**St Peter’s Institute of Pharmaceutical Sciences**

**Course: Bachelor of Pharmacy**

**Subject: Herbal Drug Technology**

**Subject Code: BP603T**

## HERBAL EXCIPIENTS

Excipients are defined as non active ingredients that are mixed with therapeutically active compound(s) to form medicines. The compound which is not an active ingredient is regarded as an excipient.

Excipients are the substances which are inert and have little or no beneficial value, but they are essential in the manufacture of various pharmaceutical dosage forms such as tablets, capsules, syrups etc.

They are mixed with the active component to make up the volume or improve their stability or mask the bitter taste or improve the appearance, odour and other characteristics of the dosage forms.

## ADVANTAGE OF HERBAL EXCIPIENTS

**Biodegradable** – They arenatural polymers produced by all living organisms. They don’t show adverse effects on the environment or human being.

**Biocompatible and non-toxic** –All the plant materials are carbohydrates in nature and made up of repeating monosaccharide units. So they are non-toxic.

**Economic** - They are cheaper and their production cost also less when compare to synthetic material.

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

## DISADVANTAGES OF HERBAL EXCIPIENTS

**Microbial contamination** – During processing, they are exposed to external environment and so, there are chances of microbial contamination.

**Variation** – Production of natural polymers is dependent on environment and abundant physical factors.

**The uncontrolled rate of hydration**—Differences in the collection of natural materials at different time intervals, also differences in region, species, and climate conditions the ratio of chemical constituents present in a given material may vary.

**Slow Process** –The production rate is depends upon the environment and many other factors. Therefore natural polymers have a slow rate of production.

**Heavy metal contamination** – There are chances of heavy metal contamination are associated with herbal excipients.

**IDEAL PROPERTIES OF EXCIPIENTS**

• They can be used practically.

• They should be non toxic & non-irritant

• Should be non volatile in nature.

• Should not be affected by temperature, light & hydrolysis.

• Should be easily available & cheap.

• Should not have specific color, odour & taste.

• Should possess good water & lipid solubility.

• Should be compatible with active ingredient in the preparation

• Should be pharmacologically inert

## CLASSIFICATION OF HERBAL EXCIPIENTS

Excipients are classified according to their application and function

* 1. Colorants- Henna, chlorophyll, caramel, amaranth, indigo
	2. Sweeteners- Glycyrrhiza, honey, stevia
	3. Binders – Acacia, gelatin, tragacanth, starch
	4. Diluents – Lactose, starch, mannitol, sucrose
	5. Viscosity builders- Pectin, tragacanth, cellulose, guar gum, gelatin
	6. Disintegrating agents-Starch, Isapgol husk, carboxy methyl cellulose
	7. Flavours – Cardamom, vanilla, lemon oil, orange oil
	8. Perfumes- Rose, lavender, sandal wood
1. **Natural Colorants:**

Natural colorants are highly colored compounds which are capable to impart colour to fabric, leather, drugs, cosmetics, & plastic.

## Advantages of natural colorants:

* 1. Natural colorants are soft, lustrous and soothing.
	2. Wide ranges are available.
	3. They are usually renewable.
	4. Eco-friendly & stable.
	5. Non hazardous to human health.
	6. Show some medicinal properties.

Highly coloured substances found in plants and animals.

Colorants are classified into dyes and pigments.

The difference between dye and pigment is dye is absorbed by the material when applied to fibres to give it a permanent colour which is resistant to the action of light, water or soap. A pigment is applied only to the surface.

## Classification:

* + 1. Based on chemical structure
		2. Based on source
1. **Based on chemical structure:** They are further classified into Pyridine based dyes- present in Berberine species

Carotenoids/ tetra terpenoids- these are bright colored pigments & impart yellow, orange and red colour. Eg: bixa, crocus, curcuma.

Quinonoids- present safflower

Tannins- They play important role by increasing the affinity of fibres towards different dye. Eg: Pomegranate, gall nut, cutch

Flavonoids- these are largest group of plant dyes. Eg: Sandal wood, hemp, onion.

## Based on source

Vegetable/plant origin: Eg: Saffron, turmeric & henna Insects Eg: Cochineal beetles and lac scale insects Minerals Eg: ferrous sulfate, ochre, and clay

* 1. **Henna Synonym:** Mahendi.

