Pharma Unit

Pharmacognosy

Top 20 Most Important Questions with Answers

According to New Syllabus ER 2020-21

1st Year D. Pharmacy

1) Define pharmacognosy, discuss the history and scope and present status of Pharmacognosy?

Ans.

Definition: Pharmacognosy is the branch of pharmaceutical science that deals with the study of crude drugs obtained from natural sources such as plants, animals, minerals, and microorganisms. It includes their identification, authentication, extraction, phytochemical study, evaluation, and classification.

The term Pharmacognosy was coined by Johann Adam Schmidt in 1811.

History of pharmacognosy

The history of pharmacognosy is ancient. Civilizations like Egypt, India, China, and Nepal used plants and animal products for treating diseases. The Egyptians had good knowledge of medicinal plants and human anatomy.

In Greece, Hippocrates (Father of Medicine) promoted natural remedies, and Galen, a Greek pharmacist, described methods of preparing plant-based medicines.

In India, the use of medicinal plants dates back to 3500 BC. The Rigveda and Atharvaveda mention many healing plants. Ayurveda also describes several medicinal plants and their uses. The famous Ayurvedic texts, Charaka Samhita and Sushruta Samhita, were written by Charaka and Sushruta.

Scope

a) Crude Drug Industry: Pharmacognosy deals with collection, drying, storage, and marketing of crude drugs used in pharmaceutical industries.

b) Phytochemistry: It involves isolation, purification, and identification of plant constituents such as alkaloids, glycosides, tannins, volatile oils, and resins.
c) Quality Control: Pharmacognosy teaches evaluation methods such as microscopy, chemical tests, physical parameters, and biological assays.
d) Herbal Drug Formulation: Many modern formulations (tablets, syrups, extracts) are derived from herbs.
e) Biotechnology: Plant tissue culture helps produce secondary metabolites and rare medicinal plants.

Present Status

a) High global demand for herbal medicines due to fewer side effects.
b) WHO encourages the use of natural medicines.
c) Expansion of nutraceutical, cosmeceutical, and phytopharmaceutical industries.
d) Use of advanced instrumental techniques like HPLC, GC-MS and spectrophotometry for standardization.
e) Acceptance of herbal drugs in developed countries.

2) Write the difference between organized and unorganized drugs?

Ans.

Organised Crude Drugs	Unorganised Crude Drugs
Obtained from specific plant organs like leaves, roots, bark, seeds, flowers.	Obtained from plant secretions or extracts like gums, resins, latex, oils.
Cellular structure is present and visible under a microscope.	No cellular structure; amorphous in nature.
Identified by morphological and histological characters.	Identified mainly by chemical tests.
Example: Senna leaves, Cinchona bark, Ginger rhizome, Clove buds.	Example: Gum acacia, Castor oil, Honey, Resins, Agar.
Usually dry, solid plant parts.	May be semi-solid or liquid in nature.
Processing is simple (cleaning, drying, cutting).	Processing involves extraction or purification.
More stable due to natural plant structure.	Less stable, may degrade faster because they are amorphous.

3) Explain Morphological Classification of crude drugs with advantages and disadvantages?

Ans.

Definition: In this method, crude drugs are classified based on the morphology (external form) of the plant organ from which they are obtained.

Examples

a) Leaf drugs: Senna, Digitalis
b) Root drugs: Ipecac, Rauwolfia
c) Bark drugs: Cinchona, Cinnamon
d) Wood drugs: Sandalwood
e) Flower drugs: Clove
f) Fruit drugs: Fennel, Coriander
g) Seed drugs: Nux vomica
h) Herbs: Mint
i) Gums/resins: Gum arabic

Advantages

a) Very simple and easy to understand
b) Useful for initial identification
c) Suitable for macroscopic evaluation
d) Based on visible characters

Disadvantages

a) Cannot identify powdered drugs
b) Cannot detect adulteration
c) Chemical nature is not understood
d) Not useful for highly processed materials

4) Explain Taxonomical and Alphabetical Classification of crude drugs?

Ans.

