# LABORATORY MANUAL OF PHARMACOGNOSY

**PUBLISHED BY PHARMACY DEPARTMENT**
**KALANIKETAN POLYTECHNIC COLLEGE**
**JABALPUR M.P.**

**SPONSORED BY STATE PROJECT FACILITATION UNIT &**
**DIRECTORATE OF TECHNICAL EDUCATION BHOPAL M.P.**

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# Foreword

The Pharmacy Department of Kalaniketan Polytechnic College Jabalpur is one of the premier institutes in the state. The Department is committed to provide quality education in the field of pharmacy. In today's highly competitive aura, the Department is capitalizing its intellectual strengths in areas such as academic knowledge, practical skills, and problem solving orientation, high ethical standards and comprehensive approach towards education delivery system. In this way Pharmacy Department is making all out efforts towards **"India as a Knowledge Society".**

The Department persistently endeavors to develop the students with high technical skills. It increases the student's competency to encounter the day to day problem in their professional working.

With the objectives of preparation of well planned & systematic Lab. Manuals, a workshop was organized by the Pharmacy Department on January 11-13, 2010 was a sincere effort. The objective of the workshop on "**Design & Development of Pharmacy Laboratory Manuals**" was to design and develop experiments as per the demand and need of the industry. By including such comprehensive approach towards getting sufficient practical knowledge of pharmacy definitely help pharmacy students for getting better jobs and becoming professional.

I wish them all good luck.

**DIRECTOR**
**DIRECTORATE TECHNICAL EDUCATION**
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# References

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3. Handa, S.S. & Kapoor, V.K.; "Pharmacognosy" Vallabh Prakashan Delhi Second edition.2003.
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# Preface

The education system cannot be said to be complete without its practical aspects. The basics behind the Laboratory work in any subject are the training it gives in well planned, organized and systematic manner. The pharmacy discipline is basically defined as the art and science of making drugs. Therefore key to this profession is the Laboratory or experimental work done by the pharmacy students and the educators. The Pharmacy council of India (PCI) has also incorporated guidelines on the conduction of experiments in its Education Regulations.

The Pharmacy Dept. of this institute has initiated the development of the Laboratory manuals. Some of the preliminary exercise and preparatory work was done by the dept in recent past.

With these objectives a workshop was organized on January 11-13, 2010. The key factor behind conduction of workshop on "**Design & Development of Pharmacy Laboratory Manuals**" was the experience of so many problems faced in the past few decades in respect of having good Lab Manuals for pharmacy students. A well defined and systematic approach to prepare comprehensive Lab manual surely assist the students, the technicians and the educators. So far very less effort have been made in our country towards a comprehensive Lab manual .This effort is being made to make our laboratories well equipped in all respects.

Experts from all part of the country had participated in the workshop and shared their view for having good Lab manual for pharmacy students. Preparation of good Lab Manuals was taken as major issue in India and now it is essential for educators and pharmacy students to learn and have sufficient practical knowledge of pharmacy for getting better jobs and becoming professional.

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# Curriculum

**PRACTICAL (75 hours)**

**1.** Identification of drug by morphological characters.

**2.** Physical and chemical tests for evaluation of drugs wherever applicable.

**3.** Gross anatomical studies (t.s) of the following drugs: Senna, Datura, Cinnamon, Cinchona, Coriander, Fennel, Clove, Ginger, Nuxvomica, Ipecacuanha.

**4.** Identification of fibres and surgical dressings.

## LEARNING CONCEPT

Man knows disease since origin of human being, but causes of them were not known. They were assumed evil spirits. So people tried to cure them with plants, which are easily available. In that way ancestors accumulated knowledge of plants and preserved them in literature such as,

1. Rigveda
2. Ayurveda (ancient science of life)
3. Materia medica
4. Ebers papyrus

In all the old texts, preference has been given to description of plant as compared to other characteristics.

The word 'Pharmacognosy' was coined in 1815 by C. A. Seydler. Pharmacognosy initially known as materia medica may be defined as scientific study of those substances ( plant and animal origin ) which are used or have been used in medicine and pharmacy. Pharmacognosy can be considered as a valuable part of the cultural heritage of pharmacy. The name Pharmacognosy is formed from two Greek word 'Pharmakon' meaning drug and 'gnosis' meaning knowledge. The modern aspect of Pharmacognosy includes not only the crude drug but also covers their chemical scrutiny, leading to isolation of active principles.

This subject deals with biological, biochemical, therapeutic and economic features of natural drugs and their chemical constituents. Even we are moving with great pace in the 21st century, Herbal medicine, cosmetics, Ayurvedic dosage form and research in the field of herbal formulation are of great interest. Therefore it is need of time to explore into area of systematic knowledge about herbal drugs.

In recent year, popularity of natural drug is considered as an important contribution of Pharmacognosy in modern medicine.

# GUIDELINES FOR TEACHERS

1. **Learning Overview** : To develop better understanding of importance of the subject
2. Know your laboratory: to understand the layout of laboratory, specification of equipment, procedure, working in groups, planning time etc. also to know total amount of work to be done in the laboratory.
3. Explain prior concepts to the students before starting of each experiment.
4. Involve the student's activity at the time of conduct of each experiment.
5. Wile taking observation each student (from batch of 20 students) shall be given a chance to perform the experiment. A sufficient number of computers shall be available.
6. If the experiment setup has variations in the specifications of the equipment, the teachers are advised to make necessary changes, wherever needed.
7. Teacher shall assess the performance of students continuously as per norms prescribed by PCI & RGPV
8. Teacher is expected to share the skills and competencies to be developed in the students.
9. Teacher may provide additional knowledge and skill to the students even though not covered in the manual but are expected from the students by the industries.
10. Teacher may suggest the students to refer additional related literature of the technical papers, reference books, seminar proceedings, etc.

# INTRODUCTION

Pharmacognosy- The study of medicines to improve health derived from natural sources such as herbs. The American Society of Pharmacognosy defines Pharmacognosy as “the study of the physical, chemical, biochemical and biological properties of drugs, drug substances or potential drugs or drug substances of natural origin as well as the search for new drugs from natural sources.”

This includes the study of plant structure, reproduction, active ingredients and nutrients-vitamins, minerals, sugars, starches and chemical constituents.

Examples
Foxglove has a cardiac glycoside that creates Digitoxin-a drug that helps to regulate the heart.

Understanding the chemical constituents helps us scientifically determine how herbs work for specific conditions and to generally increase our wellness. The holistic method is to use the whole herb, not just the extracted active components. Treating conditions in this way helps to address the whole person and not just the disease.

**Carbohydrates** :Carbohydrates in any form of sugar-provides nutrition and energy as a starch, monosaccharide, disaccharide, polysaccharide, inulin, pectin, gum and mucilage. Examples: marshmallow, comfrey, plantain, slippery elm and aloe vera
**Glycosides:Glycosides** are chemically sugar combined with a non-sugar (a-glycone) soluble in water and alcohol.
**Cardiac Glycosides**: effect on the heart-increase efficiency of heartbeat-very dangerous plants and should not be used internally. Examples: foxglove, lily of the valley
**Anthraquinone Glycosides**: laxative, purgative effect-should always be taken with a carminative. Examples: rhubarb, senna
**Flavonoids**: These antiviral, antispasmodic, antifungal, anti-inflammatory, antibacterial, diuretic, heart and circulation stimulants. Examples: hawthorn, raspberry, ginko
**Phenols and Phenolic Glycosides**:These are carbon-based, antiseptic, febrifuge, analgesic. Examples: clove, thyme
**Coumarins:** They are sweet, aromatic, blood thinning, reducing blood clots. Example: black haw, red clover, angelica, licorice
**Saponins**: They are water-soluble and form lather, similar to human sex and stress hormones. Examples: fenugreek, licorice, sarsaparilla, wild yam.
**Acids**: cleans and detoxifies, stimulates pancreatic and bile secretions
Tannic Acid: astringent, promotes rapid healing, swelling, inflammation, cuts, hemorrhoids, varicose ulcers. Examples: red clover, yarrow, willow bark, black haw, blackberry
**Alkaloids:** Alkaloids are formed when nitrogen isn’t fully used for protein productions.

There are 5000 known alkaloids that have diverse and profound effects-especially on the central nervous system. Typically have a bitter taste-nicotine, caffeine, morphine, opium poppy, codeine. Examples: Oregon grape, goldenseal, barberry

**Pyrrolizidine alkaloid (PAs):** It can cause liver blockage.They are contraindicated in pregnancy, nursing, and liver diseases. Examples: comfrey, coltsfoot

**Essential or Volatile Oils:** unstable and easily separate from the plant to vaporize into air, when plant is crushed or exposed to the sun. Used in aromatherapy, perfumes and insect repellent. Examples: rosemary, thyme, mint

**Bitter:** They stimulate secretion of digestive juices and bile. Taken before or after meals to stimulate appetite and alleviate indigestion. Examples: gentian, wormwood, goldenseal

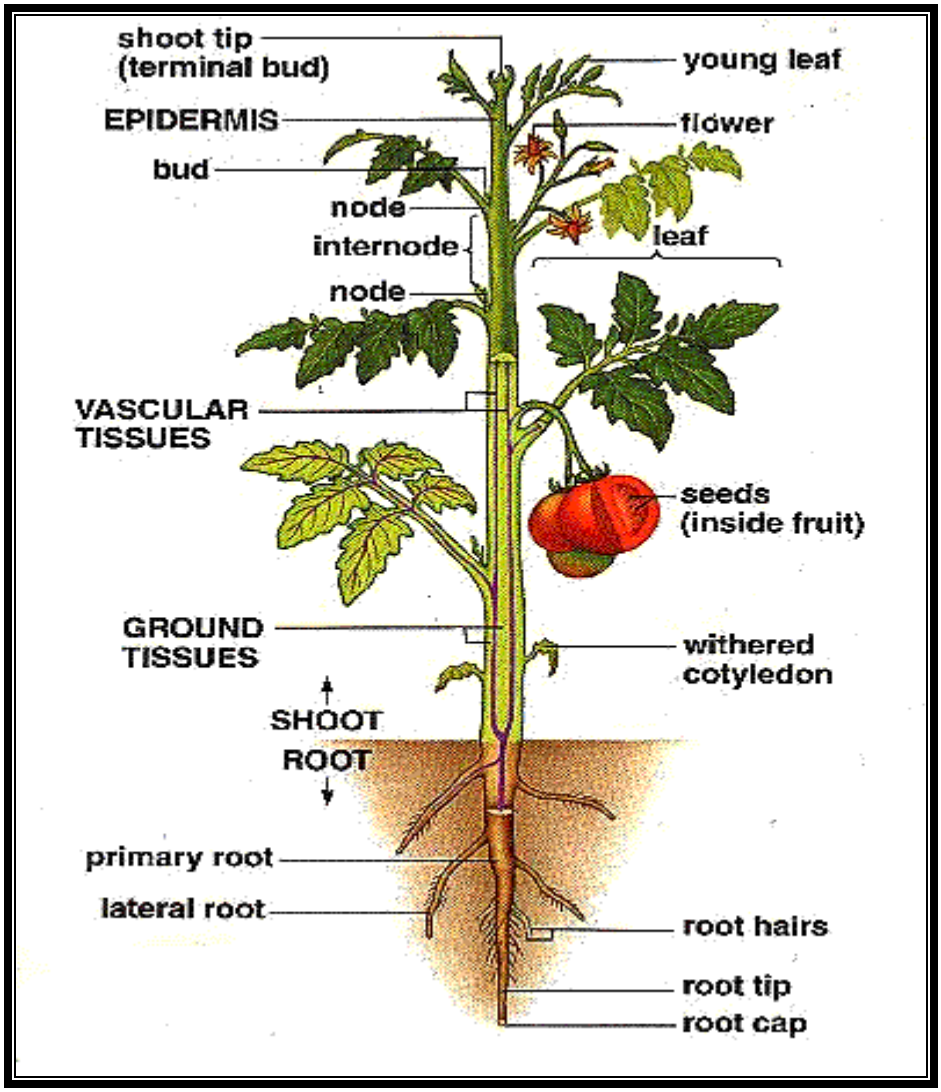
**Resins** :It is a translucent plant secretions yellow to brown in color and sticky formed from oxidized volatile oils. Expectorant, stimulating, diaphoretic, diuretic. Examples: myrrh, frankincense

Plants also contain vegetable oils, vitamins, trace elements, chlorophyll, oleoresins, alcohols, acrids, latex, gelatins, lipids, enzymes, proteins, balsams and coloring matter.

Through knowledge of our medicinal herbs and their chemical constituents natural healing can be better understood and used to improve health and wellness.

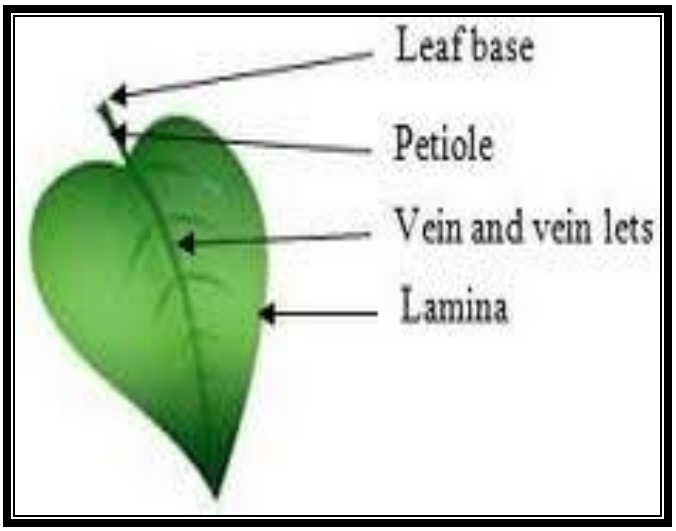
# CHAPTER- 2

# MORPHOLOGY



# Section A

## Leaf



# Morphology

The main parts of the leaf are: the blade and the petiole.
The **blade** consists of the upper epidermis, the lower epidermis, the mesophyll that lies in between and the vascular tissue.

**Epidermis** (upper and lower) consist of a single layer of cells, covered by the cuticle (a waxy substance), or, in some species, hair. Their role is protective against harmful pathogens. They also regulate water loss through the leaf. Between the epidermal cells there are specialized cells (guard cells) that form the leaf stomata and control their function. Stomata are small pores that regulate gas exchange
**Mesophyll** -In dicotyledonous plants, the **mesophyll** consists of two parts:

- The palisade mesophyll lies below the upper epidermis. It is formed by cells rich in chloroplasts.
- The spongy mesophyll lies below the palisaded mesophyll. It is formed by loosely arranged cells.

In monocotyledonous plants the mesophyll consists of a single type of cells, without any further differentiation into the above layers. A special type of cells (bundle sheath cells), surround the vascular network of the leaf.
The **vascular network** lies in the spongy mesophyl and it consists of the xylem and the phloem.

- The xylem is placed towards the upper surface of the leaf and it carries nutrients and water from the roots to the leaves.
- The phloem lies close to the lower surface of the leaf and it carries the products of photosynthesis from the leaves to the rest of the plant.

**FUNCTIONS-**

1. **Photosynthesis**: The process by which plants use light to convert water and $CO_2$ to nutrients and oxygen. It takes place in the chloroplasts.

2. **Respiration**: The process of nutrient catabolism that results in production of water and $CO_2$. It takes place during the night.

3. **Transpiration**: The release of water through the stomata. It ensures the constant circulation of the water inside the plant and also aids thermoregulation.

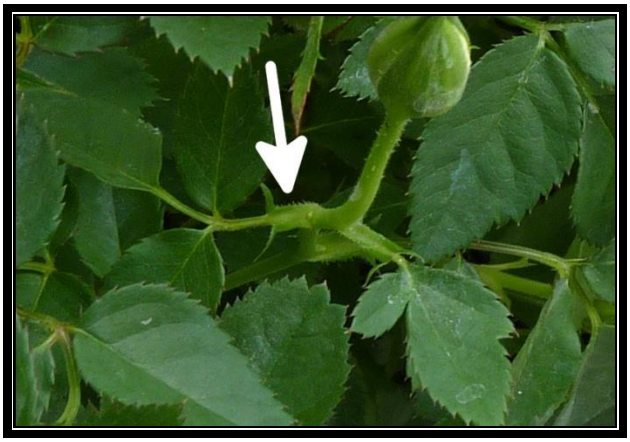
**MORPHOLOGY-**

**1. Leaf types**

**Bracts**- Modified leaves that are often related to the flower. The can be coloured and are usually smaller that the main leaves. There role is mostly protective.

**Bracts of Bougainvillea**

**Stipules:** Modified leaves that grow at the point where the petiole attaches to the stem. Their role is protective. In some species they look like thorns (eg. certain species of Euphorbia, Acacia etc).



**Rose stipule**

**Cotyledons** - Cotyledons are the first leaves to emerge.

**Passiflora cotyledons**

**Tendrils:** Modified leaves, stems or petioles that are used by many climbing plants (eg. Vitis, Passiflora, Sweet pea etc).

**Tendrils of Lathyrus sativus**

**Phyllodes:** Modified, flattened stems that take part in photosynthesis.

**Simple leaves of Ipomoea**

**2. Distinction based on their structure:**

**Simple**: Their blade is undivided, and may be lobed or not.

**Compound**: They are divided into smaller leaflets and are further classified as palmately compound, pinnately compound, bipinnately compound etc.

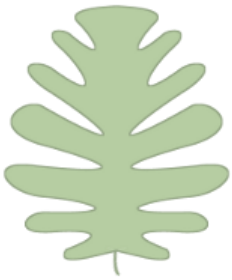
Palmately compound leaves of Dicentra.

Bipinnately compound leaves of Albizia.

