PHARMACOGNOSY

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Pharmacognosy: It is the study of crude drugs obtained from plants, animals and mineralsand their constituents.

Crude Drug: An agent which alters or changes the biological phenomenon &obtained from plant, animal & mineral sources.

Plant Sources

Ex: Senna, Clove, Fennel

Animal Sources

Ex: Shark liver oil, Bee Wax, Wool, Silk

Mineral Sources

Ex: Bentonite, Chalk, Kaolin.

Organized drug: Drugs which have cellular structure & identified by morphological and microscopical characters.

Ex: Senna, Ginger, Coriander

Un-Organised drugs: Un-organized drugs are derived from parts of plants or animal by some process of extraction and followed by purification, if necessary.

Ex: Juices, Resins.

Q.1. Differentiate organized drug from un-Organized drugs.

Organised drugs	Un-Organised Drugs
These are the organs of plants or animals.	1. These are derived from parts of plant or animal.
These are solid in nature. Ex: Bark, Roots, Stem, Fruits.	2. These are solid, semisolid or liquid in nature. Ex: Oils & Balsams
They have well defined morphological characters. These have cellular structures. It is identified by morphological characters. Ex: Rauwolfia, Ginger, Turmeric.	3. They do not have definite morphological characters. 4. Do not have cellular structures. 5. It is identified by Chemical test & Physical standards. Ex. Acacia, Agar, Tragacanth, Benzoin, Starch.

Q.2. Write a note on history and Scope of Pharmacognosy.

Ans. In India, the knowledge of medicinal plants were described in the **Rig-Veda** and **arthaveda** from which **Ayurveda** was developed, the ancient book like **charkasamhita** and **sushruthsamhita** gives information of drugs used as a Medicine.

Greek scientist like **Hippocrates** and **Aristotle** contributed a great deal.Aristotle wrote about the animal kingdom and **Theophrastus** wrote about the plant kingdom. In Egypt people were familiar with use of plant and animal drugs.

Diascorides described medicinal plants; in 1815. **Sydler** introduced the name **Pharmacognosy**, the word Pharmacognosy is derived from two Greek words.
Words Pharmakon, (Drugs) and Gignosco, (to acquire Knowledge)

Pharmacognosy further developed due to the following four events.

- Isolation of Penicillin is 1928 by Fleming.
- Isolation of Reserpine from Rauowolfia and its use as Anti – Hypertensive drug.
- Isolation of Vinca alkaloids.
- Isolation of steroidal hormones.

SCOPE OF PHARMACOGNOSY:

- Pharmacognosy helps in the detailed study of drug obtained from Plant, animal or mineral source.
- It helps in finding out the botanical source and family i.e. origin.
- The method of cultivation gives as knowledge about the type of soil, Climaticcondition and altitude required for the plants.
- It also gives us information about Chemical Constituents and their Uses.
- The drug can be evaluated to find out their quality and purity.
- Adulterants and substituents if any can be found out.

Q.3.Describe Illustrate and discuss advantages and disadvantages of various systems of classification of crude drugs?

Or

Classify different systems of crude drugs and mention their advantages and disadvantages

Ans. The various system of classification of crude drug is:

- Alphabetical Classification
- Taxonomical Classification

- Morphological Classification
- Pharmacological Classification
- Chemical Classification
- Chemo taxonomical Classification

Alphabetical Classification:

The drugs are arranged according to alphabetical order of the names in any particular language. This is the simplest form of classification. This is adopted in the I.P, B.P.

Disadvantages:

- It does not provide any information about the scientific nature of the drugs.
- It does not help in distinguishing the drug if plant, mineral or animalsource.
- It can't be known whether it is Organised or unorganized.

Taxonomical Classification:

It is the biological classification of crude drugs. Here the drug are arranged according to the plants from which they are derived i.e. Phylum. Orders, Families, Genus & Species.

For Example:

PDCOFGS

Phylum : Spermatophyte
Division : Angiosperm
Class : Dicot
Orders : Rosales
Family : Leguminosae
Genus : Glycyrrhiza, Astragalus
Species : G.Glabra, A. Gummifer

Glycyrrhiza glabra

Animal drugs are classified as Fish, Arthropods, mammals etc.

Advantage: It is classified based on botanical Characters.

Disadvantage: The parts of the plants cannot be identified botanically as theymay have been subjected to various processes.

Morphological Classification:

The crude drugs are classified based on the part of the plants like leaves, fruits, flower, woods bark, Extracts gums etc.

Parts of the Plant	Drugs
Wood	Quassia
Barks	Cinchona
Flower bud	Clove
Seeds	Nuxvomica
Entire Plant	Ephedra
Gum	Acacia
Latex	Opium

Advantages:

1. It is very useful in identifying the adulteration
2. Crude drugs from plants can be easily identified

Disadvantages:

1. It does not reflect on chemical composition of the drug

Pharmacological Classification:

The crude drugs are classified according to the pharmacological action of their chief constituents. The drugs with similar action are put together. **Example:**

Carminatives : Coriander, Caraway
Purgatives : Senna, Rhubarb, Aloes
Cardio tonics : Digitalis, Squill.
Anthelmentic: Male ferm and Quassia

Advantages: If the Contents of the Crude drugs are not known, they can be classifiedproperly on the basics of therapeutics of pharmacological properties.

Disadvantages:

1. The main disadvantage is that a drug can be placed in various classes according to its therapeutics use.Ex: cinchona can be grouped in anti-malarial and anti-arrhythmic.
2. Drug having different action but therapeutic is same are put together. Ex: Bulk purgative, irritant purgative.

5. Chemical Classification: The method is applicable to the crude drugs containing similar types of chemicals (or) the drugs are classified according to the chemical constituents present in the drugs.

Example:

1. Alkaloids : Aconite, Cinchona, Belladonna
2. Glycosides : Digitalis, Senna, Squill
3. Carbohydrates : Agar, honey, Starch
4. Volatile Oil : Clove, Eucalyptus
5. Tannins : Catechu

Advantages: The drugs from animal and plant source if the posses' similar type of constituents is placed together.

Disadvantages: This type of classification makes no proper placement of drugs containing two different types of chemical constituents.

Q.4. Write a note on Umbelliferous fruits.

Ans:

- These are fruits belonging to the family of **Umbelliferae.**
- The Umbelliferous fruits are **shizocarpous**
- The Umbelliferous fruits are used as flavoring agents and carminatives.

Ex: Fennel, Dill, Caraway &Coriander

Q.5. Define Surgical fibers and classify with examples

Ans. The fibers are elongated thick walled cell with pointed ends, cell walls of which consist of cellulose and may not contain lignin.

Classification: - Fibers obtained from various sources can be categorized as follows:

- **Plants Fibers:** For Ex. Cotton jute
- **Animal fibers:** For Ex. Silk, wool
- **Mineral fibers:** For Ex. Glass, asbestos
- **Synthetic fibers:** For Ex.Nylone,Terylene
- **Regenerated fibers:** For Ex. Viscose rayons, Acetate rayons

Q.6.What are suture and Ligatures? Mention the difference between absorbable and non- absorbable sutures with examples.

Ans. Sutures is a string or fiber, which is used for sewing or stitching tissues like skin, muscle and tendon with the help of a needle.

Ligature is also a suture but it is used without a needle for tying injured blood vessels to prevent bleeding.

Absorbable Sutures: These are absorbed and digested in the tissues of the body.

Example: Surgical Sutures, Kangaroo tendon, Chromic catgut, Vicryl

Non- absorbable Sutures: They are not absorbed and remain as such in the body as implants. They are to be removed after certain period of time from the wound where they have been applied.

Example: Silk, Cotton, Nylon, Linen

Q.7. Define Glycosides? Classify them chemically

Ans. Glycosides are organic compounds of plant and animal origin which on acidic or enzymatic hydrolysis gives one or more sugars and a non sugar residue. The non-sugar moiety is called as genin or aglycone, while the sugar components are glycones.

Classification: (05) CA cy Sap)

Type of Glycoside	Examples
Cardiac glycosides	Digitalis Arjuna Bark.
Anthracene Glycosides	Senna Rhubarb.
Cyanogenetic Glycosides	Bitter Almond Wild Cherry Bark.
Saponin Glycosides	Diascorea Shataveri.
Isothiocynate Glycosides	Black Mustard

Q.8. Define and classify Alkaloids.

Ans. Alkaloids are the basic nitrogenous products of plant origin, having marked physiological actions when administered internally. Alkaloids have complex molecular nature, wherein, generally nitrogen is in heterocyclic ring.