A. Taxonomical Classification

Definition: It classifies crude drugs based on their botanical classification, such as kingdom, division, class, order, family, genus, and species. Example: Clove → Kingdom Plantae → Family Myrtaceae → Genus Syzygium → Species aromaticum

Advantages

a) Scientific and systematic
b) Helps in plant identification
c) Useful for evolutionary studies
d) Helps in understanding relationships between plants

Disadvantages

a) Requires good botanical knowledge
b) Chemically different drugs may fall under the same family
c) Not useful for animal-origin drugs
d) Time-consuming

B. Alphabetical Classification

Definition: Crude drugs are arranged alphabetically using their English or Latin names.

Advantages

a) Very easy and fast to locate a drug
b) Helpful for indexing and cataloging
c) Widely used in pharmacopoeias
d) No need for scientific knowledge

Disadvantages

a) No scientific or logical basis
b) Does not give information about chemical nature or action
c) Similar spellings may cause confusion
d) Does not show relations between drugs

5) Write Pharmacological Classification of crude drug?

Ans.

Definition: Pharmacological classification of crude drugs involved the group of crude drugs according to their pharmacological action of their active constituent or their therapeutic uses. The drugs which include in pharmacological classification have similar pharmacological action.

Examples

a) Laxatives: Senna, Castor oil
b) Cardiac drugs: Digitalis
c) CNS drugs: Opium
d) Antispasmodics: Atropine
e) Antihypertensives: Rauwolfia

Advantages

a) Very useful for medical and pharmacy students
b) Helps correlate drugs with therapeutic use
c) Easy to memorize

Disadvantages

a) Same drug may have multiple actions
b) Does not give chemical information
c) Not useful for identification or analysis

6) Write Chemical Classification of crude drug?

Ans.

Definition: In this type of classification, crude drugs are grouped according to their major chemical constituents.

Types & Examples

a) Alkaloids: Rauwolfia, Nux vomica
b) Glycosides: Senna, Digitalis
c) Tannins: Catechu, Myrobalan
d) Volatile oils: Clove, Fennel
e) Resins: Asafoetida, Ginger
f) Terpenoids: Lemon oil

g) Steroids: Diosgenin

Advantages

a) Most scientific method
b) Predicts pharmacological action
c) Helps in selecting extraction method
d) Useful for phytochemical studies

Disadvantages

a) Requires chemical knowledge
b) Crude drugs containing multiple constituents are difficult to classify
c) Needs laboratory facilities

7) Write about Chemo-taxonomical Classification of crude drug?

Ans.

Definition: It links chemical constituents of plants with their botanical relationship. Plants belonging to same family often have similar phytochemicals.

Examples

a) Solanaceae family → Tropane alkaloids (Atropine, Hyoscyamine)
b) Papaveraceae → Isoquinoline alkaloids (Morphine, Codeine)
c) Liliaceae → Steroidal saponins

Advantages

a) Predicts chemical nature of related plants
b) Helps in discovering new drugs
c) Useful in plant evolution study

Disadvantages

a) Not applicable to all plant families
b) Some species do not follow patterns
c) Requires advanced chemical analysis

8) Define adulteration and give methods of adulteration with suitable examples?

Ans.

Definition: Adulteration is defined as substituting original crude drugs partially or wholly with other similar-looking substances.

The following are the main methods of drug adulteration:

Methods of adulteration

a) Substitution with Manufactured Materials: Artificially manufactured materials are used because they resemble the genuine drug in appearance. Example: Paraffin wax coloured yellow to substitute beeswax.
b) Substitution with Inferior Materials: Inferior or low-quality drugs are mixed or substituted with standard commercial drugs.
   Examples: Cloves adulterated with mother cloves. Saffron adulterated with dried flowers of Carthamus tinctorius (Safflower)

c) Substitution with Exhausted Materials: Exhausted materials are residues left after the active constituents have been removed.
   Examples: Used/Exhausted clove and ginger. Arabian senna substituted for Alexandrian senna
d) Substitution with Cheap Natural Substances: Cheaper natural substances unrelated to the original drug are used.
   Examples: Japan wax for beeswax and Sterculia gum for Tragacanth
e) Adulteration with Non-Plant Materials: Non-plant materials are added to increase weight or bulk.
   Examples: Stones, sand, soil, chalk, etc. mixed with plant drugs

9) Write about evaluation of crude drugs?