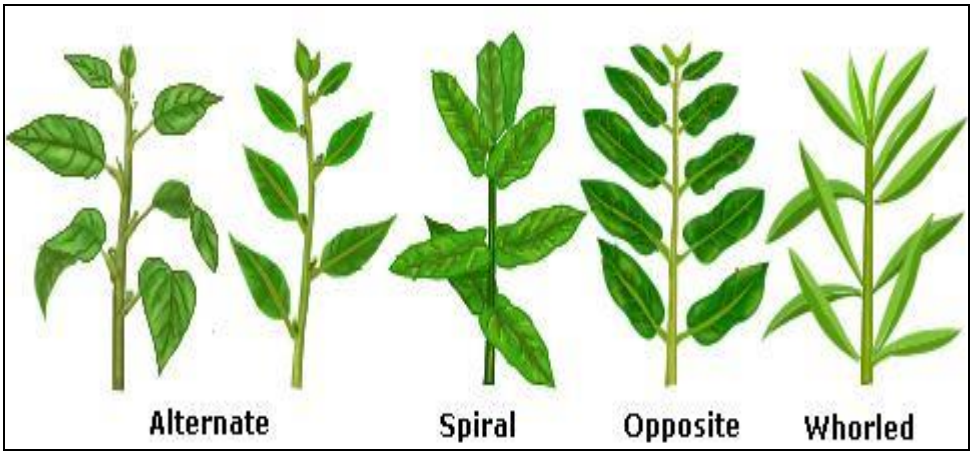
**3. Distinction based on their shape:**

| | | | |
|---|---|---|---|
|  | Acicular |  | Linear |
|  | Lanceolate |  | Falcate |
|  | Subulate |  | Acuminate |
|  | Aristate |  | Cordate |

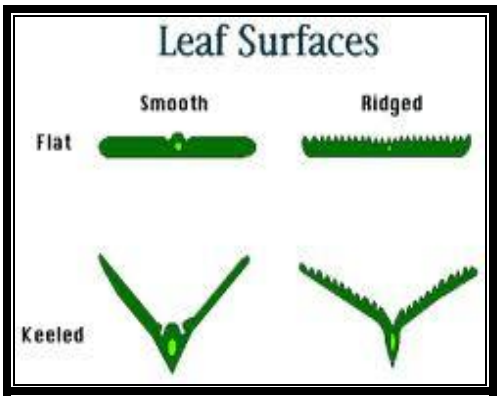
| | | | |
|---|---|---|---|
|  | Obcordate |  | Flabellate |
|  | Deltoid |  | Ovate |
|  | Obovate |  | Cuneate |
|  | Elliptic |  | Oblong |
|  | Spatulate |  | Rounded |

| | | | |
|---|---|---|---|
|  | Rhomboid |  | Reniform |
|  | Palmate |  | Lobed |

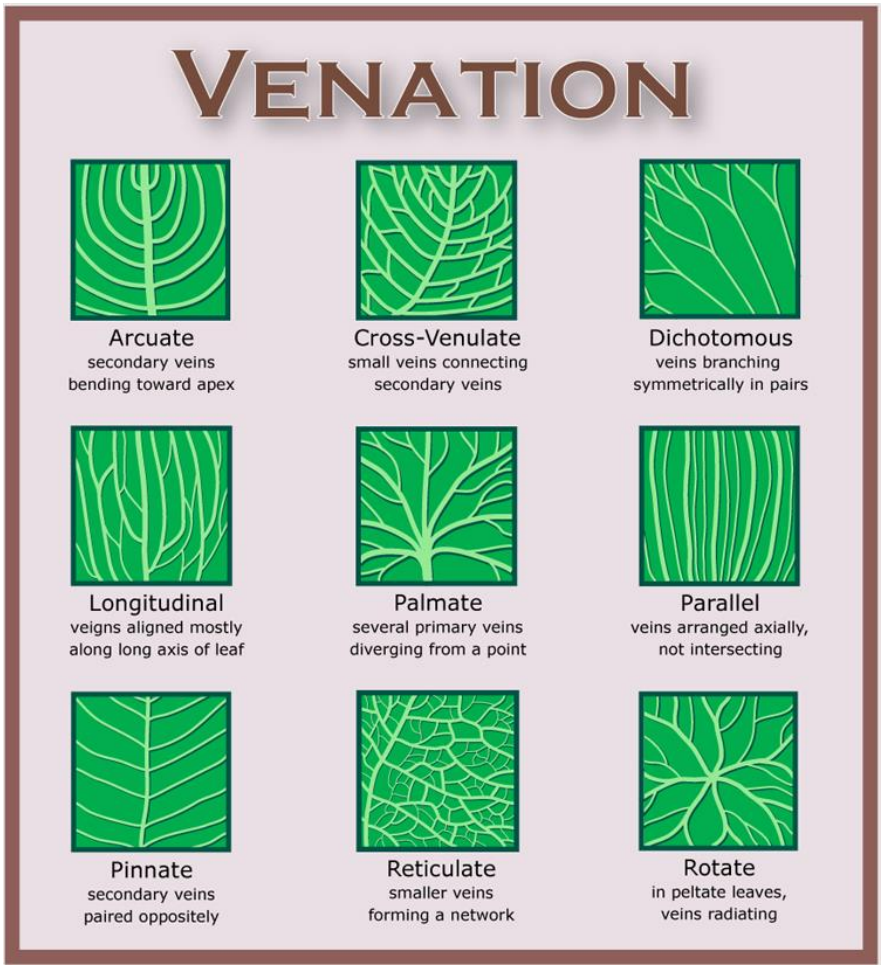
**4 Distinction based on their arrangement (phyllotaxis)-**




**5. Distinction based on their texture-**



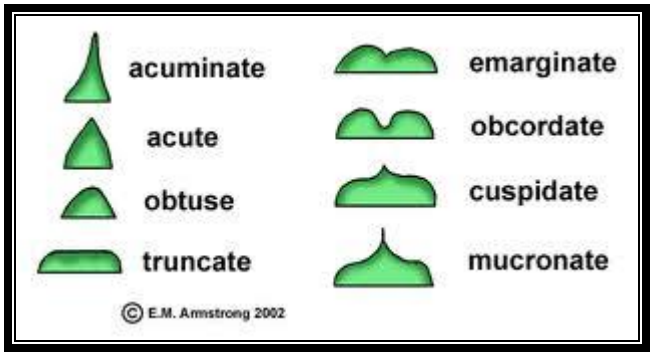

6**. Distinction based on their venation-**



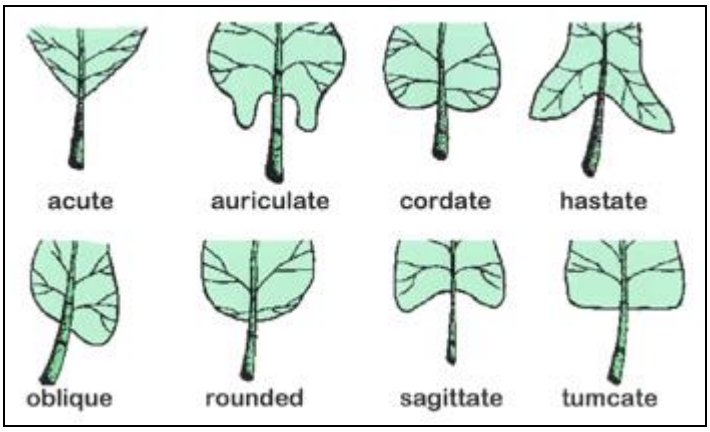

**7. Distinction based on the presence of petiole-**

| | |
|---|---|
|  | Petiolated |
|  | Sessile |

**8. Distinction based on the shape of their tip-**




**9. Distinction based to the morphology of their base:**




**10. Distinction based on the morphology of their margin:**

## Experiment No.1

**Object-** To study the morphological features of Senna Leaf (Indian senna)

**Profile**-

| | |
|---|---|
| **Common Name** | Sanaya, Hindisana, Hindisanakapat |
| **Botanical Name** | Cassia angustifolia |
| **English Name** | Senna, Indian Senna, Tinnevelly Senna, Cassia Senna, |
| **Family** | Caesalpinaceae |

### Active Constituent-

- Flavenol -isorhamnetin and kaempfeol
- Anthraquinone group compounds-Sennoside A and B.

### Therapeutic Uses-

- Senna is used in treating constipation, by stimulating intestinal peristalsis.
- It is useful in painful hemorrhoids, as it ensures soft and easy bowel movements.
- Paste of Senna leaves is applied to various skin diseases like acne, eczema etc
- It is used as an anthelmentic since it expels intestinal worms effectively.
- It is also used in hypertension and obesity.
- It is useful in loss of appetite, dysentry, hepatomegaly, spleenomegaly, indigestion, malaria, jaundice, biliousness, gout, rheumatism and anaemia.

**Important Formulations -** Panchasakara churna, Yashtayadi churna.



## Morphological Features-

It is small perennial shrub below 1.2m height with ascending branches. The leaves are feathery large compound and have pairs of lance like leaflets. Flowers are yellow and the pods are straight.

Appearance – Less entire and more broken

Size- 2-4 cm long, 7-12 mm wide

Shape- Ovate-lanceolate

Margin- Intire and curled Acute with sharp spine at the apex

Base- Thin and brittle

Texture- More pubescent

Colour- Pale greyish-green

Surface - pubescent

## Experiment No.2

**Object-** To study the morphological features of Tulsi leaves

**Profile-**

| | |
|---|---|
| **Common Name** | Tulsi ,Ocimum sanctum |
| **Botanical Name** | Ocimum tenuiflorum |
| **English Name** | Holy Basil |
| **Family** | Lamiaceae |

## Active Constituent-

Oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, β-caryophyllene β-elemene and germacrene D

## Therapeutic Uses-

- **Coughs**.
- **Sore Throat:**
- **Kidney Stone**.
- **Mouth Infections**.
- **Eye Disorders**.

**Important Formulations-** Holy basil, Tulsi swarasa.



## Morphological Features-

**Appearance –**

**Size-**1 to2 ½ inch long

**Shape-** Oval,oblong exstipulate

**Margin-** Entire or serrate

**Colour-** Green to Purple r

**Surface – Hairy Leaves**

# Experiment No.3

**Object-** To study the morphological features of Vasaka leaves

**Profile**-

| | |
|---|---|
| **Common Name** | Malabar nut Shwetavasa, Vasa, Vasaka |
| **Botanical Name** | Adhatoda Vasica |
| **English Name** | Malabar nut tree |
| **Family** | Acanthaceae |

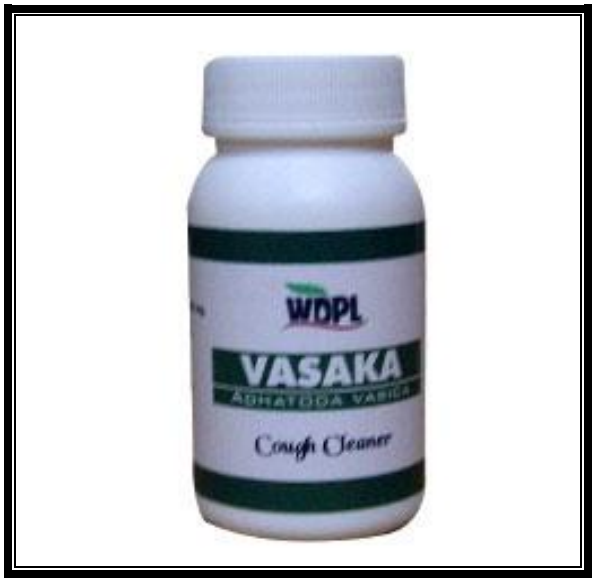
## Active Constituent-

Pyrroloquinazoline, alkaloids L-vasicine,

## Therapeutic Uses-

- Cold, cough, bronchitis and asthma.
- Its leaves, the root bark, the fruit and flowers are useful for the removal of intestinal parasites.
- A poultice of its leaves can be applied with beneficial results over fresh wounds, rheumatic joints and inflammatory swellings.
- A warm decoction of its leaves is useful in treating scabies and other skin diseases.

**Important Formulations-**Swarasa, kairali durance.


## Morphological Features-

Appearance **–**Fresh leaves entire, dried crumpled and in broken fragments.

Size-5-30cm.

Shape- Elliptic , lanceolate or ovate lanceolate

Margin- Entire

Base- Apex acuminate with tapering base

Texture- Thin and leathery

Colour- Light green

Surface – Glabrous or slightly pubescent

Taste- Bitter

# Experiment No.4

**Object-** To study the morphological features of Digitalis leaves

## Profile-

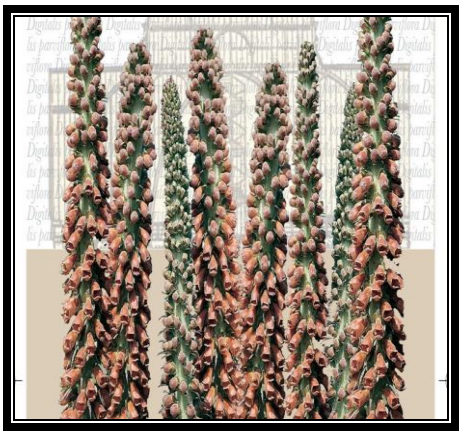
| | |
|---|---|
| **Common Name** | Foxgloves |
| **Botanical Name** | Digitalis purpurea |
| **English Name** | Digitalis purpurea *L.* |
| **Family** | Plantaginaceae |

**Active Constituent-** Digoxin.

## Therapeutic Uses-

- For congestive heart failure.

**Important Formulations**-Foxglove, Digoxin




## Morphological Features-

Appearance – blurred outlines (halos).

Size-10 -30 cm long 4-10 cm wide

Shape—broadly, ovate to ovate lanceolate upper leaves and first year lower leaves are narrow.

Margin-Crenate or irregularly crenate serrate

Base- Lamina narrows and forms a winged petiole. Lower leaves and first year have longer petiole.

Texture- Brittle,

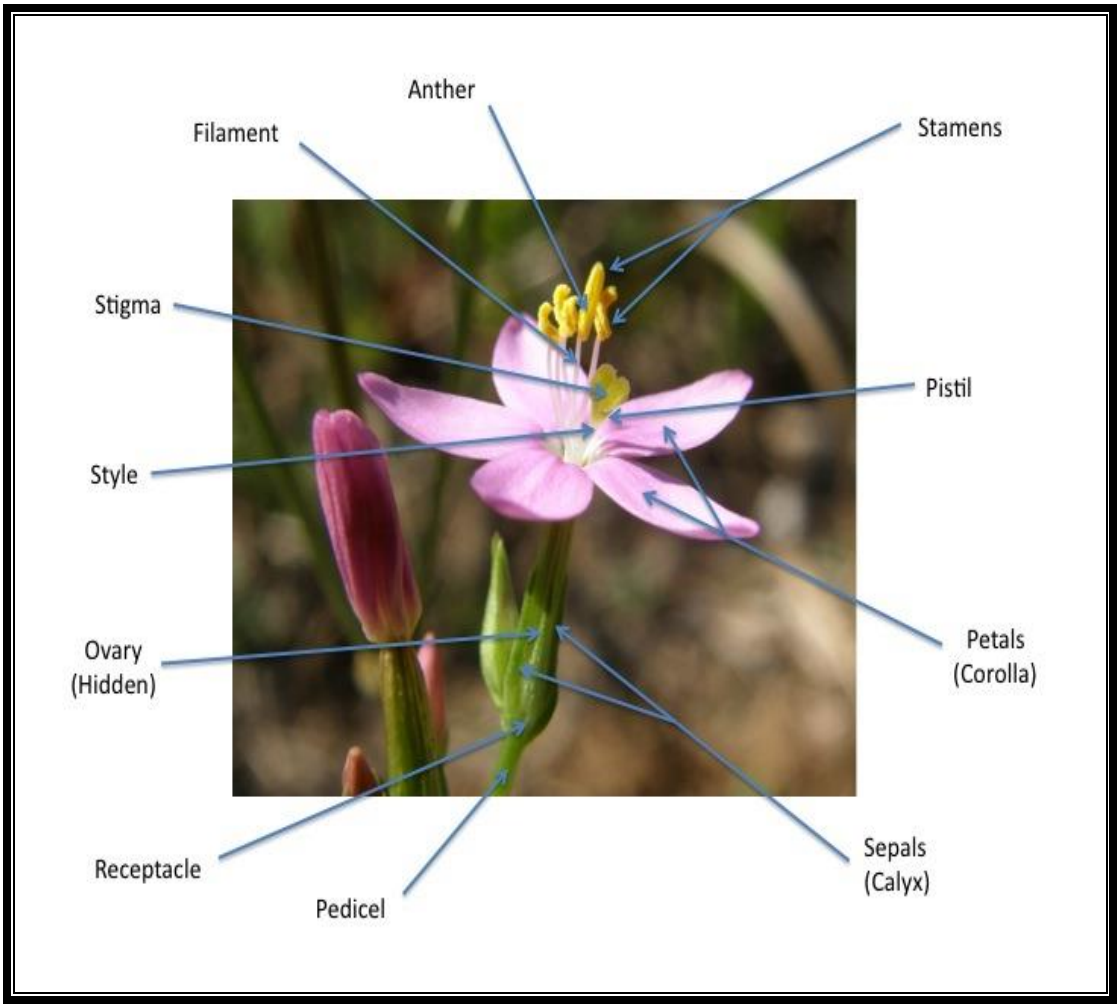
Colour- dull green and wrinkled

Surface – less hairy, lower surface densely covered with trichomes.

Taste - Bitter ,

# SECTION- B

# FLOWER/BUD, FRUITS &SEEDS



**Anther-**

The pollen-bearing body of the stamen, usually relatively compact, and supported at the end of the narrow filament. Under a lens, anthers exhibit a wide variety of forms and means of attachment. These characteristics are often important in technical keys for flower identification.

**Bract-**

A bract is a leaf-like element below a flower or on an inflorescence. Bracts are typically shaped differently than other leaves on the plant. They are usually green, but occasionally are brightly colored and petal-like.

**Calyx-**

The calyx surrounds the corolla, and is typically divided into lobes called sepals. These are usually green, and reduced relative to the petals, but they can also be large, and brightly colored, resembling petals. In many flowers, the sepals enclose and protect the flower bud prior to opening.

**Corolla-**

The corolla typically surrounds the reproductive parts of the flower. It may be continuous as in a petunia, lobed, or divided into distinct petals. In some cases, especially in cultivated varieties, the corolla may be doubled or even further multiplied, producing multiple layers of petals. In other cases, it may be lacking entirely.

**Filament-**

The filament is usually narrow and often threadlike part of the stamen which supports the pollen-bearing anther.

**Involucres-**

An involucres is a circle or cup of bracts that surrounds and supports the multiple florets of the head in the composite flowers of the family *asteraceae*.

**Ovary-**

The ovary is a part of the pistil that encloses the unfertilized seeds or ovules, and that typically develops into a dry or fleshy fruit once pollination takes place. The

ovary is generally central to the flower, and supports the other principle parts. Whether they are attached at the top (ovary inferior) or the bottom (ovary superior) is an important anatomical characteristic for classification. Not all "fruits" are mature ovaries; some form from supporting parts of the flower, for example, strawberries develop from the receptacle - the enlarged top of the flower stalk.

**Pedicel-**

The pedicel is a footstalk supporting a single flower in an inflorescence.

**Peduncle-**

The peduncle is  a stalk supporting an inflorescence or solitary flower.

**Perianth-**

The perianth is an envelope that surrounds the reproductive parts of a flower. This enclosure is composed of two concentric units, the outer perianth, or calyx which may be divided into sepals, and the inner perianth, or corolla, which may be divided into petals. Either the calyx or the corolla (or both) may be much reduced or lacking.

**Petal-**

A petal is a division or lobe of the corolla or inner perianth of a flower.

**Pistil-**

The pistil is the seed-bearing or "female" reproductive part of a flower. The pistil is composed of the ovary, the style, and the stigma. The ovary contains the developing seeds, and is connected to the pollen-receiving stigma by the style. Flowers often contain a single pistil, but may contain several. Staminate or "male" flowers contain only stamens and lack pistils entirely.

**Receptacle-**

The receptacle is generally a enlarged top of the footstalk, which supports the other parts of the flower. Some "fruits" are enlarged receptacles rather than ovaries.

**Sepal-**

A sepal is a division or lobe of the calyx or outer perianth of a flower. Sepals are often green, and/or reduced in size, but they can be colorful and petal-like as well.

**Stamen-**

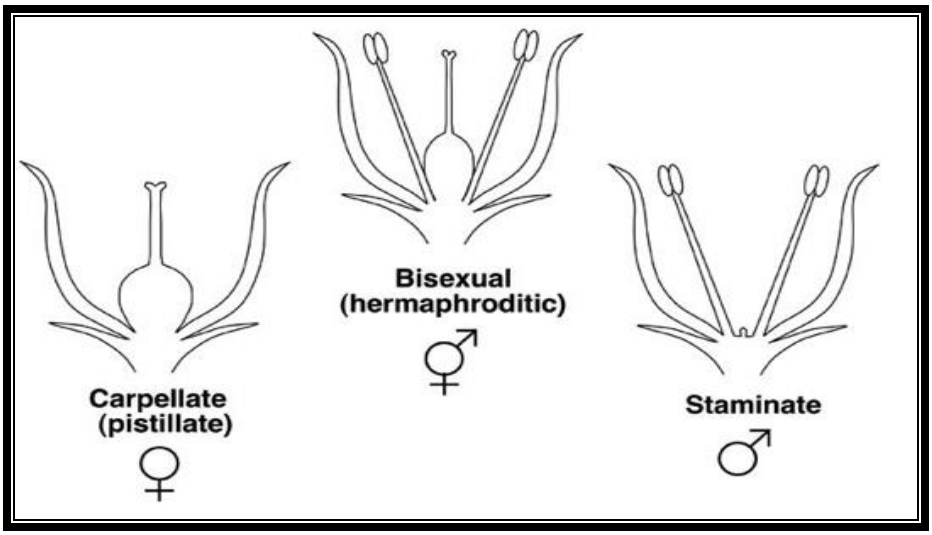
The stamen is pollen-bearing or "male" reproductive part of a flower. The pollen is borne on a more or less compact body termed the anther, which is supported by the filament. A flower may have hundreds of stamens, or only a few. Pistillate or "female" flowers have pistils but no stamens.