Classification of alkaloids: (8) TQI²PSTERA

Type of alkaloid	Examples
Tropane alkaloids	Datura Belladonna Coca
Quinoline alkaloids	Cinchona
Isoquinoline alkaloids	Opium
Indole alkaloids	Nux-vomica Rauwolfia Ergot Vinca
Purine alkaloids	Tea Coffee
Steroidal alkaloids	Kurchi Potato
Terpenoid	Aconite
Alkaloidal amines	Ephedra Colchicum

Q.9. Define and Classify Volatile oils.

Ans. The odorous, volatile principles of plant and animal sources are known as volatile oils As they evaporate, when exposed to air at ordinary temperatures, they are also called 'ethereal oils'.

Classification: (6) HA²ERP

Type	Examples
Hydrocarbons	Turpentine, black pepper
Alcohols	Peppermint, cardamom, rose
Aldehydes	Cinnamon, lemon peel, orange peel
Esters	Mustard, lavender
Ketones	Caraway, camphor
Phenol volatile oils	Clove, thyme

Q.10. Add a note on Isolation/Extraction of Volatile oils.

Ans: Volatile oils are extracted by steam distillation, solvent extraction or mechanical means such as ecuelle and enfleurage techniques.

a. Hydro-distillation } Steam distillation
b. Enfleurage method } Mechanical method
c. Ecuelle method.

Hydro-distillation: This method is used for extraction of volatile oils from herbal drugs.

Enfleurage: This method is used for extraction of delicate perfumes. The fresh flower petals are mechanically spread on layer of fatty materials, allowed to imbibe and the exhausted petals are replaced by fresh material. The process is continued till the fatty layer is saturated with volatile principles which are then extracted with lipid solvent.

Ecuelle method: Is used for extraction of citrus oils, wherein oil cells in ring are ruptured mechanically using pointed projections by twisting raw material over them in clockwise direction either mechanically or manually.

Q.11. Define and Classify Tannins/write a note on Tannins.

Ans. Tannins can be defined as the derivatives of polyhydroxy benzoic acid capable of combining with proteins.

They are further characterized as non-crystallisable, alcohol and water-soluble compounds with an acid reaction and astringent taste.

They cause precipitation of proteins and alkaloids, impart dark blue or green black colour with ferric salts. When applied to smooth muscles, they cause their contraction.

Classification: They are classified in to two types:

1. Condensed tannins
2. Hydrolysable tannins

Condensed tannins: These are formed by condensation of catechol units. They are called Phlobaphenes. On dry distillation they yield catechol tannin. On reaction with ferric chloride solution they produce brownish green Colour. **Ex. Pale Catechu and Black Catechu.**

Hydrolysable Tannins: On hydrolysis they give either Gallic acid or ellagic acid. On dry distillation they yield pyrogalol. On reaction with ferric chloride solution they produce blue colour. **Ex: Clove, Rhubarb and Tannic acid.**

Q.12. Define Pharmaceutical AIDS and classify with examples.

Ans: The substances which have little or no therapeutic value, but are essentially used in manufacture or compounding of various pharmaceutical substances.

Classification: These are classified into the following:

a) Emulsifying agents : Acacia, Tragacanth
b) Sweetening Agents : Honey
c) Coloring Agents : Turmeric
d) Disintegrating Agents :Starch
e) Flavoring Agents : Orange
f) Ointment base : Bees Wax, Lanolin
h) Lubricants : Talcum
i) Diluents : Cinnamon Water

Q.13. Write the differences between gums & mucilage.

Gums	Mucilage
Gums are translucent and amorphous substances, produced by plants. They are abnormal products of plants.	Mucilages are also plant products similar to gums and are regarded to be normal products of plant.
They are plant exudates.	They are not exudates.
They are produced due to injury.	They are produced normally.
They are produced on the surface of the stem. Chemically they are mixture of aido-biomic acid Ex- Acacia, Tragacanth	They are produced inside the plant. They are mixture of monosaccharide and Galacto-uronic acid. Ex- Agar,Ispaghula

Q.14.Define Adulteration. Explain different methods of Adulteration.

Ans. Adulteration is a practice of substituting original crude drug partially or wholly with other similar looking substance.

Reasons:

1. Scarcity
2. High price of drug

Method of adulteration of Drugs:

a. **Substitution with substandard commercial varieties**
b. **Substitution of exhausted drug**
c. **Substitution with artificially manufacturing substances**
d. **Presence of organic matter from the same plant**

c. **Adding of synthetic chemicals**

Substitution with substandard commercial varieties:

The adulterants used here may resemble original crude drug by morphological, chemical or therapeutic characters but are substandard in nature and cheaper in cost. This is the most common practice of adulteration.

Ex: - i) Nux-vomica or strychnosnux-vomica are adulterated with strychnosnux-blanda.
ii) Senna is adulterated with Arabian dog Senna

Substitution of exhausted drugs:

The drugs are exhausted for their active constituents and reuse in the original drugs. This Practice is more common in case of volatile oils.

Ex: - Fennel, coriander, caraway, dill & clove.

Substitution with artificially manufactured substances:

This type of adulteration is observed in case of drugs which are costly.

Ex. Artificial invert sugar mixed with honey.

Presence of organic matter obtained from the same plant:

In this case, advantage of similar colour, odour and constituents is taken in to consideration and other parts of the same plant are added to genuine drug.

Ex. Cloves are mixed with clove stalks

Adding of synthetic chemicals:

Many a times a synthetic chemical which constitutes one of the chemical constituents of the drug is added to the genuine drugs.

Ex. Benzyl benzoate in balsam of peru

Camphor oil in oil of rosemary

Q.15. Explain the cultivation, Collection and Preparation of Rauwolfia. (सर्पगन्धा)

Ans:

Botanical source: Itconsists of dried roots of the plant known as **Rauwolfia serpentina,** belonging to the family **Apocynaceae.**

Cultivation:

- Climate- Hot humid condition
- Soil- Clay loamy soil with large amount of humus
- ph. – acidic (around 4
- Temperature- (10-40)°C
- Rainfall- 250-500 cm
- Propagation – By seeds

The healthy seeds are sown in the nursery beds. Sowing is done in the month of May. The seedlings are then transplanted in the month of August at a distance of 16 to 30

cm. The shrub (plant) is about 1 meter in height, with white or rose coloured flowers and purplish black fruits.

Collection:

- 3 to 4 years old plant are uprooted. The roots are cut properly, washed and dried in the air. The average yield of roots per hectare is 1200 kg.

Q.16. Explain the cultivation, Collection and Preparation of Opium. (उपयोगी)

Ans:

Botanical source: - Opium is the dried latex obtained from the unripe capsule of **Papaver somniferum** belonging to the family **Papaveraceae.**

Cultivation:

- Opium is a narcotic drug. In India all the activities about opium & its derivatives are controlled by Narcotic Drugs & Psychotropic Substances Act, 1985.
- So the cultivation of opium is carried out after obtaining the license from the Central Government & also under the supervision of Central Government.
- Soil:- Loamy soil containing organic matters & Nitrogen
- Climate:- Cool weather, cloudiness & sufficient sunshine
- Temperature:- 20°C-25°C
- Rainfall:- 100-150 cm
- Altitude:- Sea Level valleys
- Propagation:- Seed
- Sowing of seeds is done from November to March. Before sowing, the seeds are mixed with 3-4 parts of sand. A distance of 25 cm should be maintained between two plants. The plants grow up to a height of 1 meter. Periodically, thinning of plants is done to get uniform growth. Plant should be kept totally free from weeds. Fertilizers containing nitrogen & phosphorus may be used for better yield.
- The plant should be protected from pests like cut worms, leaf minor & poppy boxer.

Collection:

- After sowing the seeds, within 3-4 months, the plant bears flowers. The flowers are converted in to capsules within few days & attain the maturity after 15-20 days. At maturity the Colour of the capsule changes from dark green to light green. Each plant bears about 5-8 capsules. Latex is present in the lactiferous vessels.
- Incisions are made in the afternoon when there is no wind, rain & dew with the help of an apparatus known as Nushtur.
- Because of incision, the latex will come out & thickened due to cold weather in night. The dried latex is scrapped & collected in the morning by an iron scoop apparatus called Charpala. The incision process is repeated on the same capsule for about 4 times at 4 days interval.

- Cultivation of Digitalis.

- The latex is collected in plastic containers & the dark liquid which is not required may be drained off.
- The opium collected is processed at Government opium factory at Ghazipur, U.P

Uses:

Used as narcotic Analgesic

Codeine is used as Anti- tussives agent.

Q.17. Explain the cultivation, Collection and Preparation of Senna.

