B.PHARM · SEMESTER IV · BP401T · UNIT II

BP401T Herbal Drug Technology

Unit II — Herbal Formulations, Excipients & Cosmetics

From-zero teaching notes · Clear definitions · Tables · Analogies · Exam preparation

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CHAPTER 4 — Herbal Formulations: Conventional and Novel Dosage Forms

4.1 Learning Objectives

1. List conventional herbal formulations and describe each briefly.
2. Explain novel dosage forms: phytosomes, liposomes, nanoformulations.
3. Describe composition, preparation, and characterization using standardized extracts and bioactives.

4.2 Definitions

- **Herbal formulation:** A finished medicine (syrup, tablet, cream) made from plant extracts or powders, with proper dose and quality.
- **Phytosome (phytocomplex):** A plant active chemically bound to phospholipid (a fat-like molecule) — this "fat coat" helps the active pass through body membranes and get absorbed better.
- **Liposome:** A tiny bubble made of phospholipid layers with water inside — herbal actives can be loaded inside the bubble for better delivery.
- **Nanoformulation:** Medicine made into extremely tiny particles (nanometer size) to improve absorption and targeting.

4.3 Key Terminology

Term	Simple meaning
Bioavailability	How much of the dose actually reaches the blood and works
Standardized extract (in formulation)	The tested, fixed-strength plant ingredient used in the product
Characterization	Testing the finished product's quality (size, content, stability)
Entrapment efficiency	In liposomes/nano: how much drug got loaded inside vs wasted outside

4.4 Explanation

> **Technical concept:** Herbal formulations are prepared from standardized extracts/bioactives in conventional dosage forms (syrups, mixtures, powders, capsules, tablets, creams, ointments) and novel carriers (phytosomes, liposomes, nanoformulations) to improve stability, patient acceptance, and bioavailability; they are characterized for identity, content, and performance.

> **Simple explanation:** Raw herbal powder is bitter, bulky, and poorly absorbed. Formulations solve this: a tasty syrup for children, a tablet with exact dose, a cream for skin. Novel forms go further — many plant actives (like curcumin) dissolve poorly in water and are destroyed in the gut; wrapping them in phospholipid (phytosome/liposome) or making them nano-sized helps the body actually absorb them.

Conventional formulations (table):

Form	What it is	Herbal example
Syrups	Sweet liquid with extract dissolved	Tulsi/adulsa cough syrup
Mixtures	Liquid to be shaken before use	Herbal liver tonics
Powders (churna)	Fine dry powder, taken with water/milk/honey	Triphala churna, Ashwagandha churna
Capsules	Powder filled in gelatin shells, tasteless	Garlic/green-tea capsules
Tablets	Compressed powder with exact dose	Herbal digestive tablets
Creams	Water-based semisolid for skin	Aloe vera cream
Ointments	Oil-based semisolid for skin	Herbal pain-relief balm

Novel dosage forms (table):

Form	Structure (simple)	Why better
Phytosome	Plant active + phospholipid chemically complexed	Better absorption through gut wall; e.g., milk-thistle (silymarin) phytosome
Liposome	Phospholipid bubble carrying active inside	Protects active, can target tissues
Nanoformulations	Particles <1000 nm (nanoemulsion, nanoparticles)	Huge surface area → faster/better absorption

Composition, preparation, characterization (flowchart): Standardized extract selected → excipients chosen → mixed/granulated (tablets, capsules) or dissolved (syrups) or complexed (phytosomes) → finished product → **characterization:** identity (TLC), marker content (assay), uniformity of dose, disintegration/dissolution (tablets), particle size (nano/liposome), stability.

4.5 Infographic concept box — Chapter 4

Left column: 7 conventional forms as icons (bottle, powder heap, capsule, tablet, cream jar). Right column: 3 novel forms — phytosome (molecule hugging a phospholipid), liposome (bubble), nano (tiny dots). Bottom arrow: "Standardized extract in → tested quality out."

4.6 Pharmacy relevance

- Most AYUSH industry jobs involve formulating and QC-testing exactly these dosage forms.
- Pharmacists must know that "novel" herbal products claim better absorption — check for characterization data, not just marketing.