**Stigma-**

The stigma is an upper part of the pistil which receives the pollen. The stigma is often sticky, or covered with fine hairs or grooves, or other anatomical features that help the pollen to adhere. It may be cleft into several parts.

**Style-**

The style is usually elongated part of the pistil that connects the ovary to the stigma.




**Terms describing the inflorescence**

Inflorescence refers to the flowering body of a plant. These occur in an amazing variety of forms, from solitary flowers to enormously complex clusters, and there is an equally amazing variety of technical terminology used to describe them. A basic and useful technical distinction is between determinate and indeterminate inflorescences.

- A determinate form has a fixed endpoint, usually a terminal flower that generally opens first. Lower side branches bear buds that open later. Indeterminate forms are often termed cymose or cymes.
- An indeterminate form is a shoot that can, at least theoretically, continue growing from the tip and producing more flowers indefinitely. The lower flowers open first, while upper buds may still be tiny and developing. Indeterminate forms are termed racemose or racemes.

**Solitary-**

Solitary flowers (or heads) are borne singly on isolated stems or arising individually from leaf axils.

**Raceme-**

A raceme is a simple, indeterminate inflorescence consisting of stalked flowers attached to a central stem and forming a more or less elongated cluster. The stalk of a flower is termed a *pedicle* and pedicled flowers are implied by the term raceme when used alone in the specific sense.

**Spike-**

A spike is an indeterminate inflorescence consisting of stalkless flowers attached to a central stem, generally forming a highly elongated cluster. A raceme of stalkless flowers.

**Corymb-**

Corymb is an indeterminate inflorescence forming a convex or flat-topped cluster, essentially a contracted raceme. Typically flowers arise from a central axis on stalks (pedicles) of different lengths that bring them all to near the same height.

**Umbel**-

An umbel is a branched inflorescence forming a convex or flat-topped cluster in which all the pedicles are nearly the same length, and appear to originate near a single point (like the spokes of an umbrella). Many umbels are actually highly contracted racemes, though the term is frequently used with determinate forms as well. Umbels can be compound that is an umbel of umbels.

**Head-**

Head is a compact inflorescence, with the flowers so tightly packed as to appear a single unit. The composite flowers of the sunflower family (asteraceae) are the most familiar examples, but there are many other instances. The term is applied

to both determinate and indeterminate units.

**Panicle-**

Panicle is an indeterminate inflorescence consisting of a compound raceme; that is, a central axis bearing racemes as secondary units, or a more general branching structure composed of racemes. The term is sometimes applied to any sort of a loose, branching cluster.

**Cyme-**

Cyme is a determinate inflorescence, often one forming a convex or flat-topped cluster, though the term is applied to other determinate arrangements as well. In all forms, a terminal flower opens first, followed by flowers on lower branches. Multiple levels of branching are frequently involved.

# Experiment No. 1

**Object-** To study the morphological features of Clove Bud

**Profile**

| | |
|---|---|
| **Common Name** | Lavanga |
| **Botanical Name** | Syzygium aromaticum |
| **English Name** | Clove |
| **Family** | Myrtaceae |

## Active Constituent-

Free eugenol, eugenol acetate, Gallic acid and caryophyllene

## Therapeutic Uses-

- Most commonly known use is for toothache.
- It is safe and effective as mouth wash and for bad breath.
- It can quickly relieve the running nose if that is due to exposure to cold.
- It can be used as antibacterial, antiviral, antifungal and antiseptic. It is a great help in cases of cholera and malarial fevers.
- Clove stimulates digestive system and helps indigestion, can help stomach ulcers but if it is associated with constipation and/or bleeding hemorrhoids, clove might not be the solution. Please keep its drying property in mind.
- It is also used to treat psoriasis.

## Important Formulations-Clove oil



## Morphological Features-

- Appearance – plump, heavy
- Size-about 16-20 mm long
- **Hypanthium-** It is sub cylindrical slightly flattened and tapering below. It is 10-13 cm long 4 cm wide and 2 mm thick.
- **Crown or Cap-** It consist of calyx, corolla, stamens and style. Calyx consists of four thick spreading projecting sepals. Corolla is dome shaped and is made up of four yellow coloured imbricate, immature, membranous petals and is called as head, crown or cap or dome.
- Colour- Reddish brown in colour
- Odour- Strong, spicy and aromatic
- Taste- Pungent and aromatic

# Experiment No. 2

**Object-** To study the morphological features of Fennel Fruits

## Profile-

| | |
|---|---|
| **Common Name** | Saunf |
| **Botanical Name** | Foeniculum vulgare |
| **English Name** | Fennel |
| **Family** | Umbelliferae |

## Active Constituent-

Volatile oil, fenchone,anethole.

## Therapeutic Uses-

- Fennel fruit is chiefly used medicinally with purgatives to allay their effect.
- Fennel water has anti flatulence properties similar to those of anise and dill water
- Intestinal gas, spasmodic colic,constipation
- To regulate hormonal cycles,unpredictable behavior around seasons

- Urinary infections and fluid retention
- Arthritis and similar conditions

**Important Formulations**-,Fanchone. Anethole.



## Morphological Features-

- Appearance – entire creamocrap usually with pedicel
- Size- 5-10 mm long, 2-4 mm broad
- Surface- glabrous with 5 straight prominent primary ridges and a bifid stylopod at the apex.
- Colour- yellowish brown
- Odour- aromatic
- Taste- characteristic aromatic taste

# Experiment No. 3

**Object-** To study the morphological features of Ajowan seeds


## Profile

| | |
|---|---|
| **Common Name** | Ajwain Seed , Ajwan, Ajwon |
| **Botanical Name** | Trachyspermum ammi |
| **English Name** | Bishop's Weed, Carom Seeds, Thymol Seeds |
| **Family** | Apiaceae or Umbelliferae,Carrot Family |

## Active Constituent-

Alpha-pinene, beta-pinene, calcium, camphene, carvacrol, chromium,fiber, limonene , thymol

## Therapeutic Uses-

- Ajwain seeds have long been used in traditional ayurvedic and unani medicines for various ailments. Extraction obtained from this spice is sometimes used as carminative in treating flatulence and indigestion.
- Thymol's germicide and antiseptic properties utilized in many cough remedies. In India, the seeds are used to ease asthma.

- It is useful in treatment of ascites, abdominal tumours, enlargement of spleen, piles, vomiting, abdominal pains and disease of heart and mouth.
- An extraordinary stomach tonic.
- Useful in treatment of weakness of limbs, paralysis.
- Ajwan tea helps paralysis and shaking
- Useful in treatment of liver, spleen, kidney diseases.
- Excellent pain killer.
- Excellent heart tonic.
- Reduces gases in intestines.
- It aids digestion.
- Alleviates kapha and vata.
- May increase pitta.
- Used as a respiratory stimulant.
- It promotes kidney function.
- It dissolves & discharges gall bladder & urinary stones & grave
- It energizes the nerves.
- It is a powerful decongestant for both the digestive and respiratory tract.
- It strengthens metabolism & circulation.
- It is considered to be powerfull detoxifying agent.
- It has relatively high calcium and iron content.
- It is effective in ridding the body of worms.
- It is a good anti-acidic agent, if taken by mixing with butter milk.

## Important Formulations-




**Morphological Features-**

- Appearance – Separated mericarp
- Size- about 2 mm long
- Colour- Greyish brown
- Odour- Thymol like
- Taste- Characteristic aromatic

# Experiment No. 4

**Object-** To study the morphological features of Coriander seeds


## Profile-

| | |
|---|---|
| **Common Name** | Dhaniya |
| **Botanical Name** | Coriandrum sativum |
| **English Name** | Cilantro |
| **Family** | Umbelliferae |

**Active Constituent-** Volatile oil, d-linalool, pinene.

## Therapeutic Uses-

- Coriander seeds are high in essential oils, which may be used during aromatherapy.
- The essential oils have been used to improve gastrointestinal conditions and as an appetite stimulant and antispasmodic.
- Coriander has also been used to treat impotence, rheumatism, pain, vomiting, cough, hepatitis C, fever, sore throat, goiter, migraines, and menstrual disorders,

eye problems blood impurities, parasitic worms, skin conditions, kidney disorders, mouth ulcers, oral inflammation and high cholesterol.

- It has also been used to improve vitality and memory.
- Coriander juice has been used to treat nausea and morning sickness, colitis and liver disorders.

## Important Formulations-



## Morphological Features-

- Appearance – Entire mericarps with pedicel
- Size- 2.3-4.3 mm long, subspherical
- Surface- A short stylopod with 5 small calyx teeth present at apex. Ten inconspicuous wavy primary ridges present.
- Colour- Yellowish brown in colour
- Odour- Aromatic
- Taste- Spicy, aromatic

# Experiment No. 5

**Object-** To study the morphological features of Caraway fruits

## Profile-

| | |
|---|---|
| **Common Name** | Shia jira or zira |
| **Botanical Name** | Carum carvi. |
| **English Name** | Caraway |
| **Family** | Umbelliferae |

## Active Constituent-

Volatile oil, calcium oxalate, carvone, limonene.

## Therapeutic Uses-

- In addition to its use as medicinal values, caraway indeed has many health benefiting nutrients, minerals, vitamins and anti-oxidants.
- Caraway seeds are rich source of **dietary fiber**. 100 g seeds provide 38 g of fiber. They increase bulk of the food and help prevent constipation by speeding

up movement of food through the gut. In fact, gastro-intestinal transit time of food is greatly decreased.

- Fiber also binds to toxins in the food and helps protect the colon mucus membrane from cancers. In addition, dietary fibers bind to bile salts (produced from cholesterol) and decrease their re-absorption in colon, thus help lower serum LDL cholesterol levels.
- Caraway spice is an excellent source of minerals like iron, copper, calcium, potassium, manganese, selenium, zinc and magnesium.

## Important Formulations-



## Morphological Features-

- Appearance – Separate mericarps free from pedicel
- Size- 4-7 mm long , 1 mm broad and thick
- Shape- Curved smooth
- Colour- Brown in colour
- Odour- aromatic
- Taste- spicy

# Experiment No. 6

**Object-** To study the morphological features of Cardamom fruits

## Profile-

| | |
|---|---|
| **Common Name** | Cardamon, Malabar Cardamom, Elachi |
| **Botanical Name** | Elettaria Cardamomum |
| **English Name** | **Cardamom** |
| **Family** | Zingiberaceae |

## Active Constituent-

α-terpineol, myrcene, limonene  menthone ,β-phellandrene

### Therapeutic Uses-

- Intestinal spasms.
- Heartburn, Irritable bowel syndrome (IBS) Constipation.
- Cold and Cough,Bronchitis.
- Liver problems.
- Preventing infections.

## Important Formulations-



## Morphological Features-

- Appearance –Inferior, trilocular capsule
- Size- 1-2 cm long
- Surface- Smooth or longitudinally straited
- Colour- Pale buff
- Odour- Powerful aromatic and an agreeable, pungent
- Taste- Aromatic

# Experiment No.7

**Object-** To study the morphological features of Black Pepper fruits

## Profile-

| | |
|---|---|
| **Common Name** | **Black** pepper |
| **Botanical Name** | Piper nigrum. L. |
| **English Name** | Pippali |
| **Family** | Piperaceae |

**Active Constituent-** Volatile oil, piperine, piperidine, piperettine

## Therapeutic Uses-

- Black pepper has been used for digestive disorders, such as indigestion, vomiting, diarrhea, and flatulence.
- Suggested modern medicinal applications of black pepper have included the treatment of cigarette withdrawal symptoms, postural instability in older adults, and swallowing difficulties in post-stroke and neurological disorder patients.

- It is also used to treat colds, coughs and sore throats. A preparation called "Trikatu" (black pepper, long pepper, and ginger) is prescribed routinely for a variety of diseases.

## Important Formulations-



## Morphological Features-

- Appearance – It is a entire round fruit
- Size- 3.5-5 mm in diameter
- Surface-The surface is dark brown or greyish black and strongly reticulated
- The apex shows the remains of the sessile stigma and a basal scarindicate the point of attachment to the axis
- Colour- greenish red after black
- Odour- aromatic
- Taste-Pungent

## Experiment No.8

**Object-** To study the morphological features of Gokhru fruits

### Profile-

| | |
|---|---|
| **Common Name** | Gokharu , gokshur, neringil, palleru, neringil, laghu |
| **Botanical Name** | Tribulus Terrestris |
| **English Name** | Land calotrops |
| **Family** | Zygophyllaceae |

### Active Constituent-

Gokharu (Tribulus terrestris) plant contain alkaloids, resins, tannins, sugars, sterols, essential oil, peroxidase, diastase and glucoside.

### Therapeutic Uses-

- Improves muscle growth and body strength.
- Reported to enhance libido sexualis and erectile function.
- Reduction in cholesterol.
- Urinary disorders and Urinary stones Swelling
- Reductions in high blood pressure.

**Important Formulations**- Dioscin, protodioscin, diosgenin



## Morphological Features-

**There are two plants of Gokhru-**

- The fruits of Tribulus terristris supplying small or 'chhota' gokhru and
- Fruits of Pedaliu murex supplying 'bara' or large gokhru**.**

- Appearance – Fruit is globosely 0.5inch in diameter and 1/3inch in thickness.
- Size- 1.5 meter long
- Colour- Yellowish white
- Odour- None
- Taste- None

# Experiment No. 9

**Object-** To study the morphological features of Nutmeg Seeds

## Profile-

| | |
|---|---|
| **Common Name** | Nutmeg, mace, magic, muscdier, nux moschata, |
| **Botanical Name** | **Myristica** fragrans |
| **English Name** | **Nutmeg** |
| **Family** | Myristicaceae |

**Active Constituent-V**olatile oil, terpene alcohols like borneol and gerneol

## Therapeutic Uses-

- It is used to improve memory.
- It is used in small dosages to reduce flatulence [excessive stomach or intestinal gas], aid digestion and improve appetite.
- Nutmeg can help to combat asthma.
- It is also used to relax muscles.
- Nutmeg oil is used in toothpastes, cough syrups, perfumes and cosmetic industry, Externally nutmeg oil is mixed with almond oil and is used to relieve rheumatic pain.
- Nutmeg oil is used to treat toothaches.
- Drops of nutmeg oil can also be mixed with honey to treat nausea, gastroenteritis, chronic diarrhea and indigestion.

## Important Formulations-


## Morphological Features-

- Appearance – Kernels consist of outer and inner perisperm .endosperm and embryo.
- Size- 2-3 cm long. 1.5 to 2 cm wide or in deameter
- Colour- greyish brown
- Odour- aromatic
- Taste- pungent and slightly bitter

## Experiment No. 10

**Object-** To study the morphological features of Ispaghula seeds

**Profile-**

| | |
|---|---|
| **Common Name** | **Ispaghula**, **Psyllium**, Isabgul, Isabgol, Flea **Seed,** |
| **Botanical Name** | Plantago *ispaghula* |
| **English Name** | *Spaghula* |
| **Family** | Plantaginaceae |

**Active Constituent-** Mucilage, protein

## Therapeutic Uses-

- Seeds are demulcent, cooling, diuretic and used in inflammatory conditions of mucus membrane of gastrointestinal and gastro-urinary tracts.
- They are used to cure chronic dysentery, diarrhea, duodenal ulcer, gonorrhea, constipation and piles.
- Isabgol preparations are given after colostomy to assist the production of smooth solid faecal mass.
- The seeds are used in febrile conditions and the affections of kidneys, bladder and urethra.
- A decoction of seeds is prescribed in cough and cold, and the crushed seeds made into poultice are applied to rheumatic and glandular swellings.
- Recently anticancer, antitoxic, antiatherosclerosis, hypocholesteremic, hypo-glycemic, hypotensive, cardiac depressant, cholinergic and cervical activities have been reported.

## Important Formulations-



## Morphological Features-

- Shape- long to elliptical in outline, boat shaped
- Size- 2 to 3.5 mm long, 1 to 1.75 mm broad
- Colour- Pinkish grey to brown
- Odour- None
- Taste- Bland mucilaginous.
- Surface-Dorsal surface is convex with a small elliptical or elongated shining reddish brown spot while the ventral surface is concave with a deep furrow, not perfectly reaching to either end of the seeds. At the furrow a hilum is present which is covered by a thin membrane and appears as a red spot in the centre. The outer surface is smooth, hard and translucent.

## Experiment No. 11

**Object-** To study the morphological features of Nux Vomika seeds.

## Profile-

| | |
|---|---|
| **Common Name** | Nux Vomica, Poison Nut |
| **Botanical Name** | **Nuxvomica** |
| **English Name** | Snake wood. Nux-vomica, Strychnine Tree. |
| **Family** | Loganiaceae |

## Active Constituent-

α-colubrine, β-colubrine, icajine, protostrychnine, vomicine, novacine, N-oxystrychnine,

## Therapeutic Uses-

- Dried seeds are powerful poison in large doses and in small doses it is nerve tonic, stomachic, aphrodisiac and spinal stimulant; also respiratory and cardiac stimulant.
- Seeds are also used as an anodyne, emetic and purgative.
- The most direct symptom caused by strychnine is violent convulsions due to a simultaneous stimulation of the motor or sensory ganglia of the spinal cord.

## Important Formulations-



## Morphological Features-

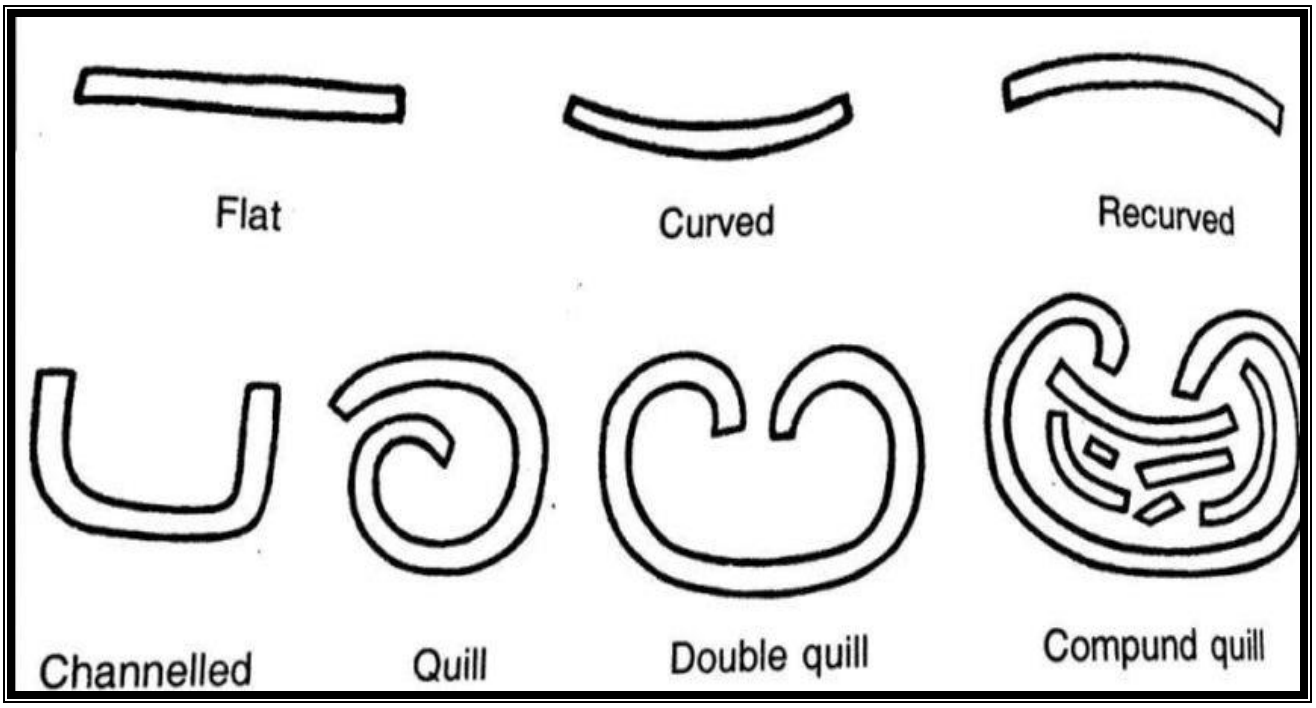
- Appearance – The seeds are disc shaped and thick. They are usually not quite flat but are little depressed on one side and arched on the other side, or some time irregularly.
- Size- 20-25 mm in diameter and 4 mm thick
- Colour- Ash grey
- Surface- Outer surface grey to greenish grey
- Odour- Odourless
- Taste- bitter

# SECTION-C

# STEM/BARK

**Bark**

All the tissues in a woody stem outside the interfascicular cambium constitute bark drugs. Barks are collected by stripping from the trunk or branches of appropriate tree and are thus obtained as relatively narrow strips. The bark drugs include cinnamon. cinchona, quillaia, asoka and kurchi bark etc. During the drying the drying process, unequal contractions cause the dried bark to assume different shapes as shown below-



# Experiment No. 1

**Object-** To study the morphological features of Ephedra stem.


## Profile-

| | |
|---|---|
| **Common Name** | Bluestem |
| **Botanical Name** | Ephedra equisetina |
| **English Name** | Ephedra |
| **Family** | Ephedraceae |

## Active Constituent-

Ephedrine ,pseudoephedrine,alkaloids, saponins, volatile oil.