**Source:** It consists of fresh and dried leaves of *Lawsonia inermis* (*L. alba*) Family: *Lythraceae*

**Constituents:** Henna contains a soluble component known as Lawsone. It is responsible for the colour. It contains xanthones, tannins, flavonoids and coumarins. Chemically Lawsone is 2, 5-dihydroxy-1, 4- naphthoquinone

**Uses:** Henna is widely used in the cosmetic industry as dyeing agent .Used to dye protein fiber in an orange shade, in conjuction with dihydroxyacetone as a sunscreen agent. Henna is worldwide known as cosmetic agent with anticarcinogenic, anti-inflammatory, analgesic and antipyretic properties.

## Turmeric

**Synonym:** Haldi, Indian saffron.

**Source:** It consists of dried, as well as fresh of the rhizomes of plant *Curcuma longa*

Family: *Zingiberaceae.*

**Constituents:** 5% volatile oils resin & diaryl heptanoid yellow colouring substance called as Curcuminoids. Curcuminoids contain Curcumin, desmethoxy curcumin and bisdesmethoxy curcumin.

**Use:** As a colorant in various pharmaceutical dosage forms, cosmetics and food products. It is one of the constituent of curry powder.

# Natural sweeteners

These are the substances which are added to drug formulation to mask bitter taste & can be used by diabetic patients also.

Natural sweetening agents are preferred over synthetic sweetening agents since they do not have any adverse effect on health.

Two types of sweeteners are available: 1. Natural sweeteners of plant origin

2. Artificial or synthetic sweeteners.

## Natural sweeteners of plant origin:

Natural sweeteners are sacharide & non-saccharide type.

 Non-saccharide sweeteners are of various types such as

1. Terpenoids
2. Steroidal saponins
3. Dihydroisocoumarins
4. Dihydrochalcones
5. Proteins, polyols,

## Stevia

**Synonym:** honey leaf, sugar leaf

**Source:** The dried leaves of the plant “*Stevia rebaudiana*” Family: *Compositae.*

C.C: Two compounds isolated and purified from aqueous extract are stevioside and rebaudioside A. Stevioside is 160-170 times sweeter than sucrose.

Use: Natural calorie free sweetener in liquid or solid foods, beverages. Stevioside, the more important product, is used as table top sweetener, in confectionaries, soft drinks and fruit products.

## Neohesperidin dihydrochalcone

Source: It is obtained from bitter orange *Citrus aurantium variety amara*

 Family: *Rutaceae* .

It is obtained by hydration of neohesperidin under alkaline conditions. It is also processed from naringin present in the peels of other Citrus species. It is about 330 times sweeter than sucrose.

**Uses:** It is used in confectionery products, chewing gum, in beverages and dairy products. In addition to sweetness, it has flavour enhancing properties in a variety of foods and other products.

# Natural Binding agents

Binders are agents are used to impart cohesiveness to the granules. This ensures the tablet remains intact after compression.

* E.g. starch, gelatin, acacia, tragacanth

## Acacia

**Source:** It is a dried gummy exudation from the stems and branches of *Acacia arabica*, *A. senegal* etc, Family: *Leguminosae*

**Constituents:** It consist ofarabinose, galactose, Rhamnose, glucouronic acid

**Chemical test:** Powder + Lead sub acetate gelatinises the aqueous solution Powder + ruthenium red no pink colour

Powder in Water + H2O2 + benzidine in alcohol blue colour (oxidase enzyme)

**Uses:** Used astablet binder (1-5%), suspending agent (5- 10%), emulsifying agent (10-20%), mucilage, thickener.

## TRAGACANTH

**Synonym**: Gum tragacanth.

**B.S**: It is a dried gum obtained from plant *Astragalus gummifer*, Fam- **Leguminosae.**

**C.C**: It consists of water soluble tragacantin and water insoluble polysaccharides Bassorin.

**Chemical test**: when strong iodine solution is added to tragacanth, it develops olive green colour.

**Use**: used to make various pharmaceutical formulations like creams, gels, & emulsions.

## STARCH

Synonym: Amylum

B.S: It is polysaccharide obtained from grains like wheat (*Triticum aestivum*) & rice (*Oryza sativa*), corn (*Zea mays*) Fam- Graminae, potato (*Solanum tuberosum*) Fam- *Solanaceae.*