4.7 India context

India's Ayurvedic companies (Dabur, Himalaya, Baidyanath, Charak) sell all these forms; phytosome technology is used in Indian products for curcumin and boswellia with improved bioavailability claims.

4.8 Key points

1. Conventional: syrups, mixtures, powders, capsules, tablets, creams, ointments.
2. Novel: phytosomes (active–phospholipid complex), liposomes (bubbles), nanoformulations (tiny particles) — all aim at better absorption.
3. Use standardized extracts as the starting material; characterize the finished product.

4.9 Common confusions

- **Phytosome vs liposome:** Phytosome = active chemically BONDED to phospholipid; liposome = active TRAPPED INSIDE a phospholipid bubble.
- **Mixture vs syrup:** Syrup is clear and sweet; mixture may need shaking (suspended particles).

4.10 Common mistakes

- Thinking novel forms change the plant's chemistry — they change DELIVERY, not the active itself.
- Assuming "nano" automatically means safe — safety still needs testing.

4.11 Mnemonics

- Conventional forms: "**S**weet **M**other **P**acks **C**lean **T**asty **C**reams **O**ften" — Syrups, Mixtures, Powders, Capsules, Tablets, Creams, Ointments.
- Novel trio: "**P**hospholipid **L**oves **N**ano" — Phytosome, Liposome, Nanoformulation.

4.12 Exam summary

Herbal formulations use standardized extracts in conventional forms (syrups, mixtures, powders, capsules, tablets, creams, ointments) and novel forms (phytosomes = active–phospholipid complex, liposomes = phospholipid bubbles, nanoformulations = sub-micron particles) that improve absorption of poorly soluble plant actives. Preparation follows composition design → manufacture → characterization (identity, marker assay, uniformity, particle size, stability).

4.13 One-minute revision

Standardized extract → 7 conventional forms for dose & taste → phytosome/liposome/nano for better absorption → test everything.

4.14 Exam questions

Short answers:

1. Define phytosome and liposome.
2. List the conventional herbal formulations.
3. Why are novel dosage forms needed for herbal actives?

Long answers:

1. Describe conventional herbal formulations with examples.
2. Explain phytosomes, liposomes, and nanoformulations with their advantages.
3. Describe the composition, preparation, and characterization of herbal formulations using standardized extracts.

MCQs:

1. A phytosome is: (a) active trapped in a bubble (b) active complexed with phospholipid (c) only nanoparticles (d) a tablet coating — **Answer: (b)**
2. Which is NOT a conventional herbal formulation? (a) churna (b) syrup (c) liposome (d) ointment — **Answer: (c)**
3. Nanoformulations improve absorption mainly by: (a) changing the drug's chemistry (b) increasing surface area (c) adding colour (d) removing actives — **Answer: (b)**

Viva:

1. How does a phytosome differ from a simple mixture of extract and lecithin?
2. Name one characterization test each for tablets and liposomes.

> **Application-based:**

1. Curcumin has poor oral absorption. Propose a formulation strategy and justify your choice.

4.15 References

1. Waldesch, F. G. Herbal Medicinal Products. CRC Press.
2. Indian Herbal Pharmacopoeia. Indian Drug Manufacturers' Association.

CHAPTER 5 — Herbal Cosmetics

5.1 Learning Objectives

1. Describe sources of herbal raw materials used in skincare, hair care, and oral hygiene.
2. List applications: sunscreen lotion/gel, hair oil, shampoo, herbal dye, herbal mouthwash, chewing gums, candies, gargles, face serums, herbal face packs.

5.2 Definitions

- **Herbal cosmetic:** A beauty/hygiene product whose active ingredients come from plants (not synthetic chemicals).
- **Active agent:** The plant ingredient that does the main work (e.g., aloe for soothing, amla for hair).

5.3 Key Terminology

Term	Simple meaning
SPF (Sun Protection Factor)	Number showing how well a sunscreen blocks UV rays
Surfactant	Cleaning agent that makes shampoo foam and remove oil/dirt
Astringent	Substance that tightens skin and reduces oiliness

5.4 Explanation

> **Technical concept:** Herbal cosmetics use plant-derived actives (oils, extracts, powders) in skincare, hair-care, and oral-hygiene products, formulated as lotions, gels, oils, shampoos, dyes, mouthwashes, gums, candies, gargles, serums, and face packs.