## Therapeutic Uses-

- Plants of the Ephedra genus, including E. sinica and others, have traditionally been used by indigenous people for a variety of medicinal purposes, including treatment of asthma, hay fever, and the common cold.
- Both ephedrine and pseudoephedrine increase blood pressure and act as bronchodilators, with pseudoephedrine having considerably less effect.
- Ephedrine promotes weight loss, specifically fat loss in humans and mice..
- Ephedrine also decreases gastric emptying.

**Important Formulations**- amphetamines, ephedrine, pseudoephedrine

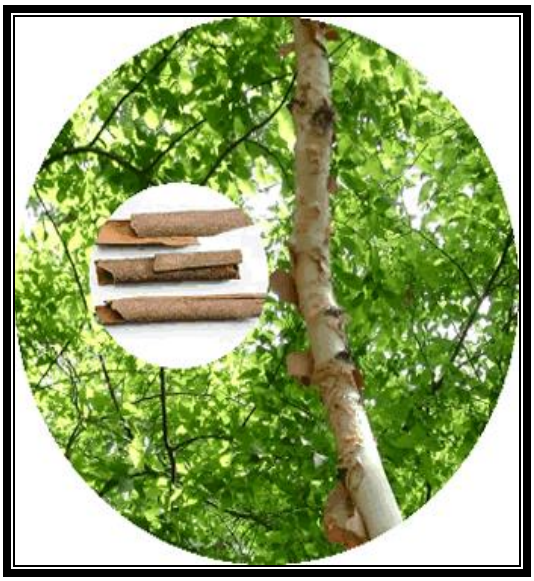


## Morphological Features-

- Appearance –The stems of ephedra are slender pieces bearing numerous fine, longitudinal ridges.
- Leaves- Greatly reduced, the lamina is 2-4 mm ling in pairs at the nodes, fused at the base and thus encircling the stem as a sheath 2-3 mm deep, apex is acute and recurved. The apex is white and the base is brown, but paler in the upper part of the stem.
- Size- 30 cm long
- Colour- grayish green
- Surface- Main stem brown because of cark with occasional
- Odour-Agreeable and slightly aromatic
- Taste- Spicy, Slightly Bitter,

# Experiment No. 2

**Object-** To study the morphological features of Cinnamon Bark



## Profile-

| | |
|---|---|
| **Common Name** | Dalchini, Ceylon cinnamon |
| **Botanical Name** | Cinnamomum zeylanicum |
| **English Name-** | Cinnamon |
| **Family** | Lauraceae |

## Active Constituent-

cinamaldehyde or cinnamic aldehyde, quinine, quindine.

## Therapeutic Uses-

- The health benefits of cinnamon include ability to balance blood sugars, minimize inflammation and combat infection.
- It is a natural immune system booster, natural antiviral fungal remedy that also combats bacterial infections.
- Infections (flu, tropical, cough, cold) viruses (herpes, etc)
- digestive problems
- cardiovascular disease
- ulcers and warts
- inflammation, rheumatism.

## Important Formulations-


## Morphological Features-

- Appearance –A small, tropical, evergreen tree most noted for its bark, which provides the world with the commonly known spice,
- Size- Length of quill up to 1m,6-10mm.in diameter,0.5mm thick.
- Colour- Reddish Brown
- Surface- Outer surface grayish green and rough due to presence of cracks, wrinkles and often bears epiphytes such as lichens.
- Odour- odorless
- Taste-bitter taste

## Experiment No. 3

**Object-** To study the morphological features of Cinchona Bark

### Profile-

| | |
|---|---|
| **Common Name** | Quinine bark, quina, quinine, kinakina, China bark, cinchona bark, yellow cinchona, red cinchona, Peruvian bark, Jesuit's bark, quina-quina, |
| **Botanical Name** | Cinchona officinalis |
| **English Name-** | Cinchona |
| **Family** | Rubiaceae |

**Active Constituent-** alkaloids, quinine, quinidine.

## Therapeutic Uses-

- Its bark can be used as a digestive stimulant and a tonic for the remedy of illnesses like indigestion.
- The herb is utilized by some herbalists in South America for treating various kinds of liver cancer, breast cancer, mesenteric cancer, and cancer of the other glands and spleen.
- In the European natural medicine systems, cinchona bark can be used as a bitter tonic, antimalarial, antiprotozoal, antispasmodic, and as a fever reducer. It's also useful for managing irregular heartbeats, anemia, leg cramps, and as an anesthetic in some situations.
- Generally, the herb can be categorized as a superb analgesic, anesthetic, antiarrhythmic, antibacterial, antimalarial, antimicrobial, antiparasitic, antipyretic, antiseptic, antispasmodic, antiviral, astringent, bactericide, cytotoxic, febrifuge, fungicide, insecticide, nervine, and stomachic.

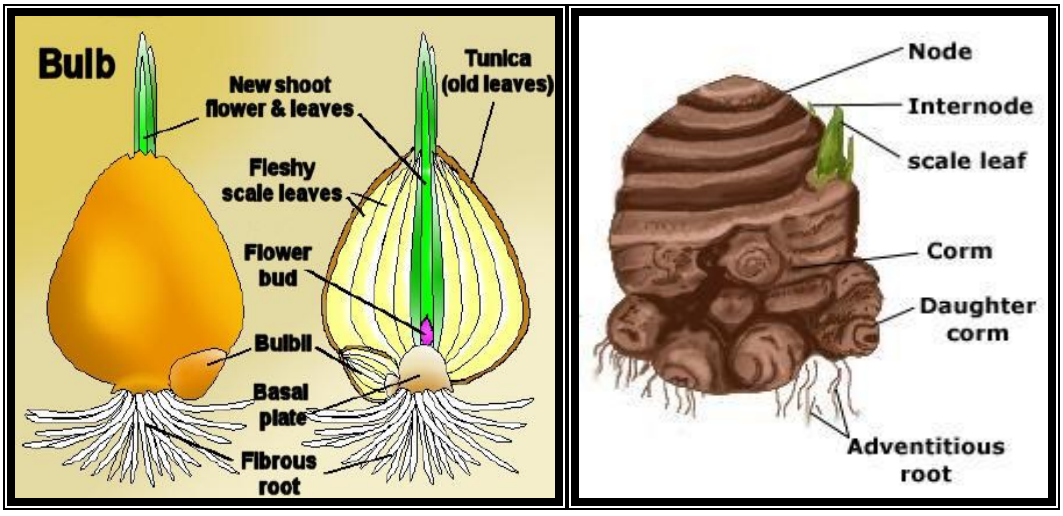
## Important Formulations-


## Morphological Features-

- Appearance –Dried bark
- Size- 30 cm. ling, 1.5 to 2 cm in diameter, 2 to 8 mm. thick
- Colour- Reddish brown to yellowish brown
- Surface- Rough, longitudinal, transverse cracks or fissured, ridges and protuberances, Grayish patches of moss or lichens are present.
- Odour- Distinct and characteristic
- Taste- Bitter

# SECTION-D

# BULB/CORN



# Experiment No. 1

**Object-** To study the morphological features of **Garlic bulb**

## Profile-

| | |
|---|---|
| **Common Name** | Lasun |
| **Botanical Name** | Allium sativum |
| **English Name-** | Garlic |
| **Family** | Liliaceae |

## Active Constituent-

Allicin, Volatile

## Therapeutic Uses-

- Garlic is alleged to help regulate blood sugar levels.
- Garlic was used as an antiseptic to prevent gangrene during World War I and World War II. More recently, it has been found from a clinical trial that a mouthwash containing 2.5% fresh garlic shows good antimicrobial activity.
- Garlic cloves are used as a remedy for infections (especially chest problems), digestive disorders, and fungal infections such as thrush.
- Garlic can be used as a disinfectant because of its bacteriostatic and bactericidal properties.

## Important Formulations-



## Morphological Features-

- Appearance – Sub-globular compound bulb
- Size- 4-6 cm in diameter with several (8-20) clove
- Colour- Pale white
- Surface- The whole bulb is surrounded by 3-5 whitish papery membranous scales from the leaf bases of the previous year's bulb and terminating in a thick, papery outgrowth. The cloves are attached to a flattened circular woody axis with numerous thin, wiry roots in the underside and short, sub cylindrical outgrowth on the upper surface.
- Odour- Strongly alliaceous
- Taste- Persistently pungent, alliaceous.

## Experiment No. 2

**Object-** To study the morphological features of **Onion bulb**

## Profile-

| | |
|---|---|
| **Common Name** | Kanda, Pyaz |
| **Botanical Name** | Allium cepa |
| **English Name** | . Nigella sativa |
| **Family** | Amaryllidaceae |

## Active Constituent-

glycosides quercetin 3,4'-diglucoside and quercetin-4'-glucoside.

## Therapeutic Uses-

- **Asthma**
  Onion is useful for wet-cold asthma. In this type the expectoration is free, fluent and abundant.
- **Cholera**
  It is an excellent first aid for cholera. In most cases, a teaspoonful of onion juice can give immediate relief.
- **Diabetes Mellitus**
  Very useful in lowering the level of blood sugar.
- **Heart**
  Since onion belongs to the muscles group, it gives strength to the heart and useful in some heart diseases.
- **High Blood Pressure**
  Very useful for hypertension that belongs to wet-cold group and is due to hardness (rigidity) of the arteries.
- **Influenza and Running Nose**
  Useful but not in all types of colds and running nose.
- **Insect Bites**
  Very useful both internally and externally but not for the insects with acidic venom, in which case it is likely to aggravate the trouble.
- **Obesity**
  It helps in weight loss but I do not recommend it as the basic remedy for obesity.
- **Vomiting and Diarrhea**
  It can check watery vomiting and diarrhea. In such cases it is used as for cholera.

## Important Formulations-



## Morphological Features-

The onion plant has a fan of hollow, bluish-green leaves and its bulb at the base of the plant begins to swell when a certain day-length is reached. The bulbs are composed of shortened, compressed, underground stems surrounded by fleshy modified scale (leaves) that envelop a central bud at the tip of the stem. In the autumn (or in spring, in the case of overwintering onions), the foliage dies down and the outer layers of the bulb become dry and brittle.

# Experiment No. 3

**Object-** To study the morphological features of **Colchicum corm**



## Profile-

| | |
|---|---|
| **Common Name** | autumn crocus |
| **Botanical Name** | **Colchicum** luteum |
| **English Name** | Alfalfa Alfalfa |
| **Family** | Colchicaceae |

## Active Constituent- Colchicine and demecolcine.

## Therapeutic Uses-

- The plant contains the alkaloid colchicine which is used pharmaceutically to treat gout and rheumatism, Familial Mediterranean fever.
- The use of the roots and seeds in traditional medicine is thought to have arisen due to the presence of this drug.
- Colchicine also processes anti tumor activity.

## Important Formulations-



## Morphological Features-

**Colchicum corm-**

- Appearance –Dried tranverse slices.
- Size- The fresh corm 3.5 to 4 cm high, 2.5 to 3 cm wide and about 2 cm thick.
- Colour- Dark brown
- Shape- Sub-reniform to ovate.
- Odour- Slight
- Taste- Bitter and acrid
- Fracture- Short

**Colchicum Seed-**

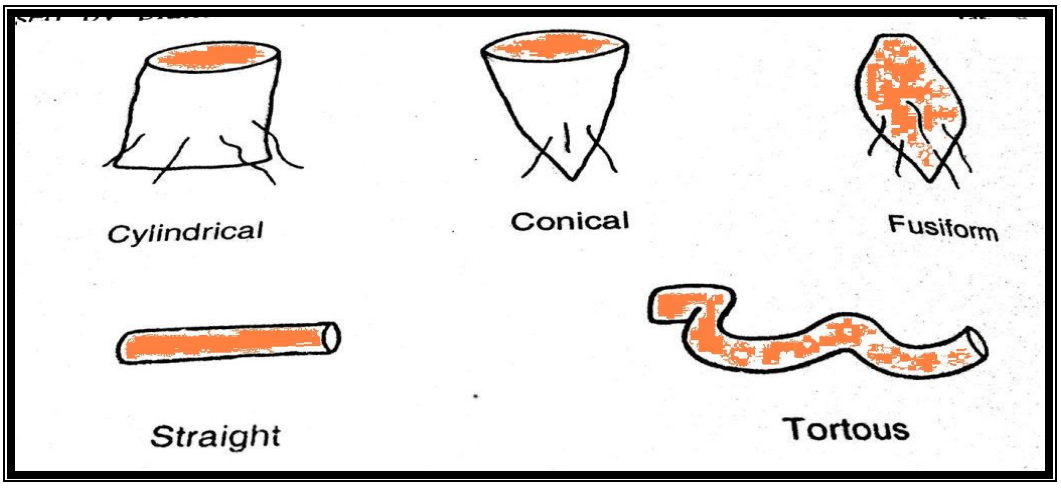
- Shape – Ovoid or Globular
- Size- 2-3mm in diameter
- Feature- Minutely –pitted testa which is reddish brown in color.
- Color- Dark brown with sugary exudates.
- Seeds are very hard.
- A well marked strophiole .

# SECTION-E

# RHIZOME/ROOT

## Underground structure

Underground structure are often used by plants as food storage organs and exhibit a wide variety of forms. They are often swollen and to facilitate drying in preparation for the market these are sliced or cut into small pieces. Some drugs are scrapped to remove the dark cork to give a light colored product. Underground structures include the roots, rhizomes and stolons. Roots have no buds, scale leaves or leaf scars and have a central core of woody xylem tissue. Examples of root drugs are podophyllum, liquorice, jatamansi, rauwolfia. rhizomes and stolons are underground stems which have buds and scale leaves and scars. They have a central pith and the drugs include ginger, turmeric, dioscorea. Different shapes which are encountered under the category of underground roots and rhizomes are shown below-



# Experiment No. 1

**Object-** To study the morphological features of **Ginger rhizomes**

## Profile-

| | |
|---|---|
| **Common Name** | Ginger |
| **Botanical Name** | Zingiber officinale |
| **English Name** | . gingembre |
| **Family** | Zingiberaceae |

## Active Constituent-

volatile oils ,shogaol, 6-gingerol, metoclopramide and donperidone.

## Therapeutic Uses-

- Eat fresh ginger just before lunch to stoke a dull appetite and fire up the digestive juices.
- Ginger improves the absorption and assimilation of essential nutrients in the body.

- Ginger clears the 'microcirculatory channels' of the body, including the pesky sinuses that tend to flare up from time to time.

- Ginger helps reduce flatulence and nausea.
- Ginger, has anti-inflammatory properties—can bring relief arthritis.
- Float some ginger essential oil into your bath to help aching muscles and joints.
- Chewing ginger post-operation can help overcome nausea.

## **Important Formulations**-Zingerone,




## **Morphological Features-**

- Appearance –Sympodial branching of horizontal rhizome
- Size- Length 5-15 cm, width 3-6 cm and thickness 0.5to1.5 cm
- Colour- Buff
- Surface- Longitudinally striated with occasional projecting fibers
- Odour- Agreeable and aromatic
- Taste- Agreeable and pungent

## Experiment No.2

**Object-** To study the morphological features of **Asafoetida**

## Profile-

| | |
|---|---|
| **Common Name** | Oleo gum, Resin, Hing |
| **Botanical Name** | Ferula foetida |
| **English Name** | Asafoetida |
| **Family** | Apiaceae |

## Active Constituent-

Volatile oil, gum, isobutyl propanyl disulphide.

## Therapeutic Uses-

- Fighting influenza:
- Remedy for asthma and bronchitis
- Asafoetida has a broad range of uses in traditional medicine as an antimicrobial for treating chronic bronchitis and whooping cough.
- Reducing flatulence.
- A contraceptive/abortifacient.
- Asafoetida oleo-gum-resin has been reported to be antiepileptic in classical Unani, as well as ethnobotanical literature.

- Balancing the vata and kapha.
- Asafoetida has been speculated to be an antidote for opium.

## Important Formulations-



## Morphological Features-

- Appearance –Perennial branching herb
- Size- 10 cm thick
- Colour- Dull yellow
- Occurs- It occurs in 3 forms – paste, tear and mass. Paste and tears are the purer forms, but the bulk of the drug is mass.
- Odour- Acrid
- Taste- Bitter

## Experiment No. 3

**Object-** To study the morphological features of **Rauwolfia root**

## Profile-

| | |
|---|---|
| **Common Name** | Chhotachand , Harkaichanda , Nai , Nakulikanda |
| **Botanical Name** | Rauvolfia serpentina |
| **English Name** | Indian snake root. Serpentine root |
| **Family** | Apocynaceae |

## Active Constituent-

Ajmaline, aricine, corynanthine, deserpidine lankanescine rauwolscine, rescinnamine, reserpine, reserpiline, isoreserpine,

## Therapeutic Uses-

- Reserpine is an alkaloid first isolated from R. serpentina and was widely used as an antihypertensive drug.
- Alkaloids in the plants reduce blood pressure, depress activity of the central nervous system and act as hypnotics.

## Important Formulations-



## Morphological Features-

- Appearance –It consist of the dried root
- Size- The majority of the pieces of the drugs are about 8 to 15 cm long and 0.5 to 1 cm thick some pieces are as much as 40 cm long and may be upto 2 cm thick. Some pieces are as much as 40 cm long and may be upto 2 cm in diameter.
- Colour- The outer surface is dull and greyish brown.
- Surface- The outer surface shows faint longitudinal ridges. In loder pieces it is somewhat scaly and the bark exfoliate in small patches, short length of aerial stem are attached to some pieces of the drug.
- Odour- Odour less
- Taste- Bitter taste.