Ans:

Cultivation:

- Senna is mainly cultivated in Tinnevelly, Ramnathapuram Districts in Tamil Nadu.
- For the cultivation red loamy or coarse gravelly soil is required.
- Before sowing the land is ploughed twice and leveled.
- Cultivation is done twice a year. The first sowing is done in February- March, while second sowing is carried out in the October to November.
- In February – March the sowing is done as main crop, while in October- November it is cultivated along with other crops like coriander, chilies and paddy.
- The sowing is done by either broadcasting method or dibbling method.
- For quick germination, the seed are triturated with sand.
- 15-25kg of seeds is required per hectare of land.
- The plants are grown as semi-irrigated or light irrigated crop and require fertilizers.
- The plant cannot survive at very low temperature.
- The crop is allowed to grow for 3-5 months and flowering tops are cut off to ensure lateral branching.

Collection:

- After 2 -3 months of sowing the harvesting of leaves is done in three stages.
- The first plucking is done when the leaflets are thick full grown and greenish in Colour.
- After one month, second plucking is done and last pit carried out after 4-6 weeks of second collection.
- The plants are up- rooted after third plucking of leaves.
- After collection, the leaflets are dried under shade or indoor

by spreading them in thin trays.

- Leave lose 50-60%of their weight on drying.
- Drying takes place within 7-10 days and leaves show yellowish green Colour.
- The leaves are tossed to separate pods.
- They are then packed into baled under hydraulic pressure.
- During storage, the drugs should be protected from light.
- About 1200kg of leaves and pods are obtained in one hectare of land.

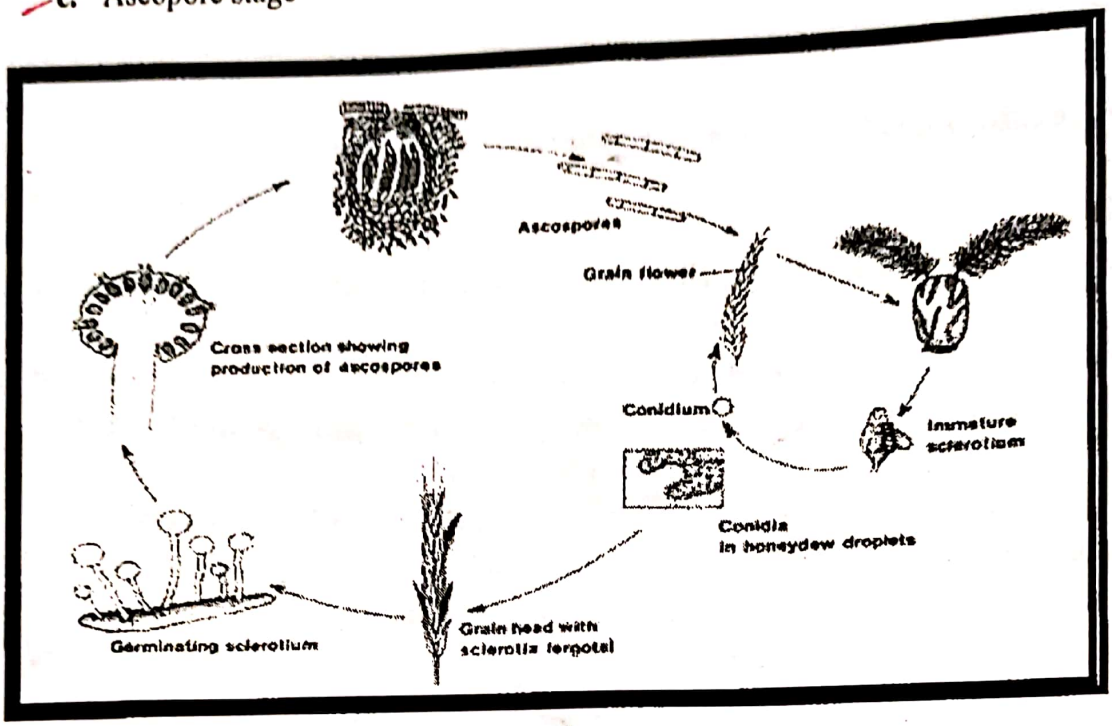
* Life cycle of ergot Claviceps purpurea Ergot

Q.18. Explain the cultivation, Collection and Preparation of ~~Rauwolfia~~.

Ans.

Ergot is a fungal growth. The life cycle of ergot shows the following stages:

a. Sphacelia or Honey dew stage
b. Sclerotium stage
c. Ascopore stage



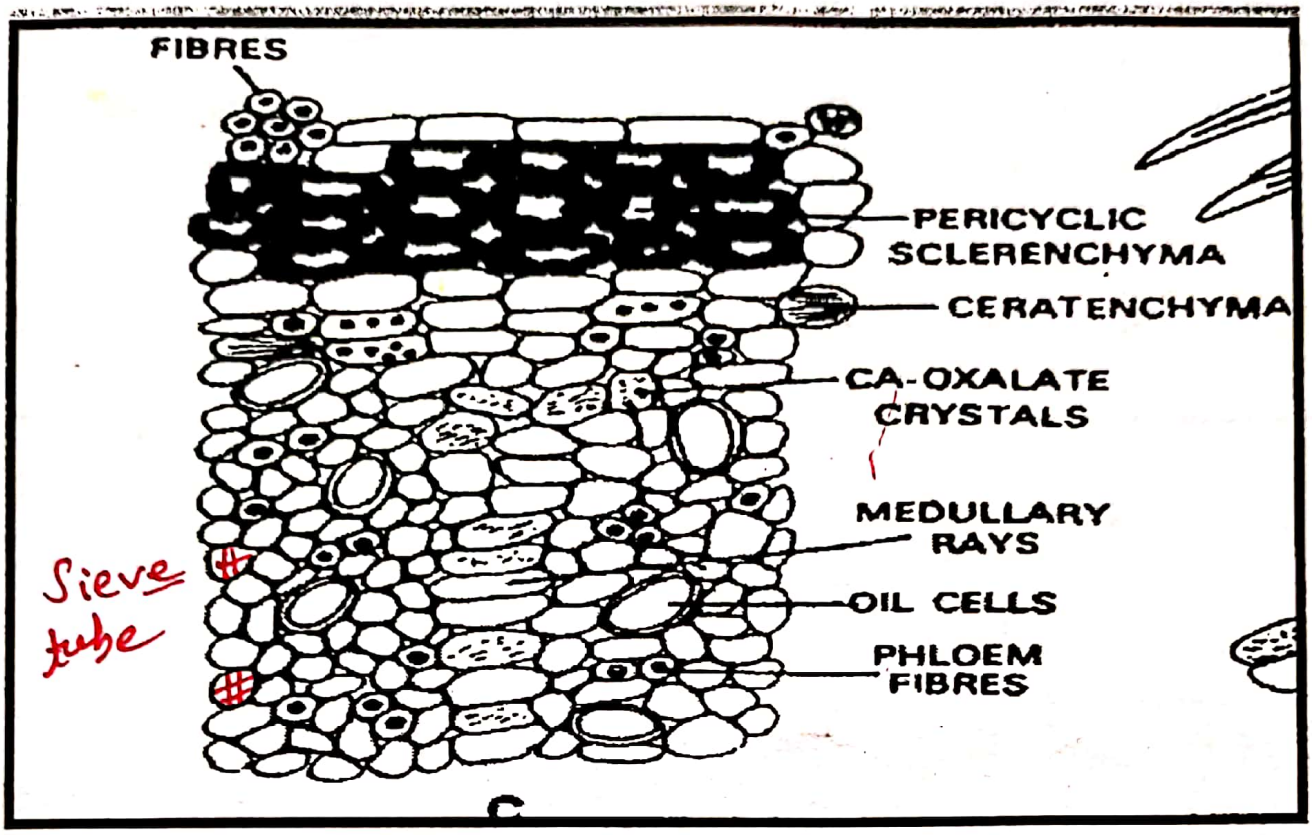
Honey dew stage:

The rye plant bears flowers at the end of spring. During this period, the spores of the fungus from the ascospore stage are carried by insects or wind and reach the flowers of Rye plant and deposit it at the base of the ovary. The spores germinate and produce hyphae. It penetrate into the walls of the ovary by enzymatic actions and forms a white mass known as Sphacelia. This Sphacelia secrete sweet saccharine yellowish coloured liquid called honey dew. Therefore, it is also called the honey dew stage.

Sclerotum stage or ergot stage or resting stage: The hyphae gradually penetrate deeper into the ovary & grow. The entire mass of ovary is now replaced by a hard ,compact, dark purple mass called sclerotium (or Ergot). The sclerotium is smaller initially . latre, it grows bigger and projects from the Rye plant.