Ans.

Evaluation of drugs means checking their quality, purity, and detecting if any adulteration is present. For whole (unpowdered) drugs, morphological characters are enough, but for powdered drugs, microscopic characters are required. Liquid drugs often need chemical tests and physical standards like specific gravity, optical rotation, solubility, etc.
Crude drugs are evaluated through morphological, histological, and chemical studies.

Different methods of evaluation:

a) Physical Evaluation: This involves studying physical properties of drugs. Parameters include specific gravity, density, optical rotation, refractive index, melting point, viscosity, and solubility in different solvents. These help confirm purity and identity.
b) Chemical Evaluation: Chemical evaluation includes chemical tests chemical assays to estimate active constituents. Quantitative tests like acid value and saponification value. These tests help detect purity, quality, and differentiate varieties of crude drugs.
c) Biological Evaluation: Also known as bioassay. It measures the potency of a drug by observing its effect on living systems such as bacteria, fungi, tissues, or whole animals. The sample is compared with a standard preparation to check its biological activity.
d) Morphological Evaluation: Also called organoleptic evaluation. It involves examining colour, odour, taste, size, shape, and features like touch, texture, and sound. This evaluation is useful for detecting adulteration especially in seeds.
e) Microscopic Evaluation: Used mainly for powdered and organized crude drugs. It includes studying tissues, cells, and internal structures under the microscope. Chemical reagents may also be used to highlight specific constituents. This helps in accurate identification of drugs using known histological features.

10) Write a note on alkaloids

Ans.

Definition

Alkaloids are derived from the word alkali like. Alkaloids are nitrogenous compounds which are basic in nature due to the presence of one or more nitrogen atoms. They are defined as basic nitrogenous compounds of plant origin which are physiologically active.

Classification of alkaloids

a. True alkaloids: True alkaloids contain heterocyclic nitrogen atoms in the heterocyclic ring. The alkaloids are derived from amino acids. They are basic in nature. For example, quinine, atropine and morphine
b. Proto alkaloids: These are also called amino alkaloids. This contains nitrogen but not in the heterocyclic ring. It is also considered as a biological amine. It is also basic in nature. For example, ephedrine
c. Pseudo alkaloids: It contains heterocyclic nitrogen atom it is weak base for example caffeine

Occurrence and distribution of alkaloids

Alkaloids are found in plants and are especially common in certain families of flowering plants. They also occur in seed bearing plants mainly in berries, bark, fruits, roots and leaves. Alkaloids are more present in dicots than monocots. Families rich in alkaloids are Apocynaceae, Rubiaceae, Solanaceae, and papaveraceae.

Isolation method

i. Stas otto process: Extraction is basically carried out by Stas-Otto process in which the moistened drug is treated with alkali to set free the base existing in salt form and then the free base is separated with an organic solvent
ii. Kippenberger process: In this Process the powdered and sieved plant substance is first digested with solution of tannin in glycerol at a constant temperature 40 degree Celsius for 48hrs. The resultant mixture is further heated to 50°C to complete coagulation of pretentious substance and finally filtered

Identification test

a. Dragendorff's Test: This test uses Dragendorff's reagent, which is a solution of potassium bismuth iodide. When mixed with alkaloids, it produces an orange or reddish-brown precipitate, indicating the presence of alkaloids.
b. Mayer's Test: In this test, Mayer's reagent (a solution of potassium mercuric iodide) is added to the sample. If alkaloids are present, a cream-colored precipitate forms.
c. Hager's Test:
d. This test involves Hager's reagent, which is a saturated solution of picric acid. When it reacts with alkaloids, it produces a yellow precipitate as a positive result.
e. Wagner's Test: Wagner's reagent is a solution of iodine in potassium iodide. When added to a solution containing alkaloids, it forms a reddish-brown precipitate, confirming their presence.