## Experiment No. 4

**Object-** To study the morphological features of **Rhubarb rhizomes**

## Profile-

| | |
|---|---|
| **Common Name** | Rheum, Rhei Radix |
| **Botanical Name** | R. palmatum |
| **English Name** | Rhubarb |
| **Family** | Polygonaceae |

## Active Constituent-

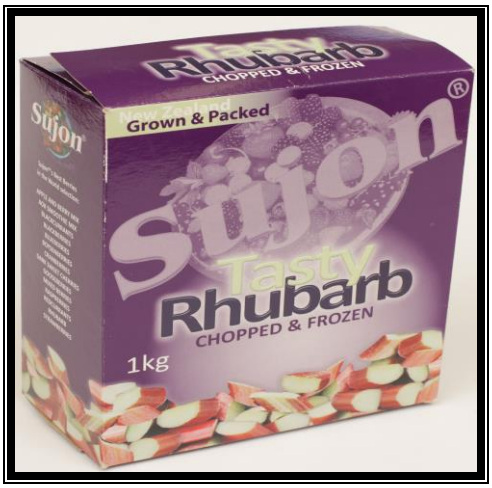
Anthraquinone glycosides, chrysophanol, emodin, aloe-emodin, rheum, tannic acids

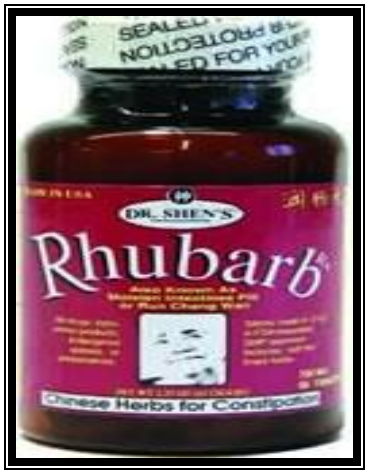
## Therapeutic Uses-

- chronic constipation ,diarrhea
- inflammation of the colon ,liver and gallbladder complaints
- hemorrhoids
- menstrual complaints

- skin eruptions due to toxin build-ups
- high cholesterol levels ,poor appetite
- poor blood circulation ,pain from swelling or inflammation
- bacterial infections ,auto-immune reactions

**Important Formulations**- Detox,




## Morphological Features-

- Appearance –Peeled and dried
- Size- 7-10 cm long and 3-6 cm. thick at the middle point
- Colour- Reddish orange
- Surface- Inner surface flat
- Odour- Faint
- Taste- Slightly bitter

# Experiment No. 5

**Object-** To study the morphological features of **Ipecac**

## Profile-

| | |
|---|---|
| **Common Name** | Antamul, golden root , Rio or Brazilian |
| **Botanical Name** | **Tylophora indica** |
| **English Name** | **Cephaelis ipecacuanha** |
| **Family** | **Rubiaceae** |

## Active Constituent-

Glucosidal tannin, ipecacuanhin

## Therapeutic Uses-

- Ipecac is used in cough mixtures.
- Ipecac and opium were used to produce Dover's powder, which was used in syrup form.

**Important Formulations**- emetine, cephalin, Polyol

,


## Morphological Features-

- Size- Length 5-15cm,diameter 3-5mm.
- Colour- Brick red to brown
- Surface- Annulated.
- Odour- Slight, powder irritant.
- Taste- Bitter and acrid.

## Experiment No. 6

**Object-** To study the morphological features of **Liquorice root**


## Profile-

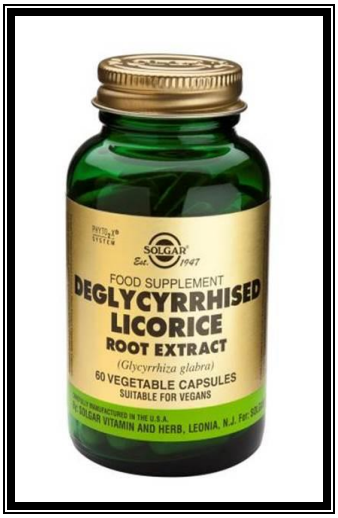
| | |
|---|---|
| **Common Name** | Mulethi |
| **Botanical Name** | Glycyrrhiza glabra |
| **English Name** | Liquorice, Licorice, Sweetwood |
| **Family** | Leguminosae |

**Active Constituent- G**lycyrrhizic acid, volatile oils.

## Therapeutic Uses-

- **Anti-malarial activity:**
- **Improves immunity:**
- **Memory improvement**
- **Anti-ulcer and Liver protection**

## Important Formulations-






## Morphological Features-

- Appearance –Peeled or unpeeled stolons and roots
- Size- 20cm and 1-2 cm in diameter
- Colour- peeled drug is pale yellow, unpeeled drug is dark brown
- Surface- longitudinally wrinkled
- Odour- Faint
- Taste- Sweet, without any marked bitterness or acridity.
- Fracture- Fibrous

# SECTION-F

# WHOLE PLANT

## Experiment No. 1

**Object-** To study the morphological features of **Vinca**

## Profile-

| | |
|---|---|
| **Common Name** | Rose Periwinkle, Madagascar, Sadabahar, Old Maid |
| **Botanical Name** | Catharanthus roseus |
| **English Name** | Vinca rosea |
| **Family** | Apocynaceae |

## Active Constituent-

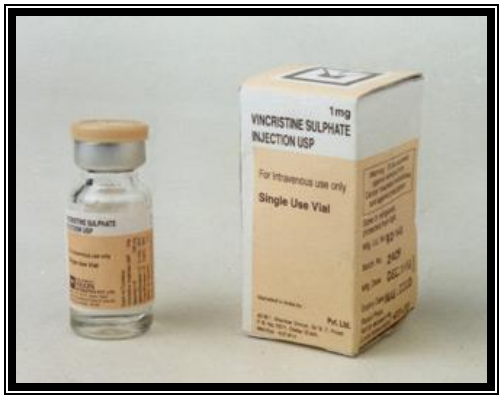
Vinblastine,Vincristine, ajmalicine

## Therapeutic Uses-

- It is used in the treatment of numerous diseases, like diabetes, Hodgkin's disease and malaria.
- The plant possesses chemical substances like vinblastine and vincristine, which help in the treatment of leukemia in children and lymphoma.

- The group of alkaloids present in it can be potentially used in the treatment of cancer.
- The root bark has been used traditionally for its calming effect and its ability to reduce blood pressure.
- It is also used in the treatment of menstrual problems, constipation and asthma.

## Important Formulations-


## Morphological Features-

A herbaceous subshrub, approximately 40-80 cm high. The leaves are oppositely arranged, oblong with petiolate acute base. The flowers are produced throughout the year, and are salveform, simple, generally 2-7 cm broad with usually 5 petals joined together at the base to form a tubule.

Flowers are violet, pink or white in color.

# Experiment No. 2

**Object-** To study the morphological features of Punarnava Plant

**Profile-**

| | |
|---|---|
| **Common Name** | Beshakapore,sant, Thikri |
| **Botanical Name** | Boerhavia diffusa |
| **English Name** | Punarnava spreading, Hog weed |
| **Family** | Nyctaginaceae |

**Active Constituent-**

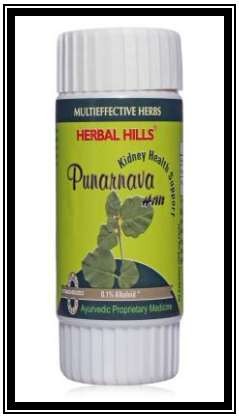
Penarnavodide, Boeravine, Flavones

## Therapeutic Uses-

- Punarnava has a diuretics, Anti-inflammatory and carminative properties.
- Punarnava is also a good Rasayana so useful in Aamavata.
- Punarnava Root is anticonvulsant, analgesic, expectorant, CNS depressant, laxative, diuretic, abortifacient.
- Punarnava is used for local application in the form of poultice or fermentation in oedema.
- Punarnava leaf juice is used in the eyes for topical application.
- Punarnava act as diuretic in dysuria.

- Punarnava roots rubbed in honey are locally applied for cataract, chronic conjunctivitis, blepharitis.
- Punarnava useful in reducing swelling and foul smelling in skin disorders.
- Punarnava is useful in heart disease, anemia, oedema.

**Important Formulations**-Trifala ghrit, Sukumar ghrita, Sothaghna lepa


## Morphological Features-

**Stem –** Greenish purple, stiff, slender, cylindrical thickened at nodes, minutely pubescent or nearly glabrous, prostrate or ascending, divaricately branched, branches from common stalk, often more than a yard long.

**Leaves-** Opposite in unequal pairs, larger ones 25-37 mm long and smaller ones 12 to 18 mm long, ovate oblong or sbuorbicular, apex rounded or slightly pointed, base subcordate or rounded green and glabrous above, whitish below, margin entire or undulate, turned up and pinkish in certain cases, rather thick in texture, petioles nearly as long as the blade, slender.

**Flowers-** Very small in size, nearly sessile or shorly stalked 10 to 25 cm in small umbels arranged on slender long stlaks; lower part greenish stmens 2 to 3

**Fruit-** One seeded nut, 6 mm long clavate, 5 ribbed, viscidly glandular.

# Frequently Asked Questions

**1.** What are leaves?

**2.** What are leaflet?

**3.** What is the type of leaf?

**4.** What do you mean by the term bark?

**5.** What are the fibrous barks?

**6.** Which type of shape present on bark? Give example.

**7.** What are functions of bark?

**8.** What is the shape of aconite root?

**9.** Why always dried root or rhizome is used?

**10.** What is the different between bulb and rhizome?

**11.** Which types of flat bark present give example?

**12.** What are fruit?

**13.** What are the difference between the flower and fruits?

**14.** Give example of

- Simple fruit
- Compound fruits
- Cremocarp fruits

**15.** What do you mean by false fruits give example?

**16.** What are rhizomes?

**17.** Why stem are absent on rhizome?

**18.** What do you mean by the term-

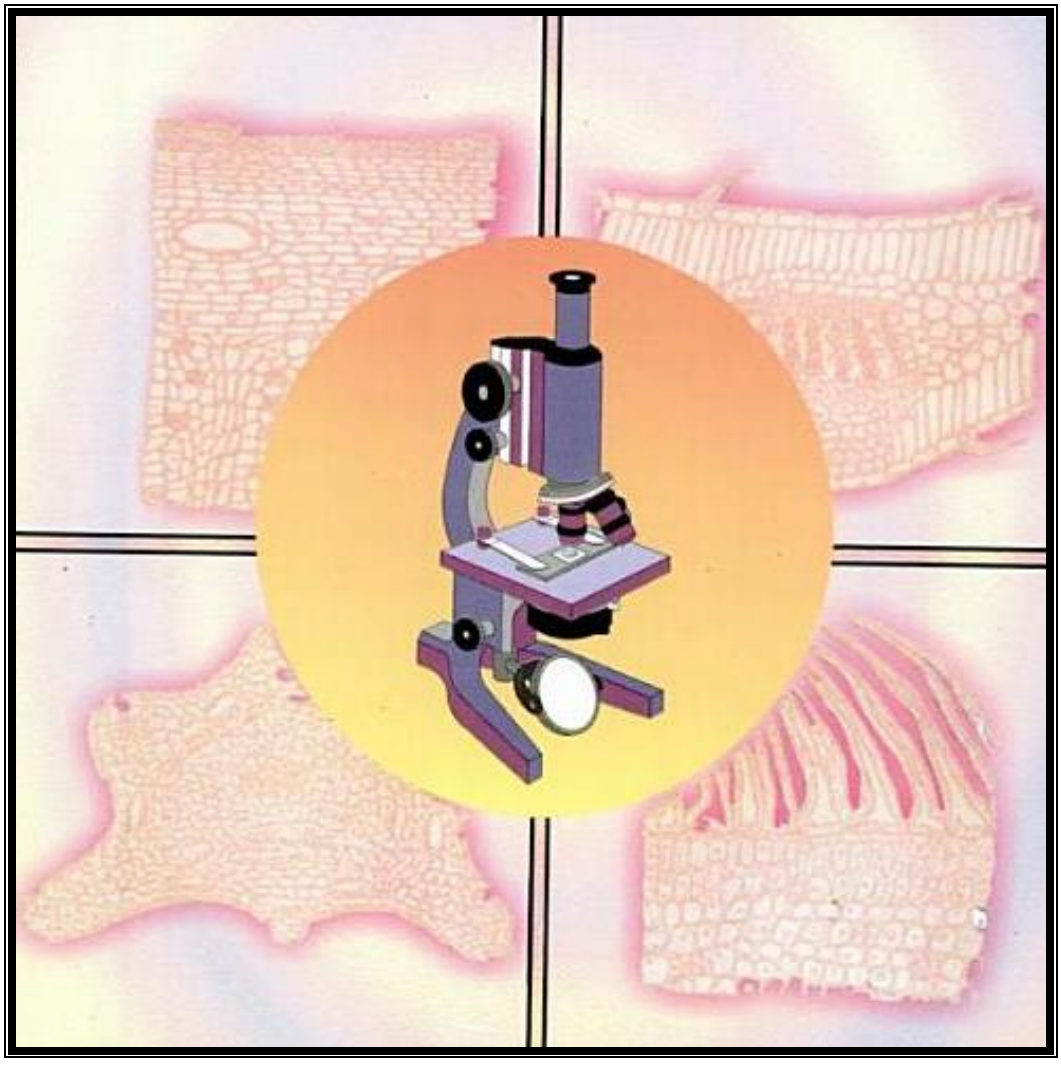
Tuber Bulb Corn Root

**19.** What are organised and unorganised crude drug?

**20.** Which type of adulteration is present on roots rhizomes?

# CHAPTER -3

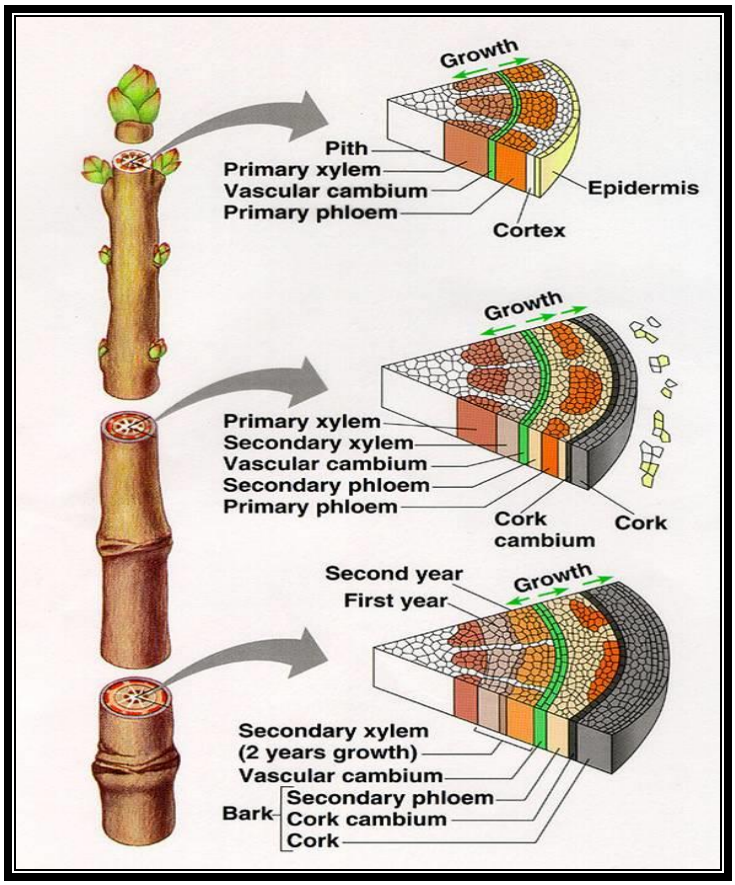
# MICROSCOPY



# General Technique

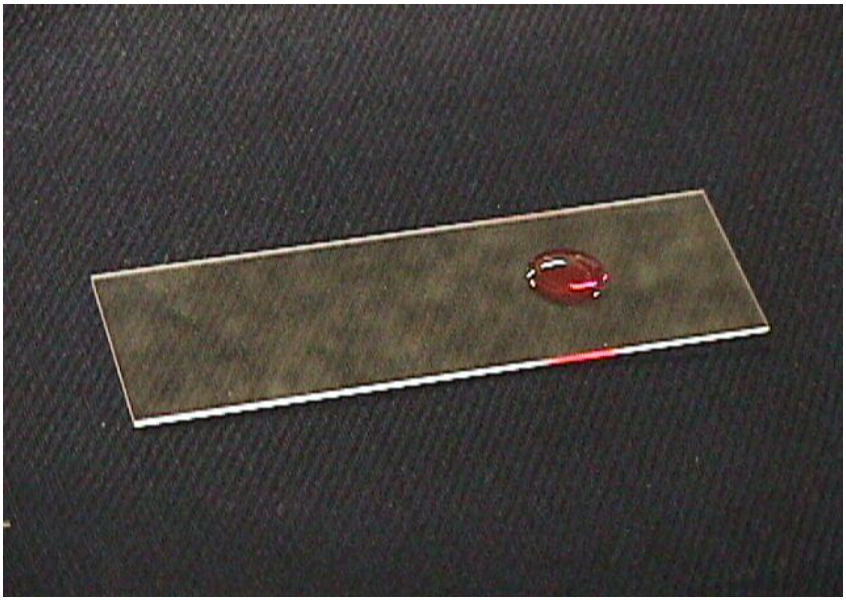
## 1 - Preparation of sample for sectioning.

Transverse section is obtained by cutting along the radial plane of a cylindrical portion of the stem, root, stolen and perpendicular to long axis.



## 2: Staining

To distinguish the arrangement of various tissues in the samples of crude drug, chemicals, dyes or colorants are used to impart colour to various tissue in section of drug sample.