Ascoporestage: Somesclerotia which are not collected fall on the ground.Thesesclerotia produce the stroma for the next year. This stroma has a stalk & round head. The head contains flask shaped pockets known as Perithecia. Perithecia contain asci. Each ascus contains eight ascospores. These ascospores are carried by insects or wind to the flowers of the Rye plant and the cycle is completed

Q.19. Describethe Microscopical /Anatomical Characters of Cinnamon Bark with neat labeled Diagram. (दालचीनी)



A transverse section shows

1. Sclereids with horse-shoe shaped thickening and containing starch grains.
2. Pericyclicfibres, lignified cells in groups of 6 to 15
3. Sieve tubes
4. Lignified phloem fibres, single or in groups of 2 to 4
5. Medullary rays usually biseriate
6. Idioblasts containing volatile oil & mucilage
7. Starch grains & calcium oxalate crystals in the medullary rays & parenchyma

Morphology

Colour - Pale brown in colour, inner surface is darker than outer surface

Odour -Aromatic

Taste- Warm Sweet

Shape - Long, flexible slender sticks consisting of either channeled pieces or single quills

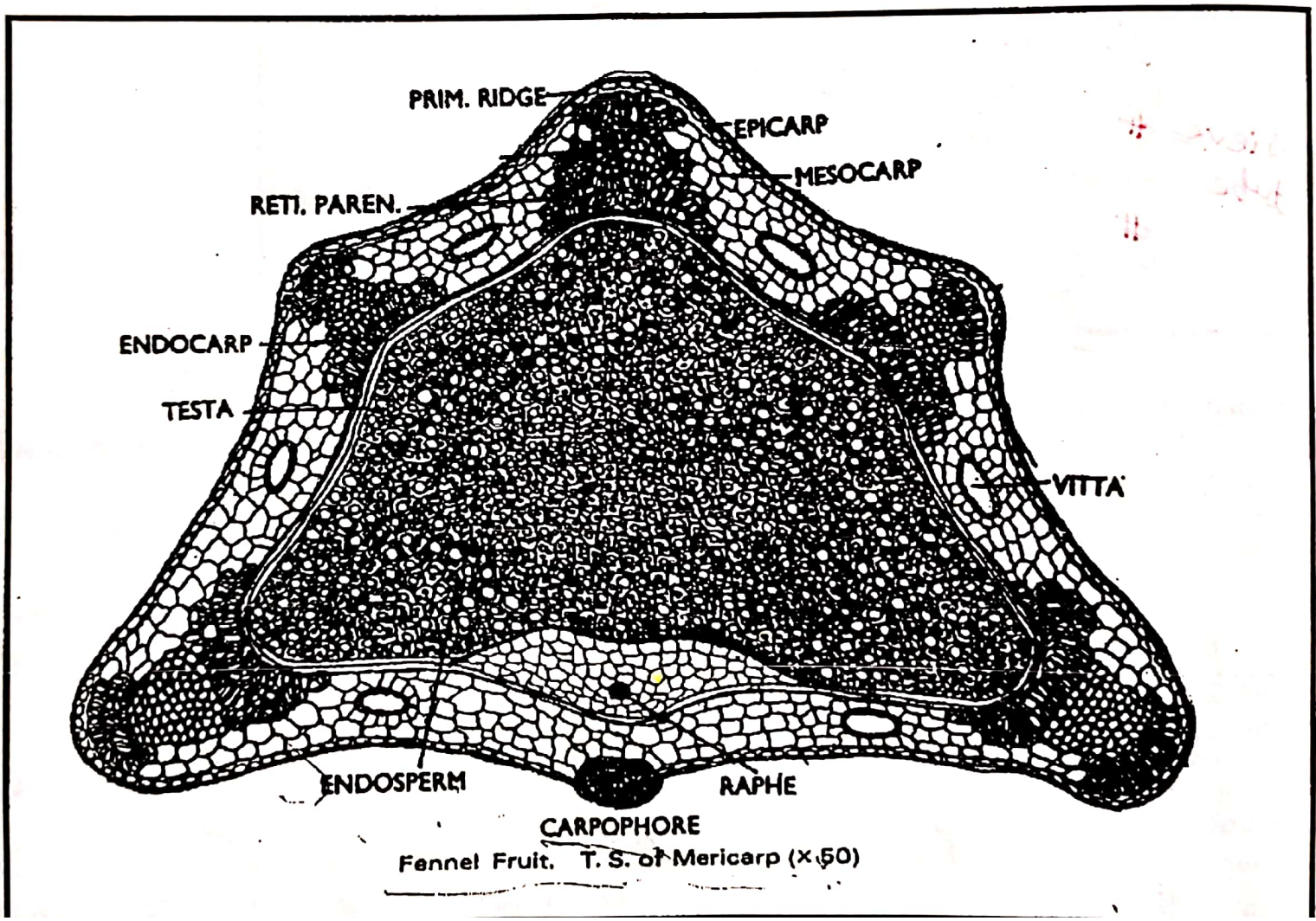
Fracture - Short& Splintery

Q.20.Describe the Microscopical /Anatomical Characters of Fennel with neat labeled diagram.

Ans

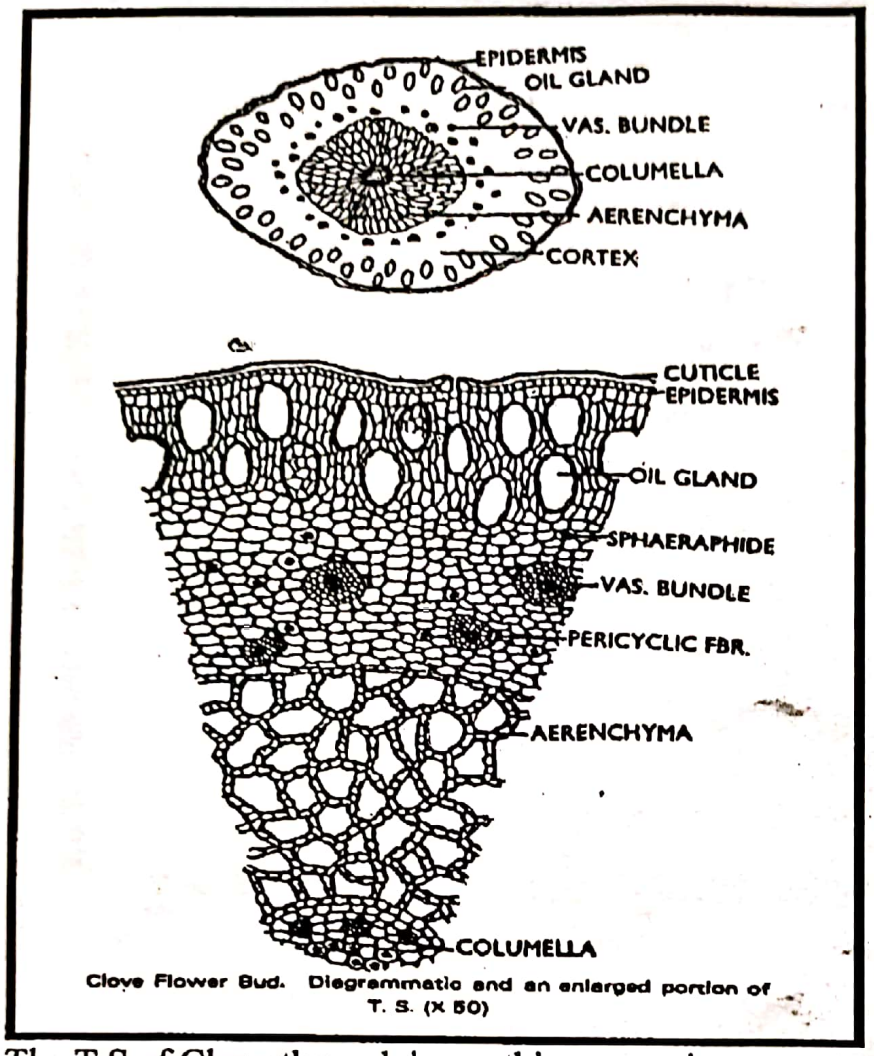
A transverse section of fennel shows:-

1. Epicarp – Polygonal cells showing a few stomata
2. Mesocarp – in the region of primary ridges, few vascular bundles with reticulate lignified parenchyma above and below.
3. Four vittae on the dorsal surface, two on the commissural surface
4. Endocarp – narrow elongated cells showing parquetry arrangement
5. Endosperm – cellulosic parenchyma with oil globules and aleurone grains



Fennel Fruit. T. S. of Mericarp (×50)

Q.21.Describe the Microscopical /Anatomical Characters of Clove with neat Labeled Diagram.