> **Simple explanation:** Instead of synthetic chemicals, these products use plant power — aloe to cool skin, amla/shikakai to clean hair, clove/neem to freshen the mouth. The plant part is chosen for a job it naturally does well.

Raw materials by category (table):

Category	Herbal raw materials (sources)	What they do
Skincare	Aloe vera (gel), turmeric, sandalwood, cucumber, rose	Soothing, anti-inflammatory, cooling, fragrance
Hair care	Amla, shikakai, reetha (soapnut), bhringraj, hibiscus, coconut oil	Cleaning (natural saponins), conditioning, hair darkening
Oral hygiene	Neem, clove, miswak (*Salvadora*), peppermint, babool	Antimicrobial, fresh breath, gum care

Applications (table — every syllabus item):

Product	Herbal actives / base	Purpose
Sunscreen lotion/gel	Aloe, cucumber, green tea, zinc-free herbal UV filters	Protect skin from sunburn
Hair oil	Coconut/sesame oil infused with amla, bhringraj, brahmi	Nourish scalp, reduce hair fall
Shampoo	Reetha, shikakai (natural surfactants) + amla	Clean hair gently
Herbal dye	Henna (lawsone), indigo, amla	Colour hair naturally
Herbal mouthwash	Neem, clove, peppermint	Kill germs, fresh breath
Chewing gums	Miswak extract, mint	Clean teeth, fresh breath on the go
Candies	Amla, ginger, liquorice	Soothing throat, tasty delivery
Gargles	Turmeric, salt + neem/tulsi decoction	Sore-throat relief
Face serums	Rosehip/jojoba-type oils, aloe, vitamin-rich extracts	Concentrated skin nourishment
Herbal face packs	Multani mitti (fuller's earth) + sandalwood, turmeric, rose water	Deep cleansing, glow

> **Analogy:** Formulating a herbal cosmetic is like cooking — the base (oil/cream/gel) is the rice, and the herbal actives are the spices chosen for flavour (function).

5.5 Infographic concept box — Chapter 5

Three panels — Skin (sunscreen, serum, face pack), Hair (oil, shampoo, dye), Mouth (mouthwash, gum, candy, gargle). Each product icon linked to its star plant (aloe, amla, neem…). Tagline: "Plants for head-to-toe care."

5.6 Pharmacy relevance

- Herbal cosmetics is a huge industry segment; pharmacists work in their formulation, QC, and regulatory compliance (cosmetics also fall under the Drugs and Cosmetics Act).
- Counsel customers that "herbal" does not mean "zero allergy" — patch tests still matter.

5.7 India context

Shikakai–amla–reetha hair wash, henna dyeing, neem datun (chewing stick), and multani mitti face packs are centuries-old Indian practices now sold as modern branded products worldwide.

5.8 Key points

1. Skincare: aloe, turmeric, sandalwood, cucumber, rose.
2. Hair care: amla, shikakai, reetha, bhringraj, hibiscus.
3. Oral hygiene: neem, clove, miswak, peppermint.
4. Know all 10 application products and their actives.

5.9 Common confusions

- **Herbal dye vs synthetic dye:** Herbal (henna) coats/conditions; synthetic dyes penetrate with chemicals — different chemistry, different risks.
- **Cosmetic vs drug:** Cosmetics beautify/cleanse; if a product claims to *treat disease*, it becomes a drug legally.

5.10 Common mistakes

- Assuming herbal cosmetics need no preservation — natural products can grow microbes; preservation and stability testing are still required.
- Forgetting oral hygiene items (gums, candies, gargles) in the answer — the syllabus lists them explicitly.

5.11 Mnemonics

- Skin: "**A**ll **T**eachers **S**mile **C**almly **R**egularly" — Aloe, Turmeric, Sandalwood, Cucumber, Rose.
- Hair: "**A** **S**hy **R**abbit **B**rings **H**appiness" — Amla, Shikakai, Reetha, Bhringraj, Hibiscus.

5.12 Exam summary

Herbal cosmetics use plant actives for skincare (aloe, turmeric, sandalwood, cucumber, rose), hair care (amla, shikakai, reetha, bhringraj, hibiscus), and oral hygiene (neem, clove, miswak, peppermint). Applications include sunscreen lotion/gel, hair oil, shampoo, herbal dye, herbal mouthwash, chewing gums, candies, gargles, face serums, and herbal face packs.