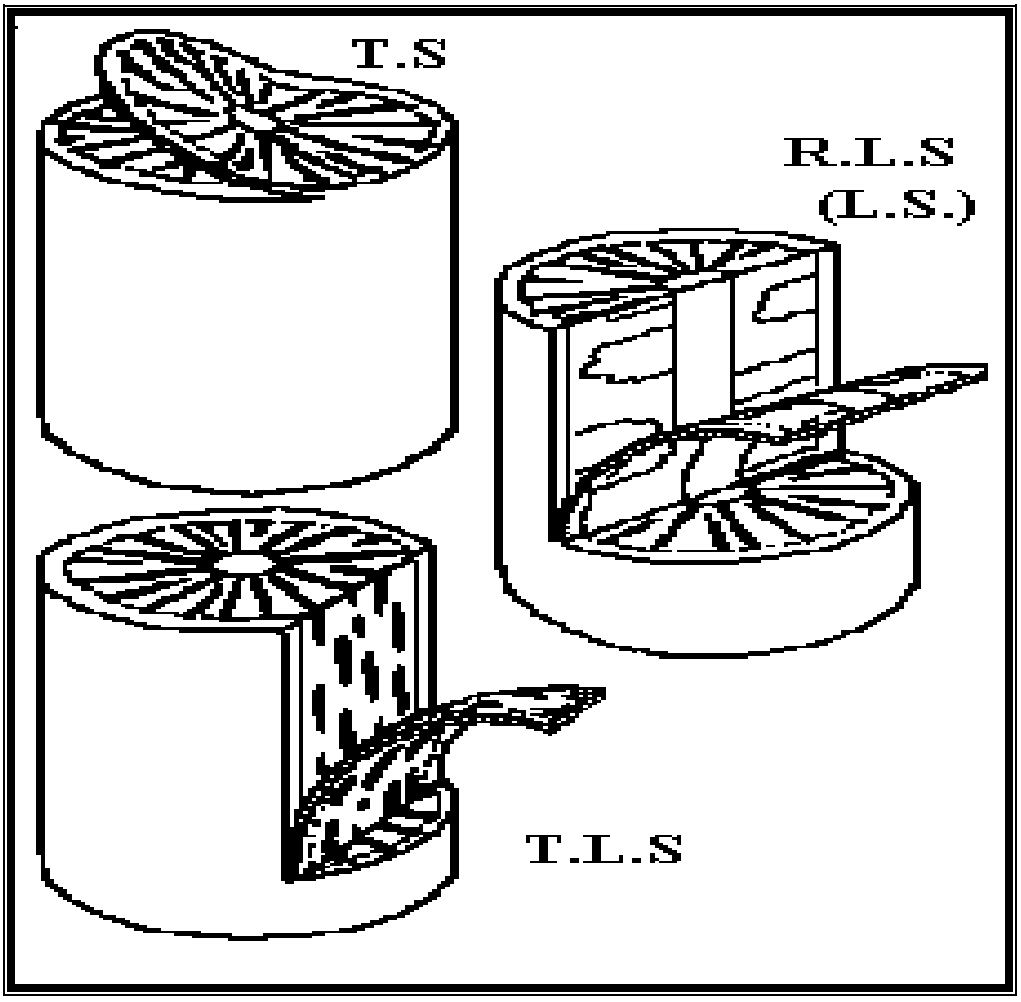


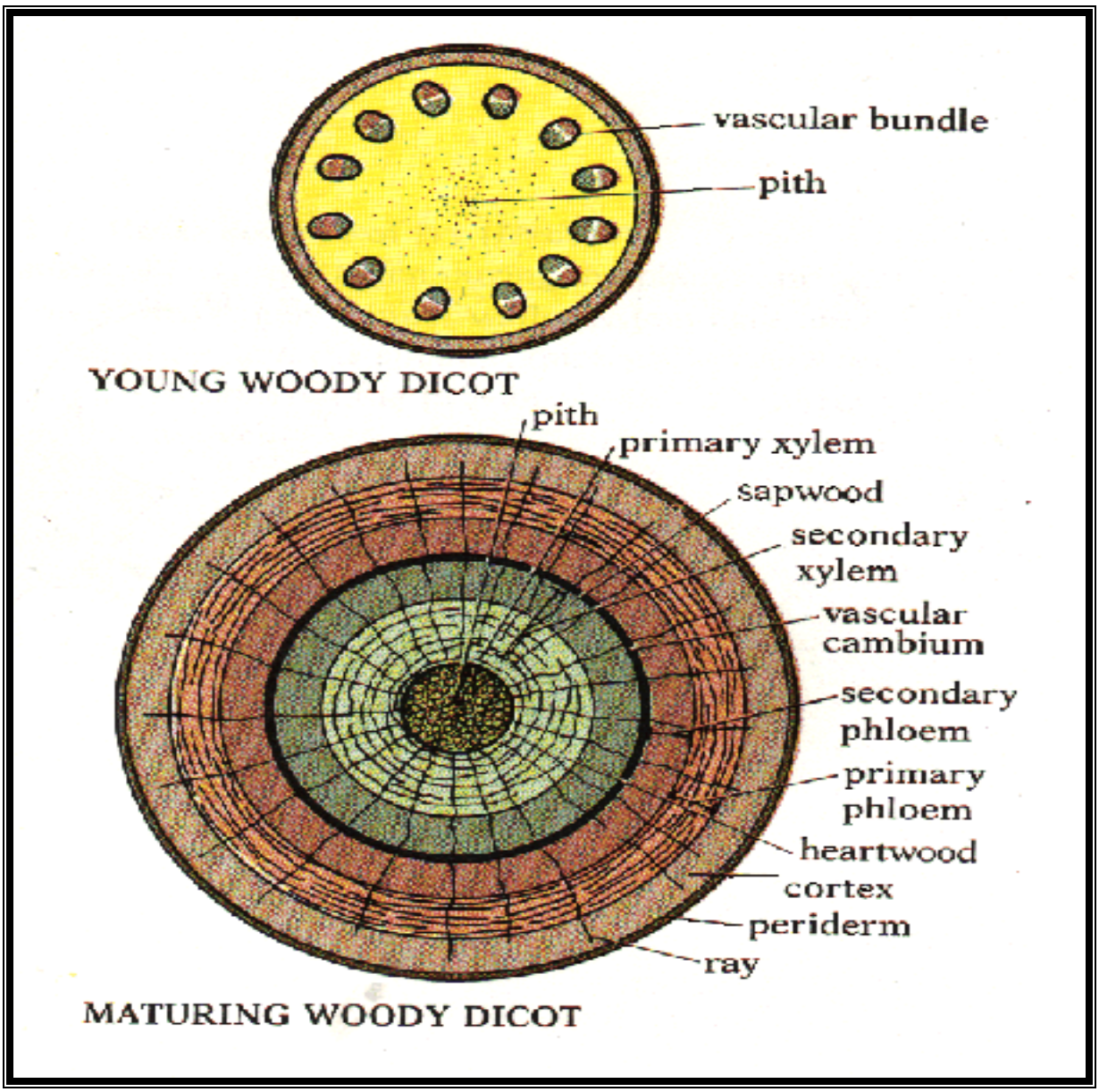
## 3. Observation

For observation of section, selection of place in a laboratory where sufficient light is available is important. The low power observation helps to draw a schematic diagram. For distinctive transverse section high power observation is used.

**Transverse section (T.S.)**

Transverse section is obtained by cutting along the radial plane of cylindrical portion of the stem, root, stolon and perpendicular to long axis.

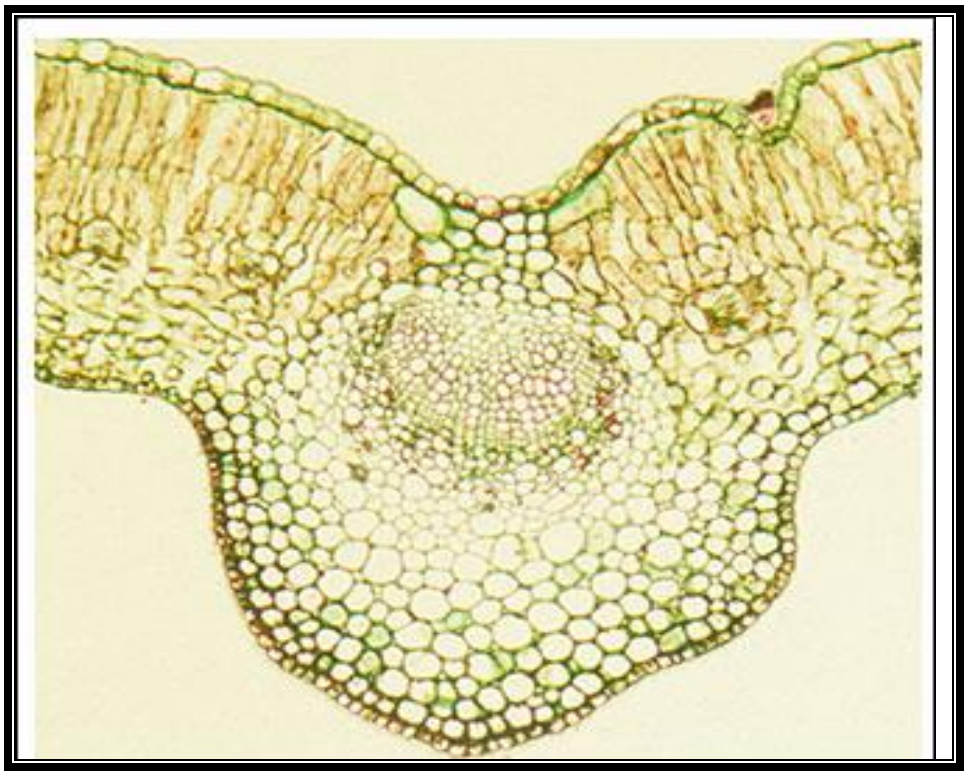





This section when prepared and observed under the microscope reveals the radial arrangement of tissues and shows concentric layers and vascular bundles.

- **Section of leaf**

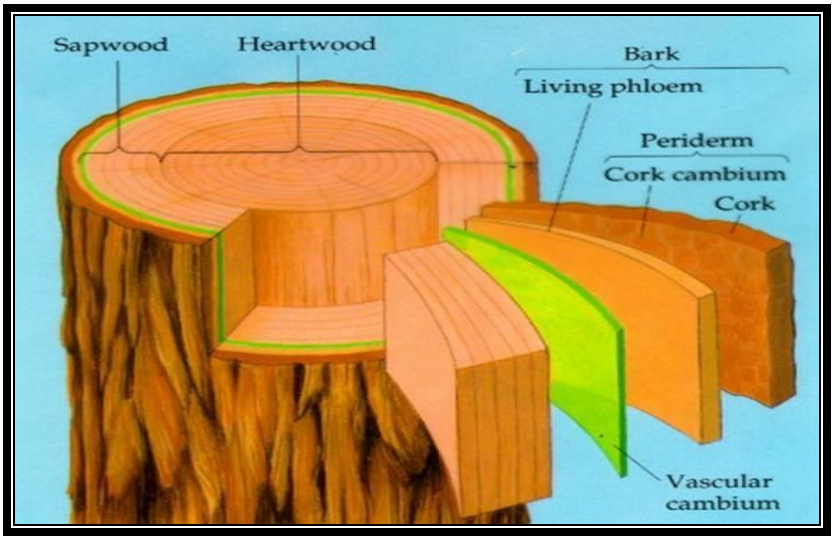
In case of leaf, the important aspect to study is a section through the midrib taken perpendicular to the midrib and Observation of a surface preparation.



**T.S. of leaf**

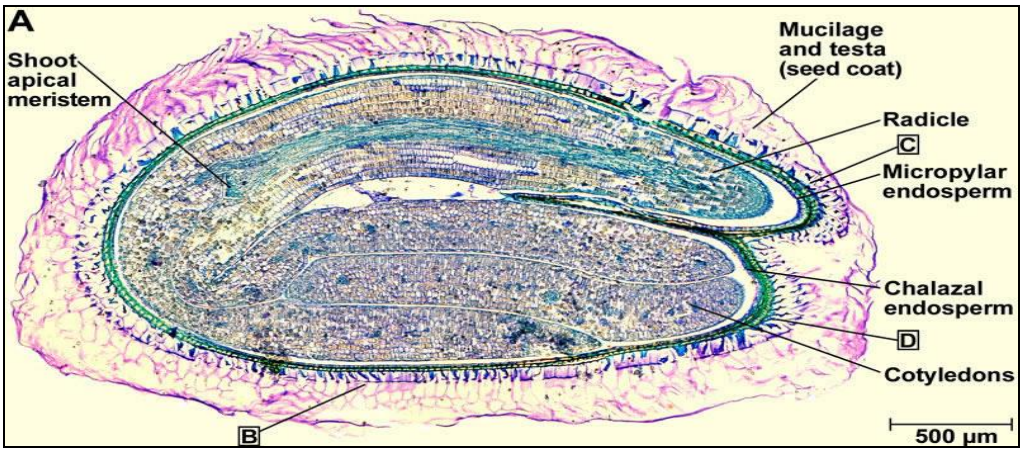
- **Section of bark**

In case of bark, transverse section is important as it reveals the horizontal section of cells and shows lenticels.




- **Section of fruit and seed**

In case of fruit and seeds, generally T.S. of various parts are observed under the microscope. In case of fruit and seed drug, separate section technique is required for individual drug.



## Section cutting technique

Following materials are required for Section Cutting.

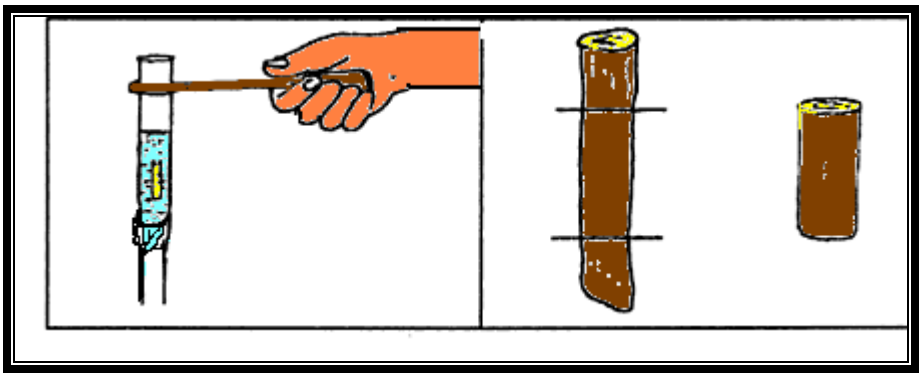
1. Paper Napkin
2. A dropper
3. Filter paper
4. Stains
5. Drug sample
6. Forceps
7. Test tube holder and stand
8. Needle
9. Camel hair brushes
10. Watch glass
11. A sharp razor blades
12. Micro-slide
13. Cover slip

.

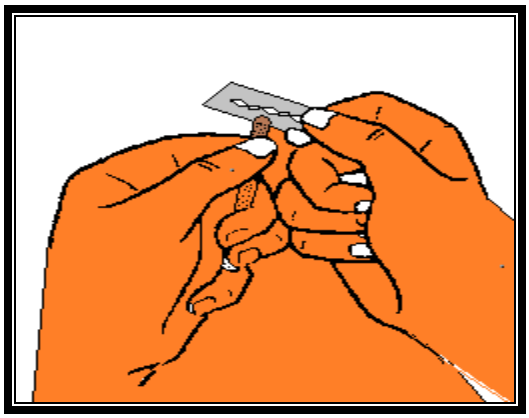
Section cutting can be done by taking transverse as well longitudinal section. Mostly transverse section is taken for study of crude drugs. Section cutting is a skill, which facilitate easy learning of the tissue components. There are various techniques of section cutting depending on the part of crude drug used. E.g. Green unripe papaya or potato is used for easy sectioning of the leaves.

## Preparation Section cutting includes the following steps of Sample for Sectioning.

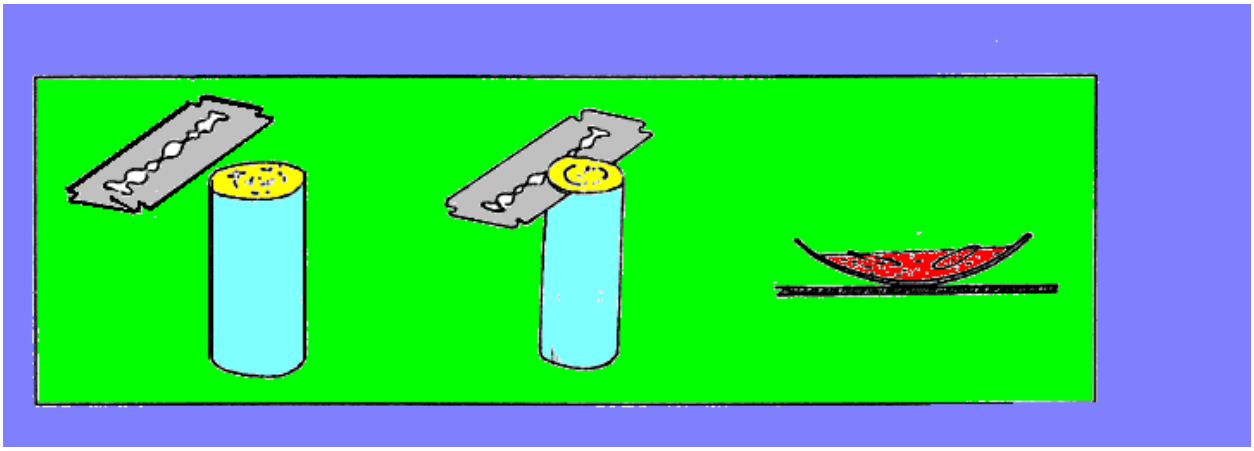
1. **Boiling of the sample**



**2. Section cutting.**



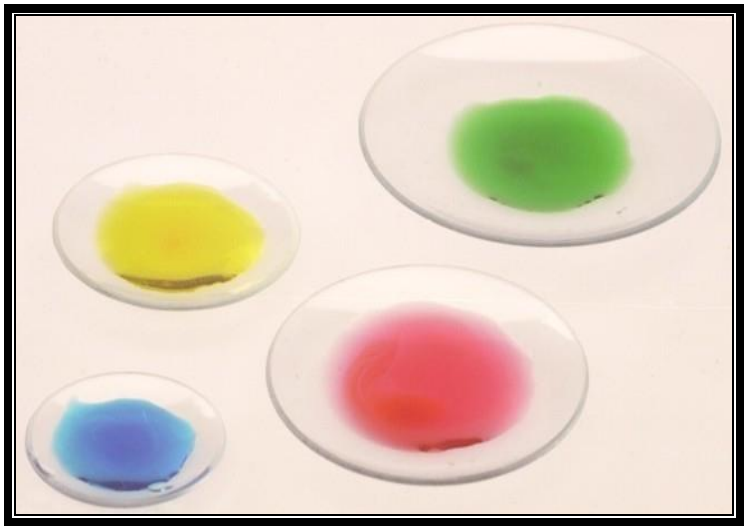
**3. Transfer the section in to watch glass containing water.**



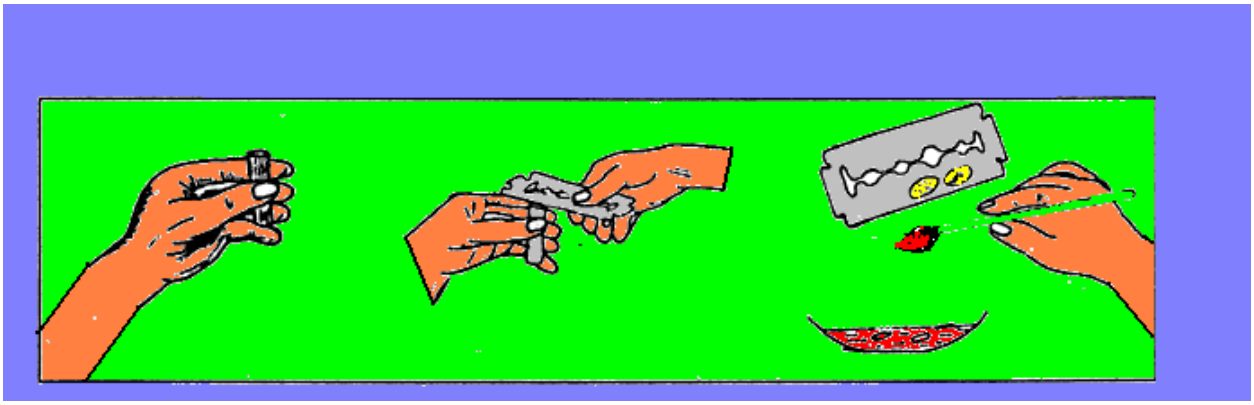
**Staining**-

A stain is a chemical dye (colorant), which combines chemically or physically with a cell content to impart colour to it. e.g. Sudan red III dissolves in the fixed oil present in the oil seed to impart red colour. Staining Process**-**

**1.** Take a clean watch glass and add the staining solution to it.



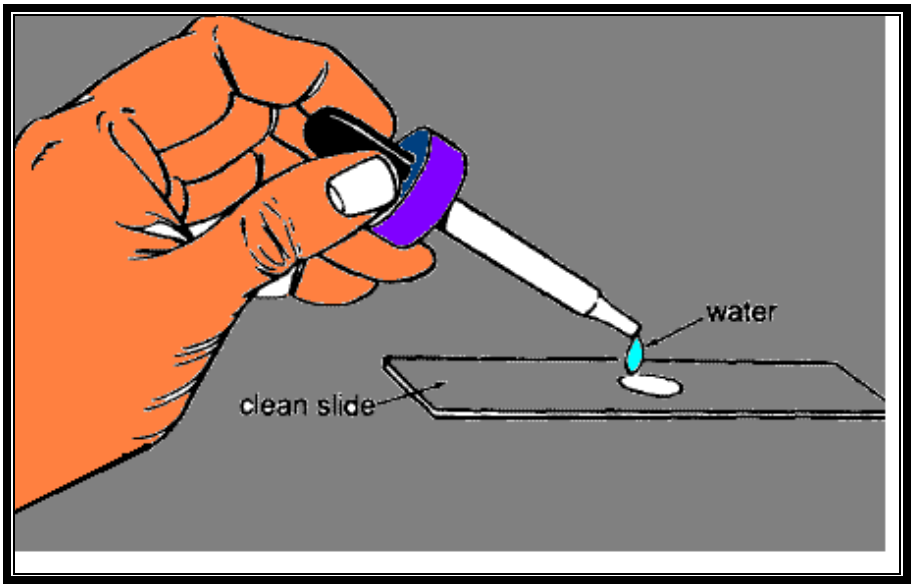
**2.** With the help of brush, transfer the section taken from watch glass containing water to stain solution and keep it for 2 - 3 minutes.