Clove Flower Bud. Diagrammatic and an enlarged portion of T. S. (X 50)

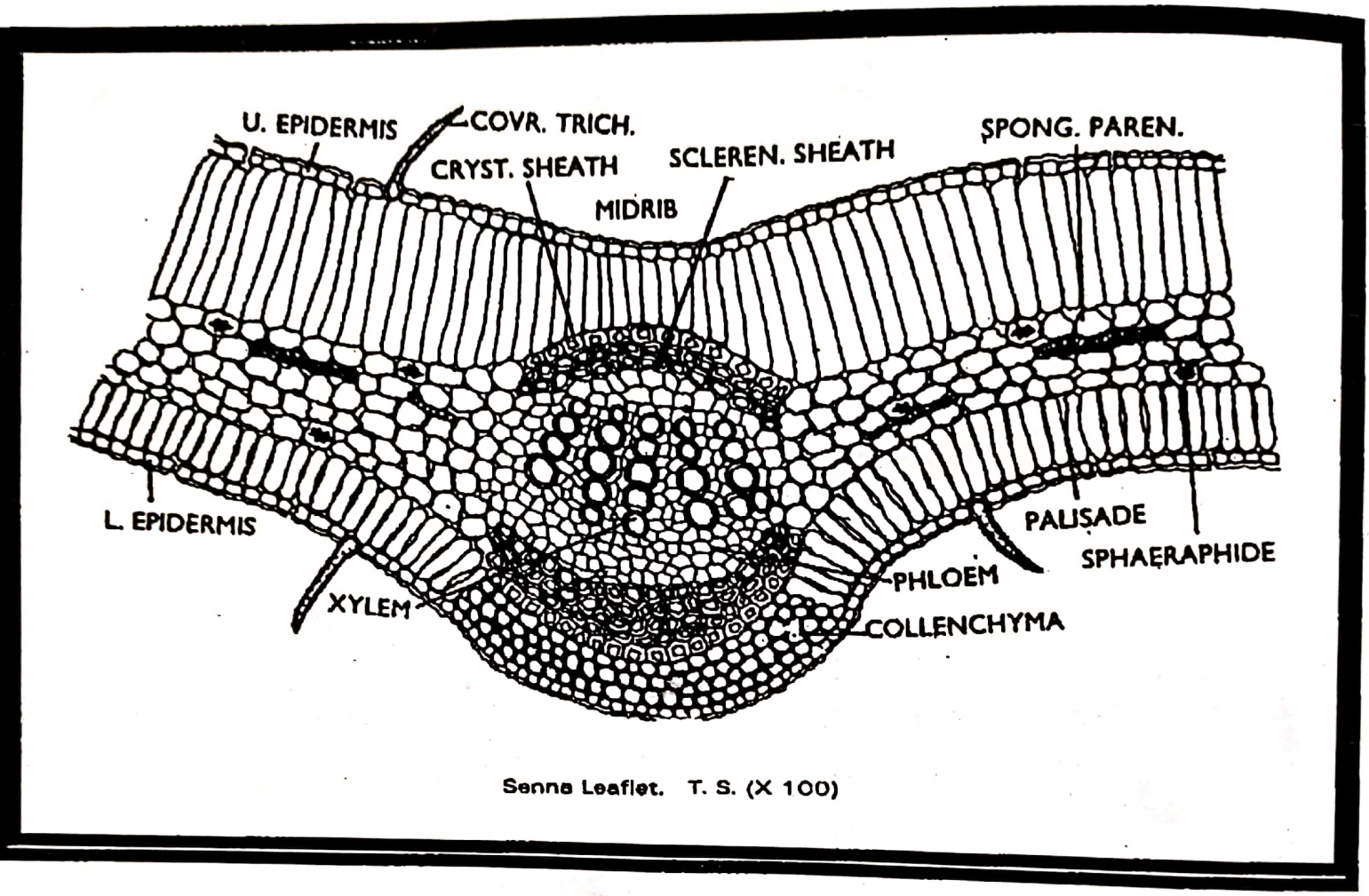
The T.S of Clove through hypanthium contains:

- Epidermis with thick cuticle and stomata
- Collenchymatous parenchyma containing numerous schizolysigenous oil glands
- Calcium oxalate clusters in parenchyma
- Zone of slightly thick walled cells embedding a ring of about 15 bilateral vascular bundles
- Meristele enclosed by lignified Pericyclicfibres
- Xylem of 5-6 lignified vessels
- Parenchyma containing air spaces or lacuna
- Central columella – thick walled parenchymatous cells containing cluster crystals of calcium oxalate and 20-25 small vascular bundles

Transverse section through region of ovary shows

- Ovary with ovarian wall
- Parenchymatousdessepiment
- Ovules with axile placentation
- Starch, prisms of calcium oxalate and stone cells are absent.

Q.22. Describe the Microscopical /Anatomical Characters of Senna with neat Labeled diagram.

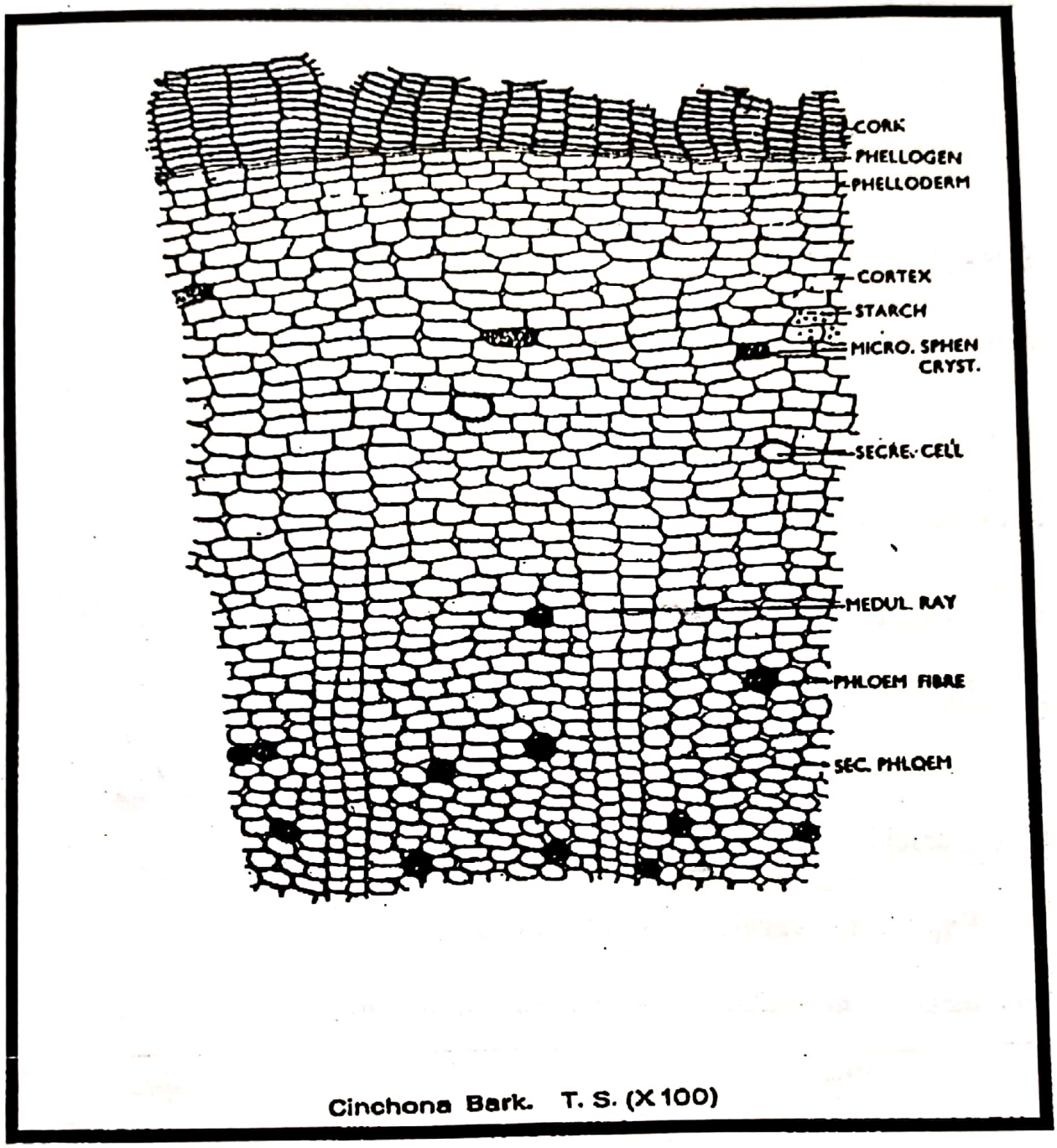


Senna Leaflet. T. S. (X 100)

The T.S of Senna consists of the following parts:

- Upper and lower epidermis – polygonal tabular cells with straight anticlinal walls
- Mucilage in the inner periclinal walls, stains red with ruthenium red
- Epidermal trichomes – unicellular, conical, thick walled with warty cuticle, curved at the base
- Palisade – a single layer below upper and lower epidermis, continuous over the Meristele but absent underneath
- Rubiaceous or paracytic stomata
- Large veins accompanied by calcium oxalate crystals
- Cluster crystals of calcium oxalate in palisade and spongy tissue, crystal sheath in mid rib region
- Meristele of radiate xylem and phloem with an arc of Pericyclicfibres below and sclerenchyma above

Q.23.Describe the Microscopical /Anatomical Characters of Cinchona Bark with neat labeled diagram.



