

HERBAL DRUG TECHNOLOGY

UNIT 3 NOTES

HERBAL COSMETICS

- SOURCES & DESCRIPTION OF RAW MATERIAL

HERBAL EXCIPIENTS

- HERBAL EXCIPIENTS SUCH AS:
 - COLOURANTS
 - SWEETERS, BINDERS, DILUENTS

HERBAL FORMULATIONS

- CONVENTIONAL
- NOVEL DF



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HERBAL COSMETICS

- Herbal cosmetics are cosmetic preparations that contain natural ingredients obtained from plants (herbs) and are used to enhance beauty, cleanse, protect or maintain the health of skin, hair & body with minimal or no synthetic chemicals.
- These are cosmetic products made using plant-based ingredients such as herbs, extracts, oils or powders to improve appearance & care of the body safely.

ADVANTAGES

- Made from natural plant-based ingredients
- Safer with fewer side effects compared to synthetic cosmetics
- Suitable for all skin types, including sensitive skin
- Provide nourishing & long-term benefits
- Usually non-toxic & non-irritant
- Eco-friendly & biodegradable
- Contain medicinal properties along with cosmetic action
- Lower risk of allergic reactions
- Generally well accepted for long-term use

TYPES OF HERBAL COSMETICS

Herbal Cosmetics are classified based on their area of application & intended use as follows:

- ① Skin Care Products
- ② Hair Care Products
- ③ Oral Care Products

① SKIN CARE PRODUCTS

- Herbal skin care products are used to cleanse, protect, nourish, & improve the health & appearance of the skin.
- These products contain herbs that possess antimicrobial, anti-inflammatory, antioxidant & moisturizing properties, making them safer for long-term use.
- Examples :
 - Herbal creams & lotions (aloe vera, turmeric)
 - Herbal soaps
 - Herbal face wash & cleansers
 - Herbal sunscreens
 - Herbal face packs & masks

② HAIR CARE PRODUCTS

- Herbal hair care products / cosmetics are designed to maintain hair health, strengthen hair roots, promote growth & prevent hair problems such as dandruff & hair fall.
- They contain herbs that improves scalp circulation & hair texture.

Example:

- Herbal shampoos (Shikakai, reetha)
- Herbal hair oils (Amla, Bhringraj, coconut oil)
- Herbal conditioners
- Herbal hair dyes (Henna, Indigo)

③ ORAL CARE PRODUCTS

- Herbal oral care products are used to maintain oral hygiene & prevent dental disorders.
- These products contains herbs with antibacterial & anti-inflammatory properties, which help in reducing plaque, gum infections, & bad breathe.

Example:

- Herbal Toothpaste (neem, clove)
- Herbal Tooth Powder
- Herbal Mouthwash
- Herbal Dental creams

SOURCES AND DESCRIPTION OF RAW MATERIALS OF HERBAL ORIGIN

- Herbal Cosmetics are cosmetics preparations made from natural raw materials obtained from plant sources.
- These raw materials are used for cleansing, protection, nourishment & beautification of skin, hair & oral cavity. Due to their natural origin, they are safe & have fewer side effects.
- The important herbal raw materials include fixed oils, waxes, gums & mucilages, herbal colours, perfumes & flavouring plants, protective agents, bleaching agents & antioxidants.

① FIXED OILS

SOURCE: Fixed oils are obtained from the seeds, fruits or kernels of plants by cold pressing or expression. They are non-volatile oils.

DESCRIPTION: - Fixed oils mainly acts as emollients & nourishing agents.

- They soften the skin, prevent moisture loss & improve texture of cosmetics products.
- They also nourish hair & protect oral tissues.

IMPORTANT FIXED OILS WITH EXAMPLE

① Almond Oil

- Source: Seeds of *Prunus amygdalus*.
- Description: Rich in Vit-E & fatty acids. It nourishes & softens skin, strengthen hair & improves complexion.
 - Skin care: Moisturizers, Cold creams
 - Hair Care: Hair Oils
 - Oral Care: Massage of gums (traditional use).