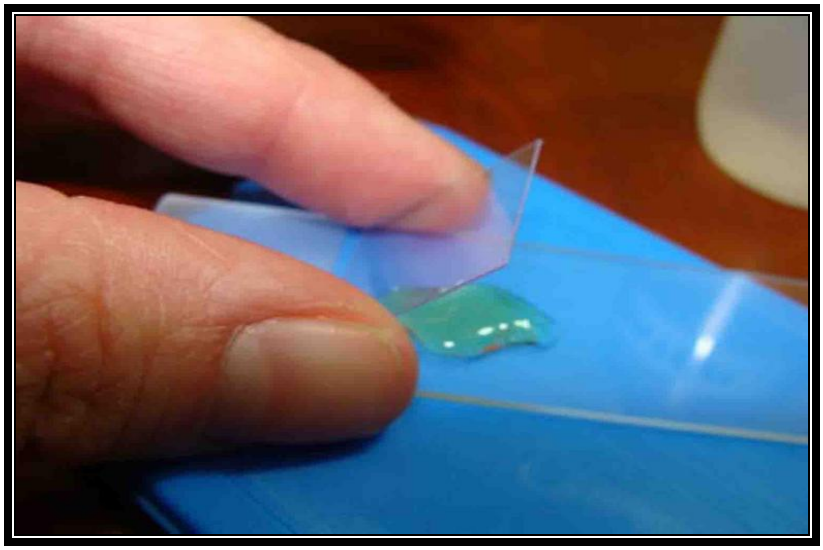
**3.** Transfer it to watch glass containing plane water, so that excess stain is washed away. This section is ready for mounting.

## Mounting Process

1. Transfer the section to be mounted on the glass slide with the help of brush.
2. Add 1 - 2 drops of water on the section with the help of Dropper.



**3.** Place a clean cover slip over the section with the help of a forceps and needle.

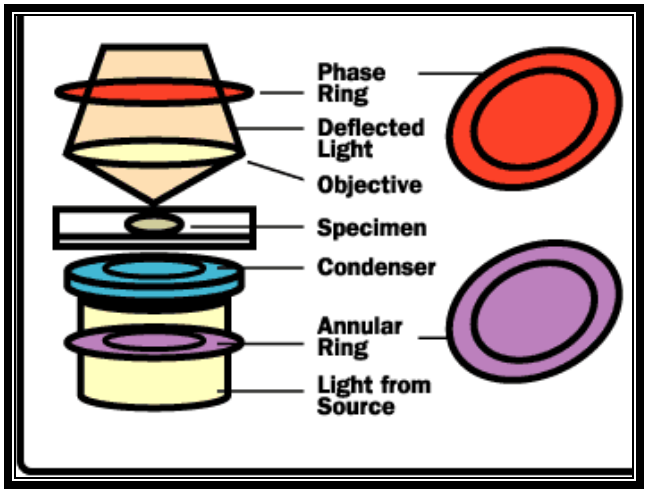


**4.** With the help of blotting paper, wipe out excess of water present outside the cover slip. The slide is ready for observation.

Procedure described above is the routine laboratory technique, so there may be evaporation of water and slide prepared will not last long. Glycerin is used to avoid evaporation of water and drying of section. In order to prepare a permanent mount, a special process is adopted named as Double Staining Technique.

## Observation -

1. Select a place in the laboratory for microscope, where sufficient light is available. Set the microscope in a such a way that the C-Arm is towards you and the objective and mirror facing the light.




**2.** Open the diaphragm completely with the help of the sub stage mirror. Adjust the position so that the field of view insufficiently illuminated.

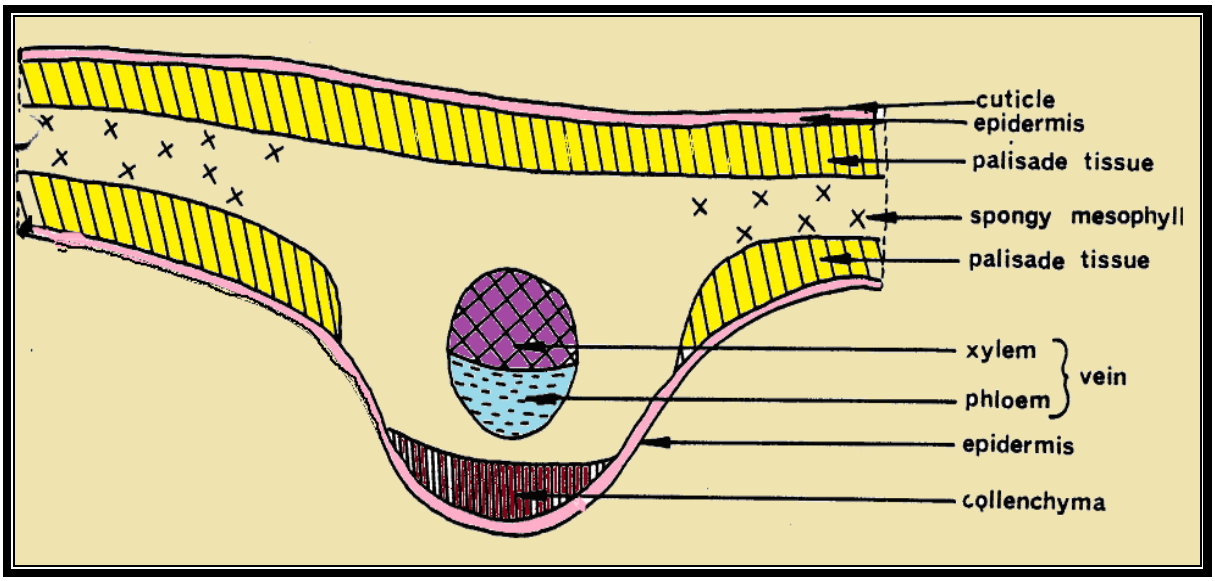
Closed diaphragm Open diaphragm

**3.** Place the slide prepared on the stage of the microscope at the centre, with the section placed exactly in line with the stage window lying above the condenser. Fix the slide between the clips. Now the slide can be moved forward, backward or sideways above the stage with the help of two screws provided on the mechanical stage. Take observations.

# Experiment No. 1

## Object- To Study the transverse section of Senna Leaf

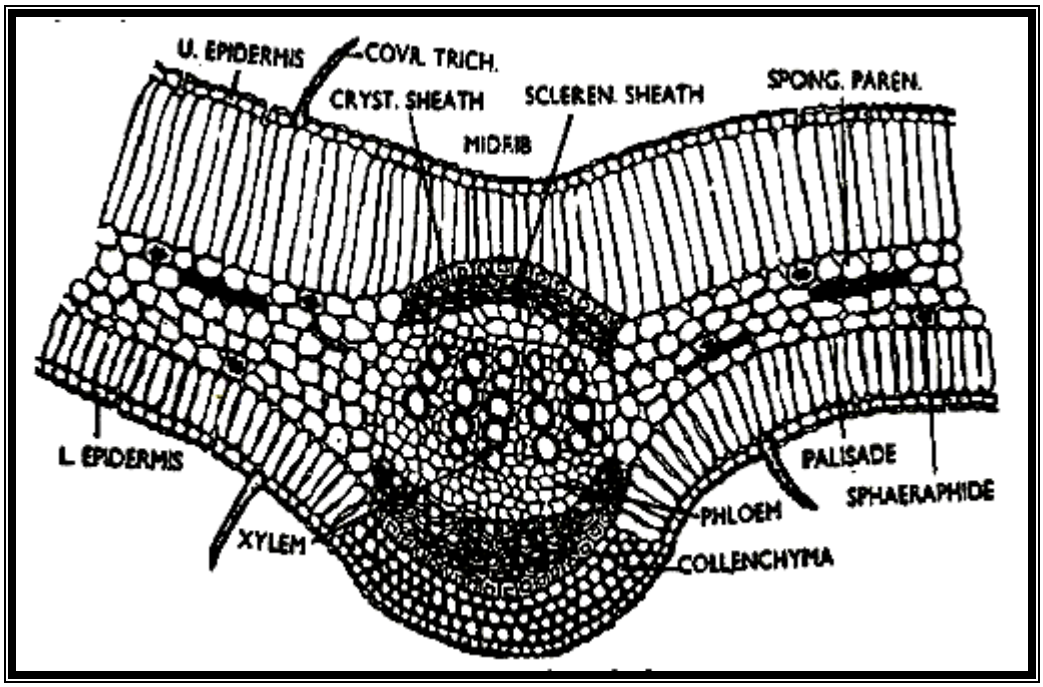
### 1. Senna Leaf



## Microscopic Characters

## T.S. of Leaflet

1. **Epidermis (upper and lower)-** Polygonal tubular cell having straight anticlinal walls. The inner periclinal wall contains mucilage and can be stained with ruthenium re. The epidermal trachoma are simple covering conical. Thin walled with warty cuticle and are curved at the base. The stomata present are of paracytic type.
2. **Palisade layer-** A single layer is present on upper and lower surface.
3. Spongy tissue- Parenchymatous cell which are loosely arranged Clustered crystals of calcium oxalate are present in them. There are few vessels having special thickness.
4. **Midrib-** Shows collenchyma, sclerenchymatous layer on both the sided of the vascular bundle consisting of xylem and phloem.
5. Prismatic Calcium oxalate crystals are present in crystal sheath which are also seen in powder of Senna.

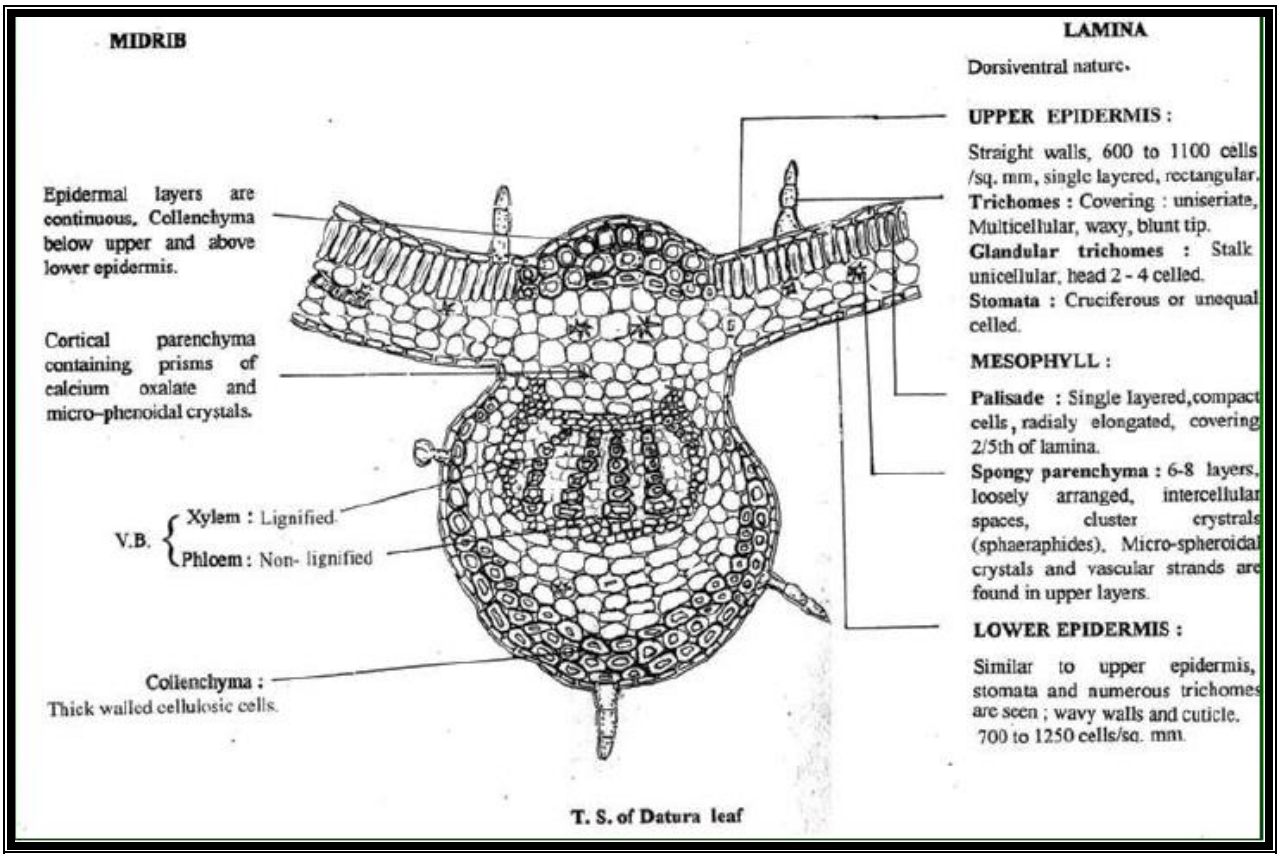


# Experiment No. 2

## Object- To Study the transverse section of Datura Leaf

### Microscopic Characters

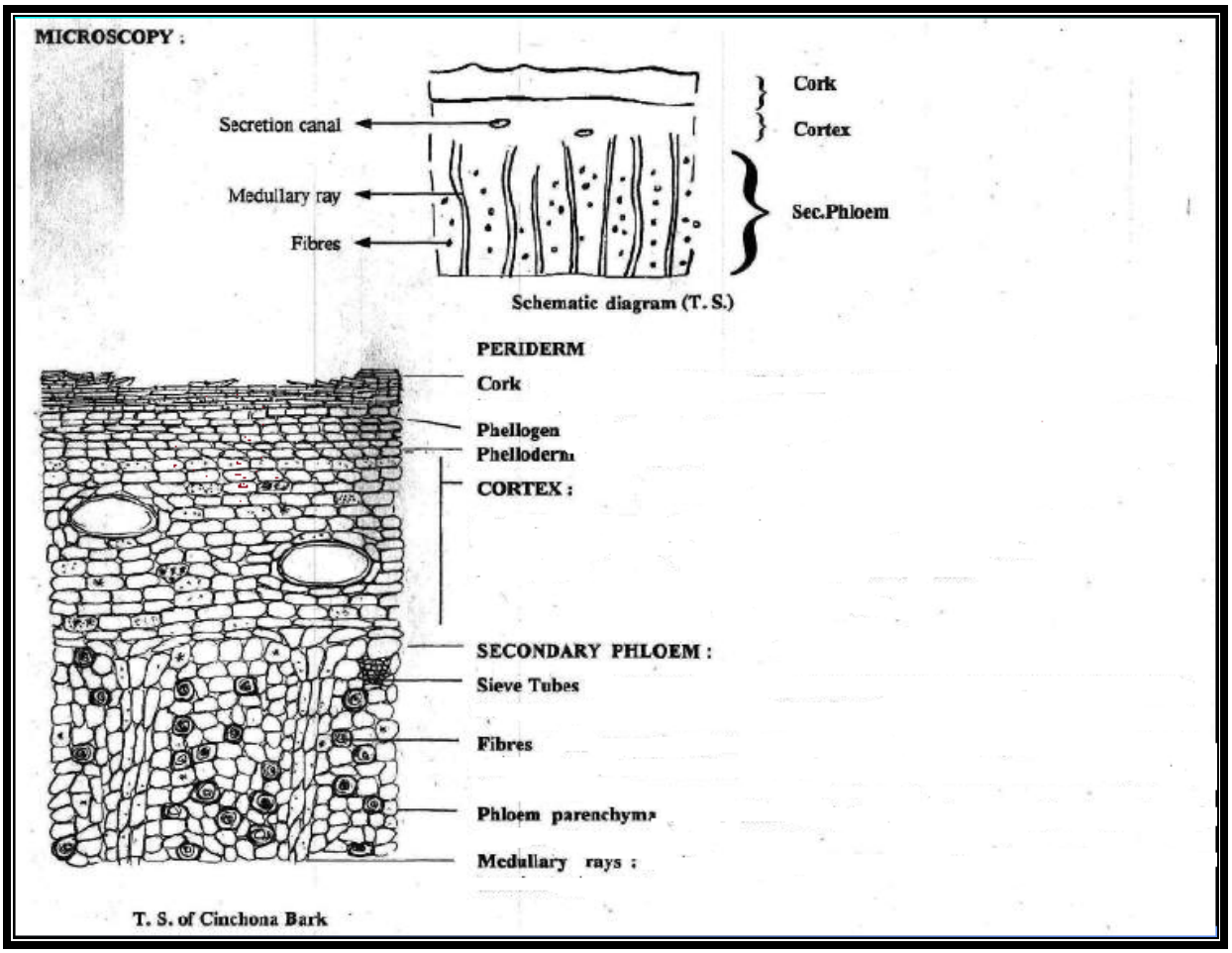
1. The leaf has a bifacial structure. Both the surfaces are smoothly cuticularised and have stomata and hairs.
2. In the mesophyll region there are clusters of calcium oxalate.
3. The epidermal cells, particularly of the lower epidemis, have heavy walls.
4. The midrib shows a bicollateral structure. Below the epidermis there are masses of callenchymatous tissue on both surfaces.
5. The xylem is present in the form of strongly curved arc. No sclerenchymatous tissue are present.



T. S. of Datura leaf

# Experiment No. 3

**Object- To study the transverse section of Cinnamon Bark**




## Microscopic Characters

A Transverse section of the bark shows the following layers of tissues-

**Cork-** It consists of thin walled dark brown cell (if present, usually it is absent)

**Sclereids-** It is horse shoe shaped and are highly lignified.

**Prricylic Fibers-** Lignified in group of 6 to 15.

**Sieve Tubes-** These are arranged in tangenifial bands which are completely collapsed in the outer layer.

**Phloem Fibers-** Occurs singly or in short tangential rows of two to five; they are lignified, colourless and slender.

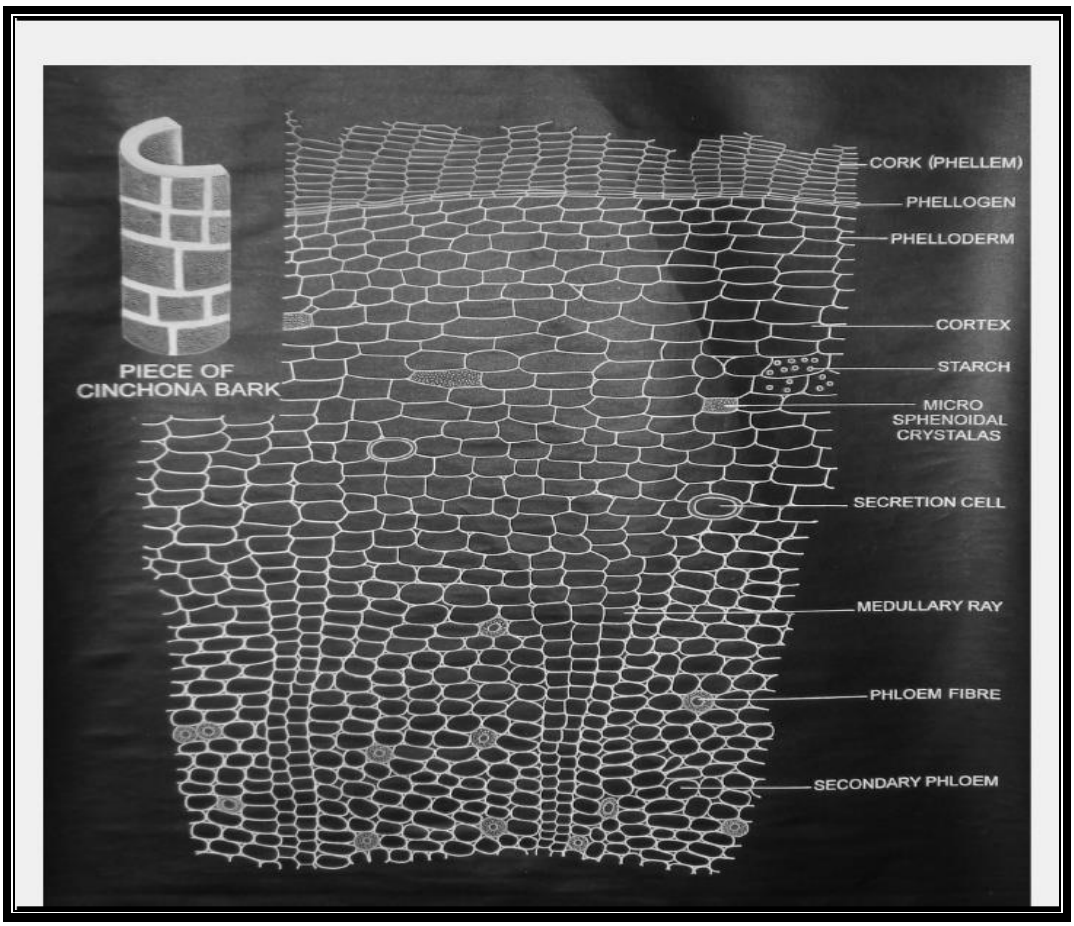
**Parenchyma-** It consists of sub rectangular cells which contain starch grain. Some cells also contain scattered minute needles of calcium oxalate.