5.13 One-minute revision

Skin–aloe/turmeric; Hair–amla/shikakai/reetha; Mouth–neem/clove/miswak → 10 products from sunscreen to face pack.

5.14 Exam questions

Short answers:

1. Name three herbal raw materials each for skincare, hair care, and oral hygiene.
2. What is the herbal source of natural hair dye?
3. List four oral-hygiene herbal products from the syllabus.

Long answers:

1. Describe the sources and roles of herbal raw materials in skincare, hair care, and oral hygiene products.
2. Write short notes on: (a) herbal sunscreen (b) herbal shampoo (c) herbal mouthwash (d) herbal face pack.

MCQs:

1. Reetha and shikakai act in shampoo as: (a) colours (b) natural surfactants (c) preservatives (d) thickeners — **Answer: (b)**
2. Henna colours hair due to: (a) lawsone (b) curcumin (c) chlorophyll (d) tannin — **Answer: (a)**
3. Which is used in herbal mouthwash? (a) clove (b) shikakai (c) henna (d) multani mitti — **Answer: (a)**

Viva:

1. Why is a patch test advised even for herbal cosmetics?
2. How does a herbal dye differ from a synthetic hair dye?

Application-based:

1. Design a simple herbal face pack for oily skin, justifying each ingredient.

5.15 References

1. Waldesch, F. G. Herbal Medicinal Products. CRC Press.
2. Drugs and Cosmetics Act and Rules (India). Government of India.

CHAPTER 6 — Excipients of Natural Origin

6.1 Learning Objectives

1. Define excipients and explain why natural excipients are preferred in herbal products.
2. Describe natural colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors/perfumes, protective agents, waxes, bleaching agents, and antioxidants with examples.

6.2 Definitions

- **Excipient:** Any inactive ingredient in a medicine that helps make, preserve, or deliver the product — the "helpers," not the "hero" (active drug).
- **Natural excipient:** An excipient obtained from plants, animals, or minerals instead of a chemistry lab.

6.3 Key Terminology

Term	Simple meaning
Binder	Glue that holds tablet powder together
Diluent	Filler that makes a tiny drug dose big enough to handle
Disintegrant	Ingredient that breaks the tablet apart in the stomach
Viscosity builder	Thickener that makes liquids less runny

6.4 Explanation

> **Technical concept:** Excipients of natural origin perform all standard pharmaceutical functions — colouring, sweetening, binding, diluting, thickening, disintegrating, flavouring, protecting, waxing, bleaching, and antioxidant action — and are preferred in herbal formulations for compatibility and consumer acceptance.

> **Simple explanation:** A tablet is mostly "helpers": something to give it bulk, something to glue it, something to colour it, something to make it break up in the stomach. In herbal products, these helpers also come from nature — plant gums glue the tablet, fruit sugars sweeten the syrup.

Master table — every syllabus category:

Category	Natural examples	Job in the product
Colorants	Turmeric (yellow), annatto (orange-red), beetroot (red), chlorophyll (green)	Make the product look attractive; identify the product
Sweeteners	Honey, stevia, liquorice (glycyrrhizin), jaggery	Mask bitter herbal taste, especially in syrups
Binders	Starch, gum acacia, guar gum, gum tragacanth	Glue powders into tablets/granules
Diluents	Starch, lactose (milk sugar), dried plant powders	Add bulk so tiny doses can be handled
Viscosity builders	Gum tragacanth, xanthan gum, sodium alginate (from seaweed)	Thicken syrups, suspend particles in mixtures
Disintegrants	Starch, pregelatinized starch, plantago (isabgol) husk	Swell in stomach fluid and break the tablet
Flavors and perfumes	Peppermint oil, orange oil, lemon oil, rose water, cardamom	Pleasant taste/smell; mask bitterness
Protective agents	Natural antioxidants, wax coatings	Protect the product from air/moisture/light
Waxes	Beeswax, carnauba wax	Coat tablets, stiffen ointments/creams
Bleaching agents	Activated carbon/charcoal, bentonite, fuller's earth (bleaching earths)	Remove unwanted colour/impurities during processing
Antioxidants	Tocopherol (vitamin E), ascorbic acid (vitamin C), rosemary extract	Stop oils/actives from going rancid

> **Analogy:** Excipients are the film crew — the actor (drug) gets the fame, but without lights, camera, and makeup (excipients), there is no movie (usable medicine).