Therapeutic uses

- It is used as antidepressant
- It is used as local anaesthetic agent
- It is used as antiseptic
- It is used as antibacterial agents

11) Write a note on volatile oil?

Ans.

Definition: Volatile oils are odorous volatile principles of plant and animal source, evaporate when exposed to air at ordinary temperature, they are also known as essential oils.

Classification of volatile oil

a) Hydrocarbon volatile oil: turpentine
b) Aldehyde volatile oil: lemongrass and cinnamon
c) Alcohol volatile oil: peppermint

d) Ketone volatile oil: camphor and cumin
e) Phenol volatile oil: clove
f) Oxide volatile oil: cardamom

Occurrence and distribution

Majority of volatile oil are present in plants they are especially present in secretory tissues for example oil ducts of umbelliferous fruits, oil cells or oil glands are present in sab epidermal tissue of lemon, and trichomes of several plants. In some cases, they do not pre-exist in the plant, but it is formed by decomposition of glycosides for example, mustard oil

Isolation method

a. Distillation method: the crude drug is distilled with water using Clevenger apparatus. For example, sandalwood, clove and cinnamon
b. Expression method: the volatile oil is obtained by expressing the fruit. For example, citrus fruits
c. Extraction method: the volatile oil is obtained by extracting the drug with volatile solvent such as ether and petroleum ether
d. Maceration method: drug containing volatile oil is first heated with melted fat or fixed oil stirring continuously in a water bath and left overnight the oil is separated from the fat with the help of alcohol. For example, oil obtained from flowers

Identification test

a) **Sudan III Test**: Take a thin section of the drug and add an alcoholic solution of **Sudan III**. The presence of **red-coloured globules** indicates volatile oils. **Explanation**: Sudan III is a fat-soluble dye that stains the oil globules, confirming the presence of volatile oil.
b) **Tincture Iodine Test**: Take a thin section of the drug and add a drop of **tincture iodine** (not tincture alkenes). **Observation**: A **red colour** appears, indicating the presence of volatile oil. **Explanation**: The iodine reacts with unsaturated compounds in the volatile oil, producing the red colour.

Therapeutic uses

- It is used as antiseptic agent
- It is used as antispasmodic agent
- It is used as carminative
- It is also used as flavouring agent
- It is also used in perfume industries
- It is also used in spices

12) Write a note on tannins?

Ans.

Definition: Tannins are polyphenolic Tannins are present in the aerial parts, e.g., leaves, fruits, barks, or stem, generally occurs in immature fruits, but disappears during the ripening process

Classification of Tannins

A. Tannins are classified into two types

Hydrolysable: these tannins are hydrolysed by acids or enzymes quickly and the product of hydrolysis is gallic acid and ellagic acid. On dry distillation gallic acid and other compound get converted to pyrogallol they react with ferric chloride solution producing bluish black colour
E.g.- Gallo tannins

B. Condensed: these are true tannins which on acidic or enzyme treatment get decomposed into a red insoluble compound known as phlobaphene's. On dry distillation they yield catechol tannins with ferric chloride solution they produce brownish green colour
E.g.- kino tannic acid,

Occurrence and distribution

Tannins are found commonly in the bark of trees, wood, leaves, buds, stems, fruits, seeds, roots, and plant galls. Tannins are distributed in species throughout the plant kingdom. They are commonly found in both gymnosperms and angiosperms. Mole studied the distribution of tannin in 180 families of dicotyledons and 44 families of monocotyledons.

Isolation Method

Both hydrolysable and condensed tannins are highly soluble in water and alcohol but insoluble in organic solvents such as solvent ether, chloroform, and benzene. Tannin compounds can be easily extracted by water or alcohol. The general method for the extraction of tannic acid from various galls is either with water-saturated ether, or with mixture of water, alcohol, and ether. In such cases, free acids such as Gallic and ellagic acid go along with ether, whereas true tannin gets extracted in water. If the drug consists of chlorophyll or pigment, it may be removed by ether. After extraction, the aqueous and ethereal layers are separately concentrated, dried, and subjected to further isolation and purification using various separation techniques of chromatography.