⑥ Coconut Oil

- Source : kernel of *cocos nucifera*
- Description : Excellent moisturizer with antimicrobial activity. Penetrates deeply & prevents dryness.
 - Skin care : Creams, Lotions
 - Hair care : Scalp nourishment
 - Oral hygiene : Oil pulling

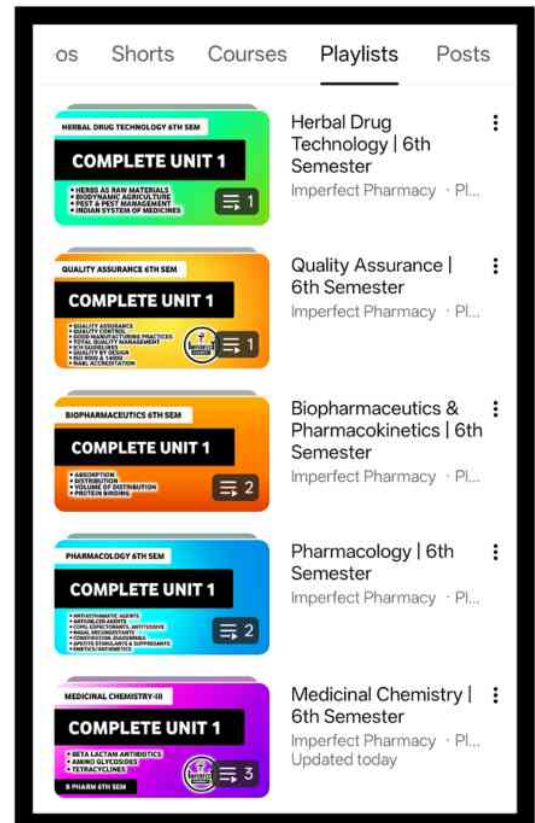
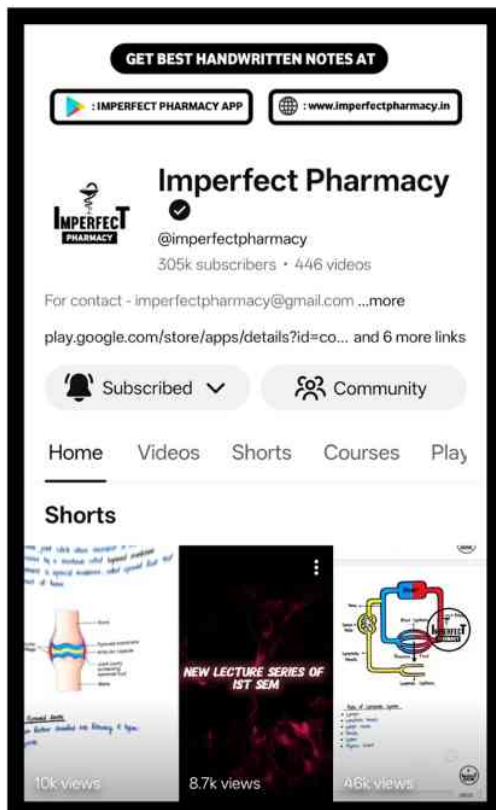
⑦ CASTOR OIL

- Source : Seeds of *Ricinus communis*
- Description : Thick & viscous oil acting as protective & moisturizing agent.
 - Skin care : Ointments, Protective creams
 - Hair care : Promotes hair growth