Cinchona Bark. T. S. (X 100)

The T.S of cinchona Bark Contains:

- Cork with an occasional presence of lichens
- Parenchymatous cortex containing starch grains and microcrystals of calcium oxalate
- Secretion canals or tannin tubes
- Phloem fibres with Y shaped pits, either isolated or in radial rows of 2 to 4
- Sieve tubes with companion cells
- Phloem parenchyma
- Medullary ray, 1-3 seriate
- Stone cells absent

Q.24. Write the differences between fixed oils and Volatile Oils

FIXED OIL	VOLATILE OIL
They do not evaporate at room temperature	They evaporate at room temperature
These are obtained from seed	These are obtained from different parts of the plant e.g. Leaves
These are obtained by Expression of seed	These are obtained by distillation method
These have characteristic odour	These have sweet odour
These are insoluble in water	These are slightly soluble in water
These are glycosides of ester of fatty acids	These contain terpenes
These produce an greasy spot on paper	These do not produce greasy spot on paper
They can be saponified with alkalis	These cannot be saponified with alkalis
Physiologically, they are emollients & demulcents. Ex: Castor oil, arachis oil	These are used as carminatives & flavoring agents.Ex. Clove, Fennel.

Q.25. Define Evaluation. Explain the various methods of evaluation.

Ans. Evaluation of a drug means confirmation of its identity and determination of its quality and purity.

Different methods of evaluation:

1. **Organoleptic evaluation**
2. **Microscopic evaluation**
3. **Physical evaluation**
4. **Chemical evaluation**
5. **Biological evaluation**

I. Physical evaluation

Physical evaluations are to be determined for drugs, wherever possible. They are rarely constant for crude drugs but may help in evaluation of crude drugs. They are:

a. **Moisture content**
b. **Viscosity**
c. **Optical rotation**
d. **Melting point**
e. **Solubility**

f. **Refractive index**
g. **Ash value**
h. **Extractive value**

Moisture content: The moisture content is determined by heating a drug at 105^0 C in an oven to a constant weight.

Drugs	Moisture content (%age)
Aloes	10.0
Digitalis	05.0
Acacia	15.0
Starch	15.0

Melting point: It is one of the parameters to judge the purity of crude drugs.

Drugs	Melting point (°C)
Colophony	75-85
Cocoa butter	39-42
Bees wax	62-65
Hard paraffin	50-57

Solubility: The presence of adulterant in the drug is determined by solubility.

Drugs	Solubility
Colophony	Light petroleum
Castor oil	Alcohol
Asafoetida	Carbon di sulphide

Refractive Index: This method is used to determine the purity of the volatile oils and fixed oils.

Drugs	Refractive index
Arachis oil	1.4678 – 1.4698
Caraway oil	1.4838- 1.4858

Optical rotation: The optical rotation is determined at 25^0C using sodium lamp as the source of light.

Drugs	Angle of optical rotation
Caraway oil	$+70^0$ to $+80^0$
Clove oil	0^0 to -1.5^0

Extractives: Many a times , the extracts obtained by exhausting crude drugs are indicative of approximate measures of certain chemical constituents. The following are various methods used to find out extractive values.

(i) **Water soluble extractives:** This method is applied to drugs which contain water soluble active constituents such as tannins, carbohydrates and glycosides.

Drugs	Water soluble extractives (% w/w) Not less than
Aloes	25.0
Linseed	15.0
Senna leaves	30.0

(ii) **Alcohol soluble extractives:** Alcohol is an ideal solvent for extraction of various chemicals like resins and tannins.

Drugs	Alcohol soluble extractives (% w/w)
Aloes	Not more than 10.0
Rhubarb	Not less than 30.0
Vanilla	Not less than 12.0

II. Chemical evaluation:

It is the determination of active constituents in the drug by chemical methods. The following are various methods of chemical evaluation.

a. Instrumental methods
b. Chemical constants
c. Individual chemical tests
d. Microchemical tests.

Instrumental methods: They make use of a variety of instruments for evaluation. The following are some examples.

Colorimetry for alkaloids of solanaceae

Fluorimetry for quinine and reserpine

Spectrophotometry for lobeline and strychnine

Chemical constantslike acid value, iodine value and ester value are used for the identification of fixed oils and fats.

Individual chemical tests: These are used for identifying particular drugs. Examples: iodine test for starch, copper acetate test for colophony, Halphen's test for cotton seed oil.

Microchemical tests: These tests are carried on slides. For example, eugenol in clove oil is precipitated as potassium eugenate crystals by adding potassium hydroxide.

III. Organoleptic evaluation:

This type of evaluation involves tests carried with the help of sensory organs. It refers to :

i) Visual examination of morphological characters

ii) Examination of sensory characters like colour, odour, taste and texture

Morphological characters: It includes an examination of visual appearance. This is possible only when the drug is available in its entire form (eg. Leaves, roots, barks,etc)

Sensory characters:

1. **Colour:** Some drugs are green in colour when dried in shade. But they become pale when dried in sunlight.
2. **Odour:** Some drugs have characteristic odour which helps in their easy identification eg. Cardamom, cinnamon, clove etc

3. **Taste:** Drugs can be evaluated by taste also. For example glycyrrhiza is sweet in taste. Gentian and chirata are bitter. Ginger and capsicum have a pungent taste.

IV. BIOLOGICAL EVALUATION

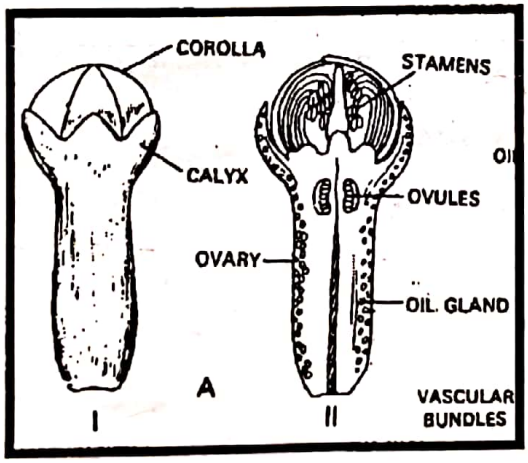
- In this method of evaluation the drugs are assayed by their pharmacological effects on living organisms like living cell, tissue, organ, bacteria fungi and living animal.
- This method is applied when the evaluation cannot be done by physical and chemical evaluation.
- This assay are also called bio-assay or biological assay because living organisms are used.
- The activity of drug used is represented in units know as international units (I.U)

Example: -

- Anthelmentic drugs like male fern are bio-assay on earth worms.
- Cardiotonic drugs like digitalis and stopanthus are bioassay on heart of the frog.
- Atropine is bio-assayed on eye of rabbit.
- Ergot is bio-assayed by on uterus of pregnant Rat.

Q.26. Write the morphological/ organoleptic characters of Clove.

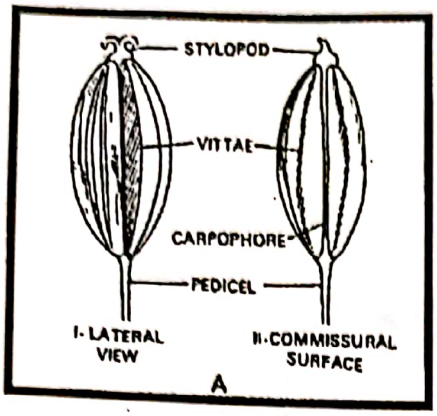
Answer –



Colour – Reddish brown in colour
Odour – Strong, spicy, aromatic odour
Taste - Pungent aromatic
Shape – crown, calyx, corolla, stamens and gynoecium

Q.27. Write the morphological/ organoleptic characters of fennel.

