hydro-alcoholic extract of turmeric rhizomes adding the phospholipids, under reflux and with stirring. Phytosomes which are prepared by the non solvent, freeze drying, spray drying or vacuum drying are called the prepared complex phytosome.




**Advantages of phytosomes**

1. Improve the absorption of lipid insoluble polar phytoconstituents, enhance the bioavailability.
2. Appreciable drug entrapment which becomes very beneficial.
3. Reduce the dose due to increased absorption.
4. Phosphatidylcholine shows synergistic effect because it is a hepatoprotactive also.
5. Phytosomes are more stable because of the chemical bonding between the phytoconstituents and carrier i.e. phophatidylcholine.
6. Effective in cosmetics

## IMPORTANT QUESTIONS

### Long Questions (10 Marks)

1. What are Herbal cosmetics? Classify them with examples. Explain sources and description of raw materials of herbal origin used in cosmetics.
2. What do you mean by NDDS? Describe method of preparation and evaluation of Phytosomes.
3. Write a brief note on Herbal excipients with appropriate examples. Discus their advantages.
4. Write a brief note Skin care Products with suitable examples.
5. What are herbal formulations? Discuss the method for formulation and evaluation of herbal tablet.

### Short Questions (5 Marks)

1. Write a short note Oral care Products.
2. What are Herbal Sweeteners? Give examples.
3. Give a short note on Hair tonics.
4. What are Natural Binders and Diluents?
5. Write a difference between Conventional and Novel drug delivery system.

### Very short questions (2 Marks)

1. Define cosmeceuticals.
2. What are Phytosomes?
3. Give examples of Skin protectants.
4. What is the composition of herbal syrup?
5. Name two herbs used as a natural sweeteners.
6. Name the herbs used in the preparation of anti-dandruff shampoo.
7. Give examples of natural diluents.
8. Name the polymers used in the formulation of Phytosomes.
9. Give the natural sources of perfuming agents.
10. Give examples of plant products used as colorants.
11. Name the herbs used for anti-aging skin treatment.
12. Give advantages of Herbal excipients.