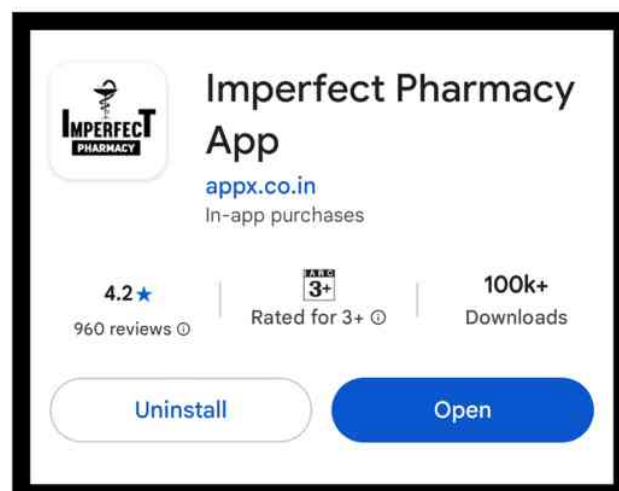
⑧ OLIVE OIL

- Source : Fruit of *Olea europaea*
- Description : Natural emollient & antioxidant. Improves skin elasticity & nourishes hair.
 - Skin care : Moisturizing creams
 - Hair care : Conditioning products

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② WAXES

- Source: Waxes are obtained from plant, animal or mineral sources.
- Description: - Waxes provides consistency, hardness & stability to cosmetic products.
 - They form a protective layer on skin & hair.

IMPORTANT WAXES

① Beeswax

- Source: Honeycomb of Honey bee.
- Description: Acts as thickening & emulsifying agent.
 - Skin care: Creams, Lip balms
 - Hair care: Hair waxes

② Paraffin Wax

- Source: Petroleum (Mineral origin)
- Description: Provides smooth texture & protective coating.
 - Skin Care: Paraffin therapy
 - Hair care: Styling waxes

③ Carnauba Wax

- Source: Leaves of *Copernicia prunifera*
- Description: Hard wax giving gloss & protection.
 - Skin care: Protective creams
 - Hair care: Hair styling products

③ GUMS AND MUCILAGES

- Source: Obtained from plant exudates, seeds or leaves.
- Description: They act as thickening, binding, suspending & stabilizing agents in cosmetic formulations.

IMPORTANT GUMS

① Gum Acacia

- Source: Acacia senegal
- Description: Good emulsifier & binder.
 - Skin care: Creams, Lotions
 - Oral hygiene: Toothpaste

② Tragacanth

- Source: Astragalus species
- Description: Forms smooth & stable gels.
 - Skin care: Gels
 - Oral care: Dental preparations

③ Aloe Vera (Mucilage)

- Source: Leaves of Aloe barbadensis
- Description: Soothing, healing & moisturizing agent.
 - Skin Care: Gels, creams
 - Hair Care: Conditioners
 - Oral Care: Mouth gels

④ HERBAL COLOURS

- Source: Obtained from roots, leaves, flowers or fruits of plants.
- Description: Provide natural colour & additional therapeutic benefits.

Example:

① Turmeric

- Source: Rhizome of *Curcuma longa*
- Description: Natural colour with antiseptic property.
 - Skin care: Face packs
 - Oral care: Tooth powders

② Henna

- Source: Leaves of *Lawsonia inermis*
- Description: Natural colouring agent.
 - Skin care: Decorative cosmetics
 - Hair care: Hair Dye

⑤ HERBAL PERFUMES AND FLAVOURING AGENTS

- Source: Obtained from aromatic plants, flowers & spices.
- Description: Used to provide pleasant fragrance & taste.

EXAMPLES:

- Rose oil: Source - *Rosa*; Skin creams.
- Peppermint Oil: Source - *Mentha piperita*; Oral care.
- Clove Oil: Source - *Syzygium aromaticum*; Oral hygiene.

⑥ PROTECTIVE AGENTS

- Source: Obtained from medicinal plants.
- Description: Protect skin, hair & oral cavity from infection, inflammation & irritation.

EXAMPLE:

① Neem

- Source: *Azadirachta indica*
- Description: Strong antibacterial & antifungal agent.
 - Skin care: Anti-acne
 - Oral care: Toothpaste

② Tulsi

- Source: *Ocimum sanctum*
- Description: Antimicrobial & antioxidant.
 - Skin care: Face wash
 - Oral care: Mouthwash

⑦ BLEACHING AGENTS

- Source: Obtained from plant extracts.
- Description: Used for skin lightening & removal of pigmentation.