Ans-



Colour – Greenish brown in colour
Odour – Aromatic odour
Taste - Aromatic Taste
Shape – Five primary ridges prominent on the surface with a bifid stylopod at the apex.
Size- 5-10mm, 2-4mm broad, straight, oval in shape.

Q.28.Write the morphological/ organoleptic characters of Gokhru.
Ans:
Colour – Greenish to Grey in colour
Odour – Odourless
Taste -- Bitter Taste
Shape – Fruits are globose, Consisting of five to ten woody cocci.
Size - 1 to 1.5cm.

Q.29.Write the morphological/ organoleptic characters of Nux-Vomica.
Ans:
Colour – Greenish brown in colour.
Odour – None
Taste - Intensely bitter Taste
Shape – Disc shaped.
Size - 10-30mm in diameter

Q.30.Write the morphological/ organoleptic characters of Senna Leaf.
Ans:
Colour – Yellowish green in colour.
Odour – Slight
Taste - Mucilaginous, bitter Taste
Shape – Lanceolate.
Size - 7 to 60mm.

Identification tests/ Chemical tests

1. Cardiac glycosides:

Baljet Test: Take the glycoside and add sodium picrate reagent. A yellow to orange Colour is obtained.

Legal Test: Sample is dissolved in pyridine and sodium Nitroprusside solution. Make it alkaline, a pink Colour is obtained

Keller-killiani test:

- Boil 1 gram finely powdered digitalis with 10 ml of 70% alcohol for 3 minutes. The extract is filtered.
- To the filterate add 5 ml of water and 0.5 ml of lead acetate.
- Filter and treat the filtrate with equal volume of chloroform and evaporate to yield extract
- The extractive is dissolved in glacial acetic acid and after cooling, 2 drops of ferric chloride solution is added to it.
- These contents are transferred to a test tube containing 2 ml of concentrated sulphuric acid.
- A reddish brown layer acquiring bluish-green colour after standing is observed due to presence of digitoxose.

2. Anthracene glycosides:

MODIFIED BORNTRAGER TEST:
1gram of sample + 5 ml of ferric chloride + 5 ml of dilute HCL. Heat on water bath and cool. Sample is then extracted with benzene. Add equal volume of ammonia to the benzene extract. A pinkish red colour is obtained in the ammonia layer.

3. Tannins:

1. Gold beater skin test: A piece of gold beater skin, when treated with dilute Hcl, ferrous sulphate and test solution of tannin gives brown or black colour.
2. With ferric chloride solution, hydrolysable tannins give blue-black colour and condensed tannins gives brownish-green colour

4. Alkaloids:

Mayer's Test: Alkaloids + Mayer's reagent --------- white ppt.

Wagner's Test: Alkaloids + Wagner's Reagent ------Brown or Reddish brown ppt.

Dragandroffs Test: Alkaloids + Dragandroffs Reagent ----- Orang red ppt.

Hager's Test: Alkaloids + Hager's Reagent _____ Yellow Colour.

Pharmacognosy drugs list

Family	Drugs	Category/uses
Apocynaceae	Rauwolfia Vinca	Antihypertensive Anti-cancer/anti-tumour
Acanthaceae	Vasaka	Anti-tussive
Combretaceae	Arjuna	Cardiotonic
Euphorbiaceae	Amla Castor oil	Vitamin Laxative
Gentianaceae	Shankpushpi	Brain tonic and sedative
Labiateae or = Lamiaceae	Tulsi Mentha	Antibacterial and insecticidal Carminative, flavouring agent
Lauraceae	Cinnamon	Carminative, flavouring agent
Leguminosae	Senna Liquorice Catechu Tolu balsam Pterocarpus	Laxative Demulcent, sweetening agent, anti-spasmodic, anti-inflammatory Astringent, dye industry, cough, diarrhoea Expectorant, flavouring agent Antidiabetic
Loganiaceae	Nuxvomica (कुचला)	Bitter tonic Nervine tonic
Myrtaceae	Clove	Dental analgesic, carminative, flavouring agent
Nyctaginaceae	Punarnava	Diuretic and expectorant
= Liliaceae	Aloes	Laxative
Plantaginaceae	Ispaghula	Demulcent, laxative , emollient
Polygonaceae	Rhubarb	Laxative
Rananculaceae	Aconite (वत्सनाभ)	Neuralgia, anti-inflammatory

Rubiaceae	Cinchona Ipecac	Anti-malarial Emetic
Santalaceae	Sandalwood	Cosmetics
Scrophulariaceae	Digitalis Picrorrhiza	Cardiotonic Bitter tonic
Solanaceae	Ashwagandha Belladonna Datura	Hypotensive , anti-tumour, asthma, depressant, anthalmentic Parasympathetic depressant Parasympathetic depressant, asthma, cough, anti-spasmodic, CNS depressant.
Umbelliferae	Coriander Fennel Asafoetida	Carminative, flavouring agent Carminative, nerve tonic, intestinal anti-septic Carminative, anti-spasmodic, stimulant
Zygophyllaceae	Gokhru	Diuretic
Diascoreaceae	Diascorea	Synthesis of hormones, rheumatoid arthritis
Hypocreacea e	Ergot	Oxytocic
Zingeberaceae	Cardamom Ginger Turmeric	Carminative, flavouring agent Carminative, flavouring agent Anti-septic, spice, colouring agent
Papavaraceae	Opium	Narcotic-analgesic

CARMINATIVES (अनुलोमक)

Carminatives are the drugs which expels gas from the gastro-intestinal tract (GIT) and relieve pain in the stomach and intestine.

CORIANDER

(Coriandrum sativum (धनिया))

Botanical Source : It consist of dried fruits of **Coriandrumsativum**
Family : **Umbelliferae**
Chemical Constituent : D-linalool, geraniol and L-borneo
Uses : Carminative, Flavouring agent

FENNEL (सौंफ)

Botanical Source : It consist of dried fruits of Foenculumvulgare (Foeniculum vulgare)
Family : **Umbelliferae**
Chemical Constituent : fenchone, Anethol.
Uses : Carminative, Flavouring agent

ASAFOETIDA (हिंगु)

It is oleogum resin

Botanical Source : It consist of dried roots and Rhizomes of **Ferula foetida**
Family : **Umbelliferae**
Chemical Constituent : Ferulic acid, umbelliferone.
Uses : Carminative, Flavouring agent

GINGER (आर्द्रक)

Botanical Source : It consists of dried Rhizomes of **Zinger officinale**
Family : **Zingiberaceae**
Chemical Constituent : Zingiberene, Gingerol
Uses : Carminative, Flavouring agent

CINNAMON BARK (दालचीनी)

Botanical Source : It consists of dried barks of **Cinnamomumzeylanicum.**
Family : **Lauraceae**
Chemical Constituent : Volatile oil, Tannin, Starch.
Uses : Carminative, Flavouring agent

CARDMOM (इलायची)

Botanical Source : It consists of dried ripe fruits of **Elettariacardamomum.**
Family : **Zingiberaceae**
Chemical Constituent : Cineole.
Uses : Carminative, Flavouring agent

LAXATIVES

Laxatives are the drugs which loosen the bowels and promote defecation. It is used to get relief from the constipation.

ALOES (कुमारी)

Botanical Source : It consists of dried Juice of **Aloe barbadensis.**
Family : **Liliaceae**
Chemical Constituent : Aloe-emodin, Barbaloin
Uses : Laxatives and purgatives, used in cosmetic Preparation.

CASTOR OIL (एरण्ड)

Botanical Source : It consists of fixed oil obtained by the cold expression of the Seeds of **Ricinuscommunis.**
Family : **Euphorbiaceae**
Chemical Constituent : Ricinoleic acid, Isoricinoleic acid.
Uses : Purgatives and Lubricant.

SENNA

Botanical Source : It consists of dried leaflets of **Cassia angustifolia.**
Family : **Leguminosae** (Fabaceae)
Chemical Constituent : Sennosides (A, B, C, D) 'Anthracene glycosides'
Uses : Laxatives and purgatives.

ISPAGHULA

Botanical Source : It consists of dried Seeds of plant **PlantagoOvata.**
Family : **Plantaginaceae**
Chemical Constituent : Pentosan and aldovbonic acid.
Uses : Laxatives, Emollient and Demulcent.

RHUBARB

Botanical Source : It consists of dried Rhizomes of **Rheum emodin.**
Family : **Polygonaceae**
Chemical Constituent : Aloes-emodin, Rhein. Anthracene glycosides
Uses : Mild Purgatives.

CARDIOTONICS

Cardio tonic are the drugs which increase the force of contraction of Cardiac muscles and also stimulate the overall activity of the heart.