Identification test for tannins

1. Phenazone Test: To 5 ml of aqueous solution of tannin-containing drug, add 0.5 g of sodium acid phosphate. Warm the solution, cool, and filter. Add 2% phenazone solution to the filtrate. All tannins are precipitated as bulky, coloured precipitate.
2. Gelatine Test: To a 1% gelatine solution, add a little 10% sodium chloride. If a 1% solution of tannin is added to the gelatine solution, tannins cause precipitation of gelatine from solution.
3. Test for Catechin: Catechin test is the modification of the well-known phloroglucinol test for lignin. Matchsticks contain lignin. Dip a matchstick in the dilute extract of the drug, dry, moisten it with concentrated hydrochloric acid, and warm it near a flame. Catechin in the presence of acid produces phloroglucinol which stains the lignified wood pink or red.
4. Test for chlorogenic acid: A dilute solution of chlorogenic acid containing extract, if treated with aqueous ammonia and exposed to air, slowly turns green indicating the presence of chlorogenic acid.
5. Vanillin-hydrochloric acid test: Drug shows pink or red colour with a mixture of vanillin, alcohol, dilute Hcl in the ratio 1:10:10. The reaction produces phloroglucinol which along with vanillin gives pink or red colour.

Therapeutic uses

- It is used as antidote
- It is used as antitumor agent
- It is used as antidiarrheal agent
- They also have antibacterial properties

13) Write a note on glycosides?

Ans.

Definition: Glycosides can be defined as the compounds in which one or more sugars are combined with non-sugar molecules through glycosidic linkage

Classification of glycosides

1. Anthracene Glycoside – Senna, Rhubarb
2. Sterol Or Cardiac Glycoside – Digitalis, Squill
3. Cyanogenic Glycoside - Bitter Almond
4. Saponin Glycoside - Dioscorea
5. Isothiocyanate Glycoside - Black Mustard
6. Flavanol Glycoside - Silymarin
7. Coumarin Glycoside - Cantharides
8. Aldehyde Glycoside - Vanilla
9. Phenol Glycoside - Bearberry

Occurrence and distribution

Glycosides widely occur in root, bark, fruits, and to a small extent in leaves. Many glycosides occur in plants, often as flower and fruit pigments, for example, anthocyanins.

Isolation method

The drug containing glycosides is finely powdered extracted by a continuous hot percolation method. Using Soxhlet apparatus with an alcohol as a solvent. During this process the various enzymes present in the drug get deactivated due to heating. The extract is than treated with lead acetate to precipitate tannins and to remain non-glycosidal impurities The excess of lead acetate is precipitate as lead sulphide by passing the H2S (hydrogen sulphide gas) through the solution The extracts filtered, and glycoside is obtained.

Identification of Glycosides

a) Borntrager's test: The drug is finely powdered and added to dilute H2SO4 Due to which the drug is hydrolysed and then it is filtered. The filtration is cooled and shaken with organic solvent such as benzene or chloroform by which aglycone part enter into the organic solvent. The organic solvent separated, and ammonia is added Ammoniacal layer turn pink to red colour

b) Killer Kiliani test: The powdered drug is boiled with 70% of alcohol for 2-3 mins and Filter. The filtrate is added to water and strong lead acetate solution. The chloroform is added and shaken. The aglycon now entered into the chloroform. The chloroform layer is separated and evaporated. The remaining part residue is then dissolved in glacial acetic acid containing 5%ferric chloride solution. Add Hcl or H2SO4, a reddish-brown layer is formed

Therapeutic uses

- Used in treating heart failure
- Used in treating irregular heartbeats

14) Write Biological Source, Chemical Constituents & Uses of digitalis, rauwolfia, senna, ginger, aloe?