Examples:

- Lemon - *Citrus limon*
- Licorice - *Glycyrrhiza glabra*

⑧ ANTIOXIDANTS

- Source: Obtained from fruits & herbs rich in vitamins.
- Description: Protect from free radical damage & delay ageing.

Example:

- Vitamin E: Plant Oils
- Amla: Emblica officinalis
- Green Tea: Camellia sinensis

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HERBAL EXCIPIENTS

- Excipients are inactive substances that are mixed with active drugs to prepare pharmaceutical dosage forms.
- They don't show therapeutic action but play an important role in manufacture, stability, bioavailability, patient acceptability & appearance of formulations.
- Herbal excipients are excipients of natural origin, mainly obtained from plants, and are preferred due to their safety, biocompatibility & eco-friendly nature.

SIGNIFICANCE OF HERBAL EXCIPIENTS

Herbal excipients are widely used because:

- They are non-toxic & biodegradable
- Improve patient compliance.
- Reduce side effects.
- Easily available & cost-effective
- Suitable for herbal, ayurvedic & modern formulations

CLASSIFICATION OF HERBAL EXCIPIENTS

According to the syllabus, herbal excipients are classified as:

- ① Colorants
- ② Sweeteners
- ③ Binders
- ④ Diluents
- ⑤ Viscosity builders
- ⑥ Disintegrants
- ⑦ Flavours & Perfumes

HERBAL COLORANTS (COLOURING AGENTS)

Herbal colorants are natural dyes obtained from plants, animals or minerals & used to improve the appearance & identification of pharmaceutical and cosmetic products.

SOURCES

- Roots, bark, leaves, flowers, fruits
- Fungi, & lichens

TYPES OF NATURAL PIGMENTS

- Anthocyanins
- Carotenoids
- Betalains
- Crocin
- Anthraquinones

IDEAL PROPERTIES

- Non-toxic & non-carcinogenic
- Free from harmful impurities
- Stable to light & temperature
- Compatible with drugs

EXAMPLES

PLANT	BIOLOGICAL SOURCE	PIGMENT
• Turmeric	Rhizomes of <i>Curcuma longa</i>	Curcumin
• Saffron	Stigma of <i>crocus sativus</i>	Crocin
• Beetroot	Roots of <i>Beta vulgaris</i>	Betacyanin
• Henna	Leaves of <i>Lawsonia inermis</i>	Lawson

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HERBAL SWEETENERS

Sweeteners are herbal excipients used to improve palatability, mask bitterness & enhance patient acceptance.

ADVANTAGES

- Don't cause dental cavities
- Low or zero caloric value
- Suitable for diabetic patients
- Improve shelf life

IDEAL PROPERTIES

- Effective in small concentration
- Stable over wide temperature range
- Non toxic & non-carcinogenic
- Compatible with formulation ingredients

EXAMPLES

PLANT	BIOLOGICAL SOURCE	SWEET PRINCIPLE
• Stevia	Leaves of stevia rebaudiana	Steviol glycosides
• Liquorice	Roots of Glycyrrhiza glabra	Glycyrrhizin
• Honey	Secretion of Apis species	Glucose & Fructose
• Bitter Orange	Fruits of Citrus auranti	Neohesperidin

HERBAL BINDERS

Binders are excipients used to hold powder particles together & provide mechanical strength to tablets & granules.

FUNCTIONS

- Increase cohesion
- Prevent tablet breakage
- Improve stability

TYPES

- Natural polymers: Starch, acacia, tragacanth
- Sugars: Glucose, Sorbitol

EXAMPLES

BINDER	BIOLOGICAL SOURCE	CHEMICAL CONSTITUENT
• Starch	Maize, rice, wheat	Amylase & Amylopectin
• Acacia	Gum of acacia arabica	Arabin
• Tragacanth	Roots of Astragalus	Tragacanthin

HERBAL DILUENTS

Diluents are excipients used to increase the bulk of solid dosage forms & make them suitable for administration.