DIGITALIS (डिजिटेलिस)

Botanical Source : It consists of dried leaves of **Digitalis purpurea.**
Family : **Scrophulariaceae**
Chemical Constituent : Cardiac glycosides and Purpurea glycosides A & B.
Uses : Used as a cardio tonic.

ARJUNA

Botanical Source : It consists of dried Stem barks of the plant **Terminaliaarjuna.**
Family : **Combretaceae**
Chemical Constituent : Tannins, Saponins, Arjunic acid, Cardiac glycosides
Uses : Used as a cardio tonic.

ANTI-HYPERTENSIVES

These are the drugs used in the treatment of high blood pressure (Hypertension). / Anti hypertensive drugs

RAUWOLFIA (सर्पगंधा)

Botanical Source : It consists of dried Roots of the plant of **Rauwolfia serpentina.**
Family : Apocynaceae
Chemical Constituent : Reserpine, reserpinine, serpentine, serpentinine.
Uses : Used in the treatment of hypertension.

ANTI-CANCER/ ANTI-TUMOUR

These are the drugs used in the treatment of Cancer/Tumour are called as anticancer or anti-tumour drugs.

VINCA Catharanthus roseus

Botanical Source : It consists of dried whole plant of **Catharanthusroseus.**
Family : **Apocynaceae**
Chemical Constituent : Vincristine and vinblastine.
Uses : Used in the treatment of Cancer.

→ Cough supression (Dry cough)

ANTITUSSIVES: These are the drugs which act upon the Pulmonary membranes and expel the bronchial mucous or secretions. It is used in cough preparation. (Expectorants)

VASAKA

Botanical Source : It consists of dried and fresh leaves of **Adhatodavasica.**
Family : **Acanthaceae**
Chemical Constituent : Essential oil, alkaloids.
Uses : Used as an Expectorant, Bronchodilator.

TULSI

Botanical Source : It consists of dried and fresh leaves of **Ocimum sanctum.**
Family : **Labiatae**
Chemical Constituent: Eugenol, Eugenol-methyl-ether.
Uses : Used as an Antitussive, Antibacterial.

TOLU BALSAM

Botanical Source : Balsam of Tolu is solid or semi-solid balsam obtained from the trunk of **Myroxylonbalsamum.**
Family : **Leguminosae**
Chemical Constituent : Cimmamic acid, Benzoic acid.
Uses : Used as an Expectorant, Flavouring agent.

SEDATIVES

These are the drugs which are used to relieve anxiety and tension without producing sleep.

ASWAGANDHA
Botanical Source : It consists of dried roots and stem of **Withaniasomnifera.**
Family : **Solanaceae**
Chemical Constituent : Tropine,pseudotropine.
Uses : Used as Depressant and hypotensive.

DATURA
Botanical Source : It consists of dried leaves and flowering tops of **Daturametel.**
Family : Solanaceae
Chemical Constituent: Hyoscine, Hyoscyamine.
Uses : Used as Parasympathetic depressant, Used in the treatment of asthma and cough.

Drugs acting on Central Nervous System (CNS)

OPIUM
Botanical Source : It consists of dried Latex obtained from the unripe capsules of the Plant **Papaver somniferum.**
Family : **Papaveraceae**
Chemical Constituent : Morphine, codeine.
Uses : Used as Narcotic analgesic, Used as an Expectorant.

NUX-VOMICA
Botanical Source : It consists of dried ripe seeds of **StrychnosNux-vomica.**
Family : **Loganiaceae**
Chemical Constituent : Strychnine and brucine.
Uses : Used as Bitter tonic, CNS stimulant.

ACONITE
Botanical Source : It consists of dried Tuberous Roots of **Aconitum napellus.**
Family : **Rananculaceae**
Chemical Constituent : Aconine, Aconitine
Uses : Used in the treatment of Neuralgia, Rehumatism.

ANTI- ASTHAMATIC

These are the drugs which are used in the treatment of asthma.

EPHEDRA
Botanical Source : It consists of dried young srem of Ephedra Gerardiana.
Family : Gnetaceae (Ephedraceae)
Chemical Constituent : Ephedrine, Nor ephedrine.
Uses : Asthma, Hay fever and whooping Cough.

DIURETICS

Diuretics are the drugs which increase the flow of urine.

GOKHRU

Botanical Source : It consists of dried ripen fruits of the plant **Tribulusterrestris**
Family : **Zygophyllaceae**
Chemical Constituents : Alkaloids (harmine,Harman), saponins (diosgenin,gitogenin)
Uses : Used as diuretics, used in the treatment of painful micturation.

PUNRANAVA

Botanical Source : It consists of fresh and dried herb known as **Boerhaaviadifussa.**
Family : **Nyctaginaceae**
Chemical Constituent : Alkaloids(Punarnavine), potassium nitrate, ursolic acid.
Uses : Used as diuretic and as expectorant.

ANTI-DIABETICS

The drugs used in the treatment of diabetes are known as antidiabetics.

GYMNEMA

Botanical Source : It consists of the leaves of the plant known as **Gymnemasylvestre.**
Family : **Asclepiadaceae**
Chemical Constituents: Gymnemic acid, Tartaric acid, formic acid.
Uses : Used as antidiabetic.

PTEROCARPUS

Botanical Source : It consists of the dried juice of the plant **pterocarpusmarsupium.**
Family : **Leguminosae**
Chemical Constituent :Kinotannic acid, resin and gallic acid
Uses : Antidiabetic, diarrhoea and dysentery.

ANTIMALARIAL

These are the drugs used in the treatment of malaria.

CINCHONA

Botanical Source: It consists of the dried bark of the plant **cinchona calisaya, C.officinalis.**
Family : **Rubiaceae**
Chemical Constituent : cinchonine, cinchonidine, quinine, quinidine
Uses : used as antimalarial.

ANTILEPROTIC

These are the drugs used in the treatment of leprosy caused by the micro-organism **Mycobacterium leprae.**

CHAULMOOGRA OIL

Botanical Source : Chaulmoogra oil is a fixed oil obtained from ripe seeds of the Plants **Hydnocarpusanthelminitica.** Hydnocarpus anthelminthicus
Family : **Flacourtiaceae**
Chemical Constituent :Chaulmoogric acid and hydnocarpic acid
Uses : used in the treatment of leprosy.

ANTI-DYSENTERICS

These are the drugs used in the treatment of dysentery.

IPECACUANHA(Ipecac)

Botanical Source : It consist of dried roots or rhizomes of ~~Cephaelisipecacuanha~~ Carapichea ipecacuanha
Family : **Rubiaceae**
Chemical Constituent : Emetine, cephaeline
Uses : used in the treatment of dysentery, used as emetic.

ANTISEPTICS & DISINFECTANTS

Antiseptics are the agents which are used to prevent or kill the microbes when applied on the living tissues.

Disinfectants are the agents which are used to prevent or kill the microbes when applied on the non-living substances.

NEEM

Botanical Source : It consist of leaves and aerial parts of the plant **Azadirachtaindica**
Family : **Meliaceae**
Chemical Constituent: Azadirachtin, salanin
Uses : used as antiseptics and insecticides.

TURMERIC

Botanical Source : It consist of fresh and dried rhizomes of the plant **Curcuma longa**
Family : **Zingiberaceae**
Chemical Constituent :Curcumin, volatile oil
Uses : used as antiseptics, expectorant, spice and colouring agent.

OXYTOCICS

The substances which cause expulsion of the foetus from the uterus by contracting the uterine muscles are known as oxytocics.

ERGOT

Botanical Source : It is a dried sclerotium of a fungus **Clavicepspurpurea.**
Family : **Hypocreaceae**
Chemical Constituent : Ergometrine, ergotamine
Uses : Used to assist delivery and to reduce post-partum haemorrhage.

VITAMINS

Vitamins are the organic molecules, essential for the maintenance and healthy body functions.

SHARK LIVER OIL

Biological Source : It is a fixed oil obtained from the fresh livers of various species of the shark, mainly **Hypoprionbrevirostris.** Hypoprion brevirostris
Chemical Constituent : Vitamin - A
Uses : Source of vitamin A.

AMLA

Botanical Source : It consist of dried as well as fresh fruits of the plant **Emblicofficinalis**
Family : Euphorbiaceae
Chemical Constituent : Vitamin - C
Uses : Source of vitamin

ENZYMES

Enzymes are the proteineous substances, which serve a role of catalysing the biochemical reactions.

PAPAIN

Botanical Source : It is a cultivated fruiting tree known as **Carica papaya.**
Family : **Caricaceae**
Chemical Constituent : Papain
Uses : Used as digestant and anti-inflammatory agent.