Ans.

a) Digitalis

- Source: Dried leaves of Digitalis purpurea
- Constituents: Cardiac glycosides (Digitoxin, Digoxin)
- Uses: Cardiotonic in heart failure

b) Rauwolfia

- Source: Dried roots of Rauwolfia serpentina
- Constituents: Reserpine, Ajmaline
- Uses: Antihypertensive, antipsychotic

c) Senna

- Source: Leaves & pods of Cassia angustifolia
- Constituents: Sennosides A & B
- Uses: Laxative

d) Ginger

- Source: Rhizomes of Zingiber officinale
- Constituents: Gingerol, shogaol
- Uses: Carminative, antiemetic

e) Aloe

- Source: Leaves of Aloe barbadensis
- Constituents: Aloin
- Uses: Laxative, wound healing

15) What are pharmaceutical aids give pharmacognosy of kaolin?

Ans.

Definition: Pharmaceutical aids are the substance which have no or little pharmacological effect, but they are essentially used in the preparation of pharmaceutical dosage form like tablets, capsule, injections, suspension and emulsion. Examples are kaolin, lanolin, beeswax, Acacia tragacanth, Agar

Pharmacognosy of kaolin

Synonyms: China clay, porcelain

Source: Kaolin is a naturally occurring mineral that is formed by the weathering of rocks containing aluminium silicates. Kaolin deposits are often found in areas with high levels of rainfall and a warm, tropical climate. Over time, the weathering of the rocks in these areas breaks down the aluminium silicates and leaves behind kaolin. The kaolin deposits are then mined from the earth and processed to remove impurities before being used in various industrial applications.

Chemical Constituents: kaolinite and halloysite. Kaolinite is a hydrated aluminium silicate with the chemical formula $Al_2Si_2O_5(OH)_4$, while halloysite is also a hydrated aluminium silicate with the chemical formula $Al_2Si_2O_5(OH)_4 \cdot 2H_2O$. Kaolin may also contain small amounts of other minerals, such as quartz, feldspar, and mica

Uses

- Kaolin is used in some pharmaceutical products as an excipient
- Kaolin is used in a range of personal care products, such as soaps, creams, and powders, as a thickening agent, absorbent, and skin protectant
- Kaolin is also used in the production of ceramics

16) Define and classify nutraceuticals with examples. Give therapeutic applications?

Ans.

Definition: Nutraceuticals: Nutraceuticals are food or parts of food that provide medical or health benefits in addition to basic nutrition. They help in prevention and management of diseases.

Classification

a) Nutrients: Vitamins (Vitamin C), Minerals (Calcium, Iron), Amino acids.
b) Herbals / Botanicals: Plant products like Aloe vera, Turmeric, Ginger, Garlic.
c) Dietary Supplements: Omega-3 fatty acids, Probiotics, Protein powders.
d) Functional Foods: Fortified foods such as vitamin D fortified milk, calcium-fortified juice.
e) Phytochemicals: Flavonoids (green tea), Carotenoids (carrot, tomato), Lycopene.

Therapeutic Applications

a) Boost immunity (Vitamin C, Zinc, Probiotics)
b) Improve digestive health (Probiotics, Prebiotics)
c) Reduce inflammation and act as antioxidants (Turmeric, Green tea flavonoids)
d) Support cardiovascular health (Omega-3 fatty acids, Garlic)
e) Improve bone health (Calcium, Vitamin D)

17) Define Pro-biotics, Pre-biotics, Dietary fibres. Give their therapeutic applications?

Ans.

Probiotics – Definition & Therapeutic Applications

Definition:

Probiotics are live beneficial microorganisms (mainly bacteria like Lactobacillus and Bifidobacterium) that, when consumed in adequate amounts, improve the health of the host.

Therapeutic Applications:

a) Improve gut health and digestion
b) Prevent and treat diarrhoea (antibiotic-associated diarrhoea)
c) Restore normal intestinal flora
d) Boost immunity
e) Reduce symptoms of irritable bowel syndrome (IBS)

Prebiotics – Definition & Therapeutic Applications

Definition:

Prebiotics are non-digestible food ingredients (mainly carbohydrates like inulin and fructooligosaccharides) that promote the growth of beneficial gut bacteria.

Therapeutic Applications:

a) Improve bowel movements
b) Increase growth of healthy gut microbes
c) Reduce constipation
d) Enhance calcium absorption
e) Support immune function

Dietary Fibres – Definition & Therapeutic Applications

Definition:

Dietary fibres are plant-derived, non-digestible carbohydrates (such as cellulose, pectin, hemicellulose) that pass through the digestive tract unchanged and aid bowel health.