FUNCTIONS

- Improve tablet size
- Enhance flow property
- Adjust tablet weight

EXAMPLES

DILUENT	SOURCE	NATURE
• Lactose	Milk sugar	Disaccharide
• Mannitol	Plant exudates	Sugar alcohol
• Starch	Cereals	Polysaccharide

HERBAL VISCOSITY BUILDERS (THICKENERS)

Viscosity enhancers increase the thickness of liquid formulations without altering their therapeutic action.

FUNCTION

- Improve pourability
- Act as stabilizers in emulsions
- Improve palatability

EXAMPLES

- Pectin
- Tragacanth
- Guar gum
- Cellulose derivatives

HERBAL DISINTEGRANTS

Disintegrants help tablets to break into smaller particles after administration, improving drug dissolution.

EXAMPLES

- Starch
- Isabgol husk
- Natural Cellulose

HERBAL FLAVOURS & PERFUMES

Flavours & Perfumes are added to improve taste & odor of pharmaceutical & cosmetic products.

EXAMPLES

Flavours : Cardamom, vanilla, lemon oil, orange oil

Perfumes : Rose oil, Lavender oil, Sandalwood oil

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HERBAL FORMULATIONS

- Herbal formulations are dosage forms prepared from one or more herbs or processed herbal materials in specific quantities.
- They are used to diagnose, treat, alleviate or prevent disease & may also provide nutritional & cosmetic benefits.

TYPES OF HERBAL FORMULATIONS

Herbal formulations are mainly classified as:

- ① Herbal syrups
- ② Herbal mixtures
- ③ Tablets
- ④ Novel dosage forms
- ⑤ Herbal creams

① **HERBAL SYRUPS**

- Herbal syrups are aqueous preparations with sweet taste & viscous consistency.
- They are prepared using herbal infusions, decoctions, juices or tinctures, along with sugar, honey or sweetening agent.

COMPOSITION

- Herbal extract (infusion / decoction / tincture)
- Sugar / Honey / Unrefined sugar
- Glycerin or Sorbitol
- Antimicrobial agents (if required)

PREPARATION

- Herbal infusion (15 min) or decoction (30 min) is prepared.
- Liquid is strained & pressed to remove maximum extract.
- Equal proportion of herbal extract & honey / sugar is mixed.
- Gently heated until syrupy consistency is obtained.
- Tincture may be added to increase effectiveness.

ADVANTAGES

- Masks bad taste of drugs
- Suitable for pediatric patients
- Soothing effect on irritated tissues

PREVENTION & STORAGE

- Stored in dark glass bottles
- Temperature below 30°C
- Preservatives like glycerin, methyl paraben, sodium benzoate may be used.

EXAMPLES

- Raspberry syrup
- Cherry syrup
- Compound sarsaparilla syrup

② **HERBAL MIXTURES**

Herbal mixtures are combinations of two or more powdered herbal drugs, mixed in specific or random proportions to obtain desired pharmacological activity.

CHARACTERISTICS

- May be subjected to extraction after mixing
- Require standardization for quality control
- Improve therapeutic activity
- Reduce side effects
- Increase patient compliance

USES

Used in chronic diseases like diabetes, liver disorders, digestive problems.

Example : Herbal mixture for diabetes management.

③ **HERBAL TABLETS**

Herbal tablets are solid dosage forms prepared by compression or moulding of powdered herbs or herbal extracts, along with suitable excipients.

METHOD OF PREPARATION

- Weighing of herbal drugs & excipients
- Mixing in ascending order of weight
- Conversion into granules
 - Wet granulation
 - Dry granulation
- Compression using tablet punching machine
- Coating (if required)
- Evaluation

TABLET COATING

Tablet coating is done to:

- Mask unpleasant taste & odour
- Improve appearance
- Protect drug from moisture & air
- Control site of action & drug release

EXAMPLES OF HERBAL TABLETS

- Triphala tablet
- Ashwagandha tablet
- Guduchi tablet
- Neem tablet
- Turmeric (Curcumin) tablet
- Brahmi tablet

ADVANTAGES OF HERBAL TABLETS

- Easy to administer & convenient to use.
- Accurate & uniform dose in each tablet.
- Good stability & longer shelf use.
- Mask unpleasant taste & odour of herbal drugs
- Easy to store, transport & handle.