6.5 Infographic concept box — Chapter 6

A tablet cross-section showing labelled "helper" zones: colour coat (turmeric), glue (acacia), filler (starch), breaker (isabgol). Beside it a syrup bottle: sweetener (honey), thickener (tragacanth), flavour (mint), protector (vitamin E). Caption: "11 helper families, all from nature."

6.6 Pharmacy relevance

- Choosing the right natural excipient is a core formulation skill; wrong binder = crumbling tablet, wrong sweetener = children refuse the syrup.
- Natural excipients can vary batch to batch — they also need QC.

6.7 India context

Honey, jaggery, gum acacia (from Indian *Acacia* trees), isabgol (grown in Gujarat/Rajasthan), and beeswax are all abundantly produced in India, making natural excipients economical for Indian herbal industry.

6.8 Key points

1. Excipients = inactive helpers; natural ones come from plants/animals/minerals.
2. Know all 11 categories with at least two examples each.
3. Match the excipient to the job: binder glues, disintegrant breaks, sweetener masks taste.

6.9 Common confusions

- **Binder vs diluent:** Binder GLUES particles together; diluent just ADDS BULK.
- **Disintegrant vs viscosity builder:** Disintegrant breaks the tablet in the stomach; viscosity builder thickens liquids — opposite jobs in different dosage forms.
- **Protective agent vs antioxidant:** Antioxidants are one TYPE of protective agent (against oxidation); protective agents also include moisture/light barriers like wax coats.

6.10 Common mistakes

- Listing only one example per category in exams — the syllabus expects breadth; give two.
- Forgetting bleaching agents and protective agents — they are in the syllabus list.

6.11 Mnemonics

- "**C**ute **S**ingers **B**ring **D**elicious **V**ery **D**elightful **F**lavours; **P**retty **W**omen **B**uy **A**pples" — Colorants, Sweeteners, Binders, Diluents, Viscosity builders, Disintegrants, Flavors; Protective agents, Waxes, Bleaching agents, Antioxidants.

6.12 Exam summary

Natural excipients serve 11 functions: colorants (turmeric, annatto), sweeteners (honey, stevia), binders (starch, acacia), diluents (starch, lactose), viscosity builders (tragacanth, xanthan), disintegrants (starch, isabgol), flavors/perfumes (mint, orange oil), protective agents (wax coats, antioxidants), waxes (beeswax, carnauba), bleaching agents (activated carbon, bentonite), antioxidants (vitamin E, vitamin C).

6.13 One-minute revision

11 helpers: colour, sweeten, glue, fill, thicken, break, flavour, protect, wax, bleach, anti-rust (antioxidant).

6.14 Exam questions

Short answers:

1. Define excipient. Why prefer natural excipients in herbal products?
2. Give two natural examples each of: binders, disintegrants, sweeteners.
3. What are bleaching agents? Give natural examples.

Long answers:

1. Classify excipients of natural origin and describe each category with examples.
2. Write short notes on: (a) natural colorants (b) viscosity builders (c) natural antioxidants.

MCQs:

1. Gum acacia is used as: (a) disintegrant (b) binder (c) sweetener (d) colour — **Answer: (b)**
2. Isabgol husk acts as: (a) binder (b) disintegrant (c) flavour (d) wax — **Answer: (b)**
3. Which is a natural sweetener? (a) saccharin (b) stevia (c) aspartame (d) sorbitol — **Answer: (b)**
4. Beeswax is used as: (a) sweetener (b) wax base/stiffener (c) disintegrant (d) colour — **Answer: (b)**

Viva:

1. How does a disintegrant work inside the stomach?
2. Why do syrups need both a sweetener and a viscosity builder?

> **Application-based:**

1. A herbal tablet crumbles during packing and tastes very bitter. Suggest one natural excipient for each problem and justify.

6.15 References

1. Waldesch, F. G. Herbal Medicinal Products. CRC Press.
2. Indian Herbal Pharmacopoeia. Indian Drug Manufacturers' Association.