C.C: Amylose & amylopectin

Use: it is a binder of choice in wet granulation & tablet formulation

# Natural diluents:

Diluents are added to tablet formulations to provide better tablet properties such as

1. To provide improved cohesion
2. To allow direct compression manufacturing

 iii) To enhance flow

## Lactose

**Synonym**: milk sugar, Lactin, lactosum

**Source:** A natural disaccharide consisting of galactose and glucose and obtained from milk of most of mammals.

**Description**: white crystalline powder with odourless and faintly sweet taste. It is stable in air but readily absorbs odours. Several varieties of lactose are available: anhydrous alpha, alpha monohydrate and anhydrous beta.

Use: As diluent in tablets, capsules, dry powder inhalations. Used as a coating agent with sucrose. It is used to prepare lyophilized products.

## Mannitol

**Synonym:** D-mannite, Mannogem

**Source:** saccharine exudation from the stem of *Fraxinus ornus*, family: Oleaceae It can be also be obtained chemically by reduction of mannose.

**Description:** white, crystalline, odourless, non hygroscopic and sweet powder. The crystals are orthorhombic prisms.

**Uses:** Diluent for tablet formulations, helps in direct compression, acts as sweetening agent, and acts as thickening agent, plasticizer in soft gelatin capsules.

Therapeutically acts as osmotic diuretic, as diagnostic agent for kidney function, in treatment of acute renal failure, cerebral edema & to reduce intraocular pressure.

# Viscosity builders

These are the aqueous solutions to increase its viscosity without altering properties. The inhibit crystal growth, improve physical stability. It is desirable to increase the viscosity of dosage form to provide or to improve palatability or pourability

## Types:

1. Natural gums E.g. acacia, tragacanth, xanthan gum, etc.
2. Cellulose derivatives E.g. Methyl cellulose, ethyl cellulose, CMC
3. Chitosan
4. Synthetic polymers E.g. carbomer, PVA
5. Clays E.g. Magnesium aluminium silicates, bentonite, etc**.**

**Carrageenan**

**Syn:** chondrus extract, Iris moss extract

**Source:** Sulphated polysaccharide extract of the sea weed called Carrageenan; or irish mosss, the red- algae obtained from *Chondrus crispus* belonging to family, *Rhodophyllaceae*

**Constituents:** It mainly consist of K, Na, ca, Mg, & ammonium sulfate esters of galactose & 3,6- anhydrogalactose copolymers.

Uses: used as a viscosity builder. In preparation of suspensions, emulsions, gels, creams, lotions, eye drops, suppositories, tablets, capsules, etc.

## Xanthan Gum

**Source:** It is a polysaccharide produced by certain species of bacteria. It is produced by pure fermentation of glucose using the bacterium named as Xanthomonas compestris.

**Chemical nature**: D-glucose, D-mannose and D- glucuronic acid with short side chains.

**Uses:** very good emulsifying agent, stabilizer, thickener, viscosity enhancer, food and cosmetic industry.

**References:**

1. Chavhan SA. Herbal excipients in novel drug delivery systems. IJP. 2017; 4(7):208-216.
2. Singh P, Mahmood T, Shameem A, Bagga P, Ahmad N. Review on Herbal Excipients and their Pharmaceutical Applications. IJPLS. 2016; 5(3):53-57.
3. Khanal DP. Helping Ingredients (Excipient) in Pharmaceutical Formulation: Coloring Agents–Use and Health Concern. JMMIHS. 2014; 1(1):40-48.

4. Poona V, Sagar G, Abhishek K, Yuvraj S, Pradesh M. Review Article Remarkable Contribution of Natural Excipients in Finished Pharmaceutical Products (FPPs). 2018; 52(02):7-14.

5. Choudhary PD, Pawar HA. Recently Investigated Natural Gums and Mucilages as Pharmaceutical Excipients: An Overview, J of pharma. 2014; 2014(2):1-9.

6. Khawnekar S, Bhatia V, Shashtri K, Yadav M, Pandey S. Herbal Excipients: Pharmaceutical Applications. IJPPR. 2014; 6(3):617-621.