Therapeutic Applications:

a) Prevent constipation by increasing stool bulk
b) Reduce cholesterol levels

c) Help control blood sugar levels
d) Reduce risk of colon diseases
e) Support weight management by increasing satiety

18) Explain Pharmacognosy of senna and opium?

Ans.

Pharmacognosy of senna

A) Synonyms: Alexandrian senna, Tinnevelly senna, Folia senna

B) Family: Fabaceae (Leguminosae)

C) Biological Source: The biological source of senna is the dried leaflets and pods of Cassia angustifolia and Cassia acutifolia.

D) Geographical Source: Senna Alexandrina is naturally cultivated in the region from Mali in the east to Somalia and Kenya. It is indigenous to Asia, from the Arabian Peninsula to India and Sri Lanka. In India, it is mainly found in Tinnevelly, Madurai, and Ramnath Puram districts of Tamil Nadu.

E) Organoleptic Properties

- Colour: Flowers are Yellow in colour and Leaves are yellowish green
- Odour: Slight and unpleasant
- Taste: Mucilaginous, bitter, and characteristic
- Size: Leaves are 7-8 mm in width and 25 to 60 mm in length
- Shape: Leaves are lanceolate in shape with an acute apex, sometimes ending in a spine
- They have an asymmetrical base, with the transverse line being more prominent on the lower surface.
- Surface: Trichomes are present on the entire surface of the leaves.

F) Chemical Constituents

- Anthraquinone Glycosides: Present in less than 2.5%, also referred to as crystalline compounds. Contains Rhein and aloe-emodin. Includes sennosides A and B, which are stereoisomers: Sennoside A: Dextro-rotatory form (aglycone), Sennoside B: Meso-rotatory form (aglycone)
- Naphthalene Glycosides: Present in the leaves.
- Other Components: Calcium oxalate, Volatile substances Yellow flavanol colouring matters, such as kaempferol and its glycosides, and isorhamnetin, Sterols and their glucosides, Monoterpenes, phenylpropanes, fatty acids, and esters, Mucilage, Resin, Water-soluble polysaccharides

G) Pharmaceutical Uses

- Purgative Properties: Reduces water absorption by influencing peristaltic movement.
- Cathartic Action: Effective in chronic constipation.
- Laxative Properties: FDA-approved for over the counter (OTC) laxative use.
- Specific Conditions: Used in irritable bowel syndrome (IBS), Applied in post-rectal surgery care, Effective in haemorrhoids treatment
- Weight Management: Sometimes used for weight loss (though not recommended for prolonged use).
- Pregnancy and Lactation: Generally considered ineffective and should be avoided during pregnancy and lactation.

Pharmacognosy of Opium

A. **Synonym:** Crude opium, Raw Opium, Gum Opium, Afim.
B. **Family:** Papaveraceae
C. **Biological source:** Opium from the unripe capsules of Papaver somniferous belonging to family Papaveraceae
D. **Geographical source:** In India, opium is primarily cultivated in Madhya Pradesh, Rajasthan and Uttar Pradesh, These regions have suitable climate and soil conditions for Papaver somniferous cultivation
E. **Chemical Constituents:**
   Codeine 0.8 to 2.5%, Nicotine, thebaine 0.5 to 2%, noscapine 4 to 8% and papaverine 0.5% to 2.5% and also contain morphine
F. **Therapeutics uses:**
   - It is used as narcotic analgesic
   - It also produces sedative action
   - It also used to relieve pain.
   - It is also used to treat cough

19) Write biological sources, family, chemical constituents and uses of Tulsi, ephedra, myrobalan?