④ **HERBAL CREAMS**

Herbal creams are semi solid dosage forms containing herbal drugs or herbal extracts incorporated into a hydrophilic cream base.

PREPARATION

- Herbal extract or powdered drug is mixed with cream base
- Mixed uniformly to obtain smooth & homogeneous based cream

CHARACTERISTICS

- Less greasy compared to ointments
- Easily spreadable
- Better cosmetic appearance
- Shorter shelf life than ointments

USES

- Skin care & cosmetic purpose.
- Treatment of minor skin disorders
- Moisturizing & soothing actions

EXAMPLES

- Aloe vera cream
- Herbal fairness cream
- Baby herbal cream

NOVEL DRUG DELIVERY SYSTEM

- A Novel Drug Delivery System (NDDS) refers to advance & improved methods of delivering drugs in the body to achieve better therapeutic effect with fewer side effects.
- Unlike conventional dosage forms, NDDS delivers the drug at right site, in the right amount & for the right duration.

EXAMPLE OF NDDS

- Liposomes
- Phytosomes
- Nanoparticles
- Niosomes

PHYTOSOMES

- Phytosomes are advanced forms of herbal drug delivery systems.
- They are complexes of natural active phytoconstituents & Phospholipids.
- Enhances bioavailability, solubility & absorption of herbal molecules.
- Useful for plant - derived polyphenols, flavonoids & terpenoids.

NEED OF PHYTOSOMES

- Many phytoconstituents have poor lipid solubility & limited absorption.
- Traditional extracts show low bioavailability.
- Phytosomes improve membrane permeability & stability.
- Provide better pharmacokinetic & pharmacotherapeutic profiles.

COMPONENTS OF PHYTOSOMES

- Phytoconstituent (active plant extract or flavonoids)
- Phospholipid (Phosphatidylcholine, phosphatidylserine)
- Solvent (dioxane, acetone, ethanol)
- Optional excipients (Stabilizers, Antioxidants)

METHOD OF PREPARATION

- ① Solvent Evaporation Method
- ② Anti-solvent Precipitation Method
- ③ Rotary Evaporation Technique

① SOLVENT EVAPORATION METHOD

- Step 1: Dissolve phytoconstituent & phospholipid in an organic solvent.
- Step 2: Stir & reflux at a controlled temperature (50°-60°C).
- Step 3: Evaporate solvent under reduced pressure.
- Step 4: Dry the film & collect the phytosome complex.

② ANTI-SOLVENT PRECIPITATION METHOD

- Step 1: Dissolve phospholipid in an organic solvent.
- Step 2: Add phytoconstituent solution gradually.
- Step 3: Add anti-solvent (n-hexane or ether) slowly to precipitate complex.
- Step 4: Filter & dry the obtained precipitate.

③ ROTARY EVAPORATION TECHNIQUE

- Step 1: Mix phytoconstituent & phospholipid in suitable solvent.
- Step 2: Place in rotary evaporator at 50°-60°C.
- Step 3: Remove solvent under vacuum.
- Step 4: Collect dry phytosome complex & store in desiccator.

EVALUATION PARAMETERS

- Physical appearance & Colour
- Particle size & Zeta potential
- Drug content determination
- Fourier transform infrared spectroscopy (FTIR)
- Differential scanning calorimetry (DSC)
- In-vitro drug release studies
- Stability testing

ADVANTAGES

- Improved solubility & absorption
- Enhanced stability
- Controlled drug release
- Compatible with various routes of administration

LIMITATIONS

- Costly preparation.
- Sensitive to heat & light.
- Limited scalability

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