Ans.

a) Tulsi

- Biological source: Dried leaves and aerial parts of Ocimum sanctum / Ocimum tenuiflorum.
- Family: Lamiaceae
- Chemical Constituents: Volatile oil (eugenol, methyl eugenol), ursolic acid, flavonoids.
- Uses: Carminative, antimicrobial, digestive stimulant.

b) Ephedra

- Biological source: Dried stems of Ephedra sinica, Ephedra gerardiana, and other Ephedra species.
- Family: Ephedraceae
- Chemical Constituents: Alkaloids, ephedrine, pseudoephedrine.
- Uses: Bronchodilator, decongestant.

c) Myrobalan

- Biological source: Dried fruits of Terminalia chebula (Haritaki), Terminalia bellirica (Bibhitaki), and Emblica officinalis (Amalaki).
- Family: Combretaceae / Phyllanthaceae
- Chemical Constituents: Tannins, gallic acid, ellagic acid, chebulinic acid.
- Uses: Astringent, digestive tonic.

20) Explain phytochemical investigation of drugs?

Ans.

Phytochemical investigation refers to the complete scientific study of crude drugs to identify, isolate, purify, and characterize the chemical constituents present in plants. These constituents include alkaloids, glycosides, tannins, flavonoids, saponins, terpenoids, steroids, volatile oils, etc.

Objectives of Phytochemical Investigation

a) To identify the active chemical constituents.
b) To isolate and purify individual phytochemicals.
c) To determine structure, properties, and biological activity.
d) To standardize crude drugs for medicinal use.
e) To detect adulteration and ensure purity.
f) To develop new herbal formulations or drugs.

Steps in Phytochemical Investigation

a) Collection and Authentication of Plant Material
   - Plant parts (roots, leaves, seeds, bark) are collected from natural sources.
   - Authentication is done by a botanist using morphological and taxonomical characters.

b) Drying and Size Reduction
   - The collected material is shade-dried to remove moisture.
   - Dried material is powdered to increase surface area for extraction.

c) Extraction of Phytochemicals: Extraction is the process of separating soluble plant chemicals using suitable solvents.
   Methods of extraction: Maceration, Percolation, Soxhlet extraction, Reflux extraction, Steam distillation (for volatile oils)
   Choice of solvents
   - Non-polar: Hexane (for fats, waxes)
   - Moderately polar: Chloroform, ethyl acetate (for alkaloids)
   - Polar: Water, ethanol, methanol (for tannins, glycosides)

d) Preliminary Phytochemical Screening: The crude extract is tested for the presence of different classes of compounds using simple chemical tests. This gives a qualitative idea of which constituents are present.
   Examples
   - Alkaloids → Mayer's, Dragendorff's test
   - Glycosides → Borntrager's test
   - Tannins → Ferric chloride test
   - Flavonoids → Shinoda test
   - Saponins → Foam test
   - Proteins → Biuret test
   - Carbohydrates → Molisch's test

e) Isolation and Purification of Phytochemicals: Active constituents are separated using advanced techniques like Column chromatography, Thin Layer Chromatography (TLC), High-Performance Liquid Chromatography (HPLC), Gas Chromatography (GC), Preparative TLC, Fractional crystallization. These methods help in obtaining pure compounds.

f) Characterization of Isolated Compounds: The purified phytochemicals are analyzed to determine structure, molecular weight, and functional groups.
   Spectroscopic techniques used:
   - UV–Visible spectroscopy
   - IR spectroscopy
   - NMR (^{1}H and ^{13}C)
   - Mass spectroscopy (MS)

   These tools help to determine:

- Chemical structure
- Functional groups
- Molecular formula

g) Quantitative Estimation: Determination of exact amount of chemical constituents.
Examples:
- Total alkaloid content
- Total phenolic content
- Flavonoid concentration
- Vitamin levels

Methods: spectrophotometry, titration, HPLC quantification.

h) Biological / Pharmacological Evaluation: In this method the Isolated compounds or extracts are tested for pharmacological activity. This step confirms the therapeutic potential of the phytochemicals.

i) Standardization of Herbal Drug: Based on the results, chemical makers are used to Set quality control standards also used to check identity, purity, and potency of herbal drugs. Standardization prevents adulteration and ensures efficacy.

All The Best For Your Exam

Notes:

1) Please Read All the Topics & All the Chapters of Pharmacognosy Very Carefully.
2) This Pdf Notes/Questions & Answers Are Only for Reference Purpose.