**Idioblast-** There are longitudinally elongated cells containing volatile oil, or more rarely mucilage.

**Modularly rays-** There are usually biscriate, widening slightly as they approach to the pericycle. Many of these cells also contain minute needles of calcium oxalate or starch grain.

# Experiment No. 4

**Object- To study the transverse section of Cinchona Bark**




**T.S. of Cinchona Bark**

## Microscopic Characters

It shows the following structures-

**Cork-** Numerous layers of thin walled, flat polygonal cells filled with reddish brown mass.

**Cortex-** It is narrow, parenchymatous, cells contain starch grains and microcrystals of calcium oxalate. Secretion canals are also present.

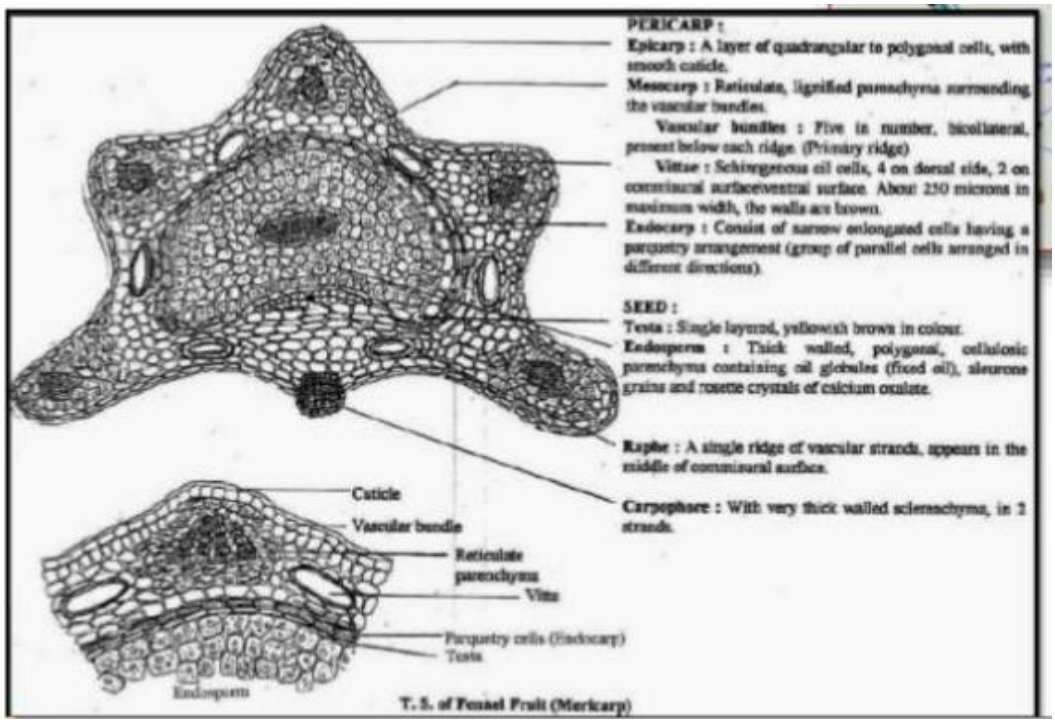
**Phloem fibers-** Lignified phloem fibers with tubular fennel shaped pits.

**Phloem parenchyma-** Consist of cells with thin, dark reddish brown walls, some containing micro prisms of calcium oxalate.

**Medullary rays (Medullary)-** They are from one to three seriate Salaried are absent.

# Experiment No. 5

## Object- To study the transverse section of Fennel Fruit



## Microscopic Characters

Fennel is a typical umbelliferous fruit called cremocarp. Each cremocarp consist of two mericarp connected by central stalk called carpophores. T.S. of mericarp shows two prominent surfaces- Commissural and dorsal. Commissural surface is flat with two ridges and three ridges are present in the dorsal surface.

The cremocarp is divided into two mericarp and each mericarp consists of the following structures.

**Epidermis-** It is composed of single layer of polygonal tangentially elongated cells with smooth cuticle.

**Mesocarp-** It consists of two types of cells.

Reticulate lignified parenchyma is present surrounding the Bicol lateral vascular bundles while the other type is made up of ordinary polyhedral cells.

**Vittae-** Four yellowish brown elliptical vittae are present on the dorsal surface between the ridges and two on the commissural surface.

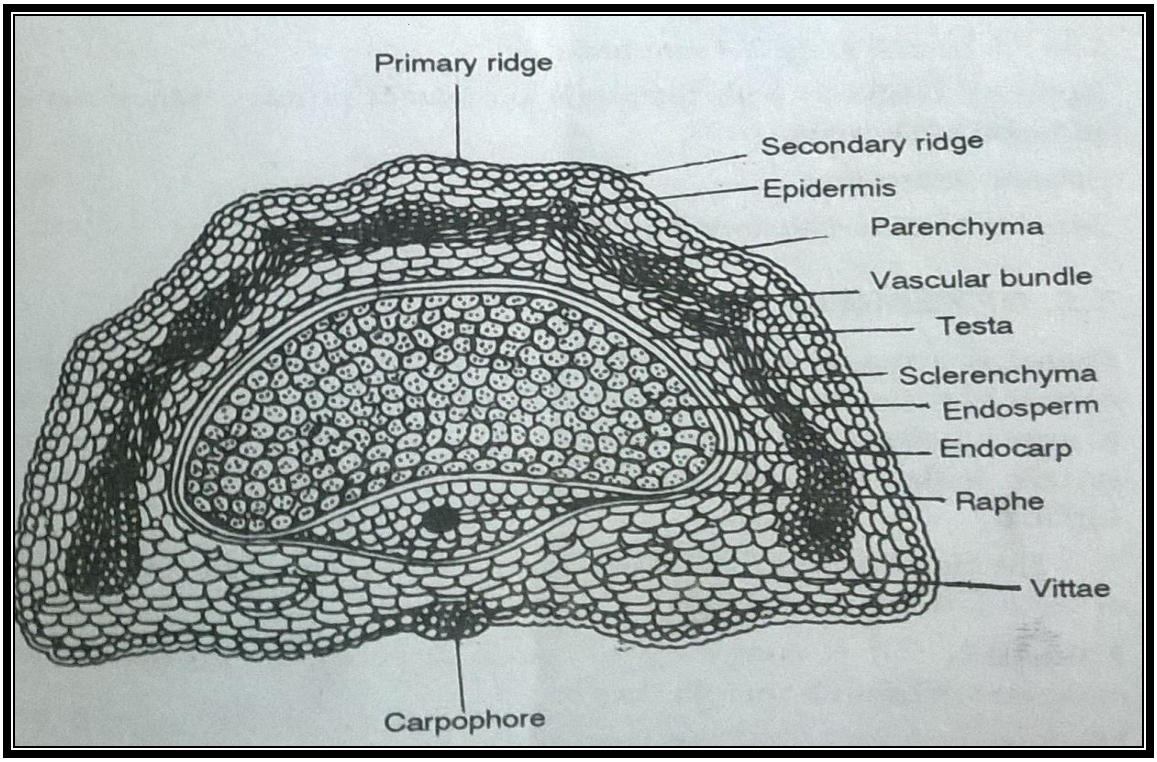
**Endocarp-** It consists of narrow elongated cells with parquetry arrangement.

**Testa-** Single layered and yellowish colour.

**Endosperm-** it consist of polygonal parenchyma cells containing oil globules and aleurone grains. A crescent shaped embryo is present in the apicl region of mericarp. Raphe is present in the middle of commissural surface in front of carpophore.

# Experiment No. 6

**Object- To study the transverse section of Coriander Fruit**



## Microscopic Characters

The cremocarp is divided into two mericarps. T.S. of mericarp shows two prominent surfaces dorsal and commissural. It has 5 less prominent primary ridges and 4 prominent secondary ridges. In the ripe fruit dorsal surface has no vittae mericarp show the following structure in T.S.

Epidermis of the pericarp is composed of polygonal tabular cells. Prism crystal of calcium oxalate is present occasionally.

**Mesocarp-** It is composed of outer and inner layer of parenchyma and in between lignified sclerenchymatous cells in sinous rows. They tend to be longitudinally directed in the outer layers, and tangentially directed in the inner layers. In the secondary ridges all the cells run tangentially while in the primary ridges all run longitudinally. Mesocarp in between the sclerenchymatous bands is composed of irregular polygonal cells with lignified walls.

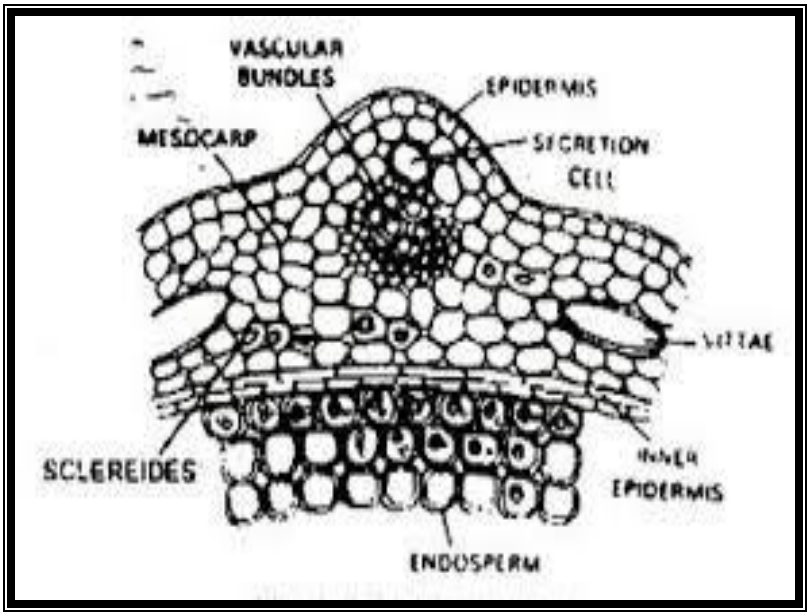
**Endocarp-** It is made of typical parquetry cells.

**Testa-** Brown flattened cells in single layer.

**Endosperm-** It is composed of colourless parenchyma cells containing fixed oil and aleurone grains. It is curved in shape. Rosettes of calcium oxalate are present.

# Experiment No. 7

**Object- To study the transverse section of Caraway Fruit**

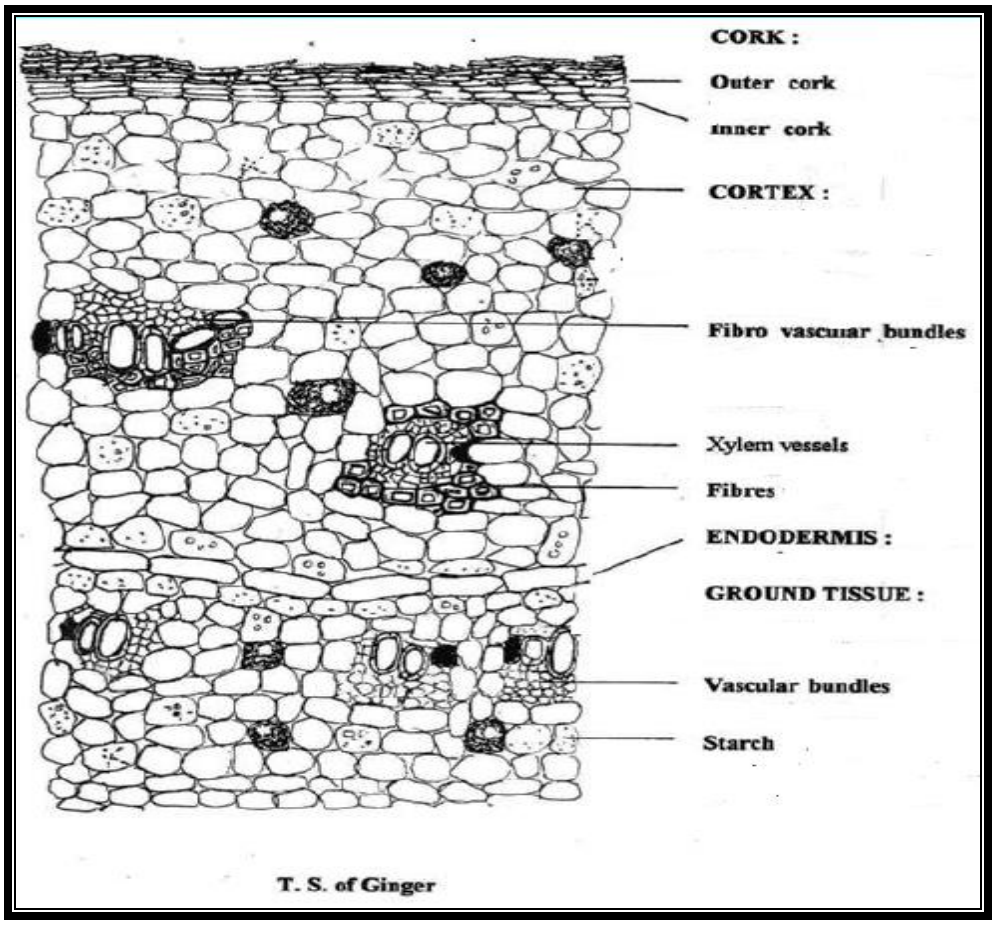



- The **mericarp** is nearly equilaterally pentagonal in transverse section and shows a fibrovascular bundle in each primary rib.
- The **epicarp** consists of tabular polygonal epidermal cells with thick outer walls possessing a striated cuticle and with occasional stomata.
- The **mesocarp,** located between primary rib regions, is composed of collapsed, thin-walled parenchyma normally bearing four dorsal vittae in the intervals and two commissural vittae and sometimes one or more additional vittae.

- The **endocarp** consists of broad, slightly undulate, inner epidermal cross cells that are coherent with the collapsed cells of the spermoderm.
- The **endosperm** consists of thick-walled reserve parenchyma containing fixed oil and aleurone grains up to 10 µm in diameter, the latter with embedded rosette aggregates of calcium oxalate up to 4 µm in diameter. An embryo is embedded in the upper end of the endosperm.

# Experiment No. 8

## Object- To study the transverse section of Ginger




T. S. of Ginger

## Microscopic Characters

A transverse section of the rhizome shows the following tissue layer-

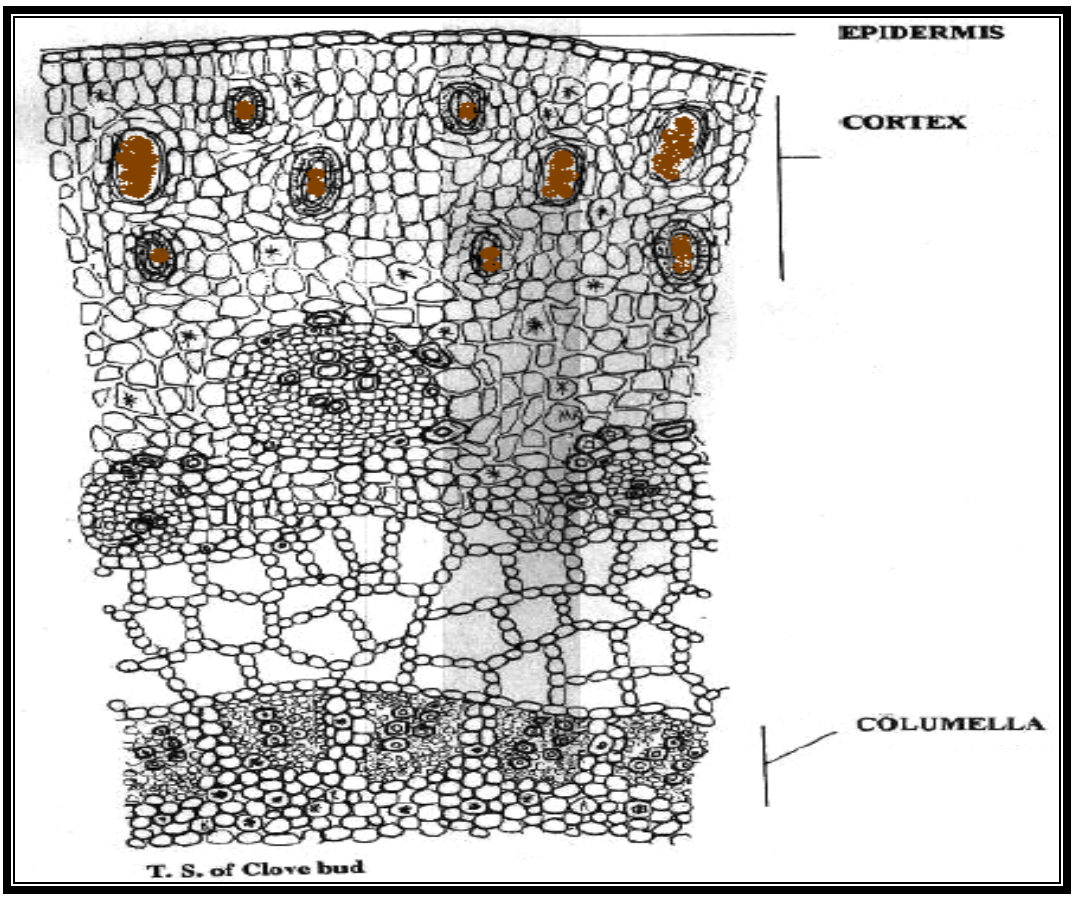
**1. Cork-** It consists of a outer zone of irregularly arranged cells and inner zone of redially arranged cells (about in jamica Zinger).

**2. Cortex**- It consists of this walled, cellulosic round parenchyma cells with inter cellular spaces, containing starch grains, brown oleoresin cells are also present in the cortex.

**3. Vascular bundle-** Closed collateral fibro vascular bundles are also present in the cortex. In stele ring of vascular bundles (without fibres) are present just below the endodermis. The xylem vessels have annular, spiral or reticulate thickening which is not lignified. The phloem fibers are thin walled with only central lumen lignified with pectosic transverse septa.

# Experiment No. 9

## Object- To study the transverse section of Clove




T. S. of Clove bud

## Microscopic Characters

A transverse section passing through the hypanthium shows the following layers

1. **Epidermis-** It consists of small tubular cells with straight walls and a thick cuticle having anomocytic type of stomata.
2. **Oil cell layer-** Below the epidermis is a zone of roughly radial arranged parenchymatous cells containing numerous schizogenous oil glands arranged in two or three, intermixed layers. The oil glands are ellipsoidal in shape, with the long axes redial. And show on epithelium composed of two or three layers of flattened cells.

   The ground non parenchyma also contains cluster crystals of calcium oxalate.
3. **Vascular Bundles-** A ring of bicollateral bundles is present in the parenchymatous layer the meritless are enclosed in an incomplete ring of lignified fiber. The xylem is composed of 3-5 lignified spiral vessels.
4. **Aerenchyma-** Below the ring of vascular bundle is a zone of aerenchyma, composed of aie spaces separated by lamellae one cell thick, which support the central columella.
5. **Collumella-** The ground tissue of the columella is parenchymatous and is particularly rich in calcium oxalate crystals. In outer region of columella is a ring of some 17 small vascular bundles.

# Frequently Asked Questions

1. How to focus the Transverse section in order to get fine image?
2. What is role of condenser and iris diaphragm in critical illumination?
3. State a role of a chemical dye during staining procedure.
4. Give two examples of staining agent with their reactions.
5. Write the reactions of cell wall and cell content with staining agent along with observation.
6. List the necessary material required for section cutting.
7. How to make a sample preparation for microscopic examination?
8. What is the purpose of taking transverse section of crude drug?
9. Mention special method for section cutting of leaf.
10. Why young leaves are preferred to get fine section? Give reason.

# CHAPTER - 4

# CHEMICAL EVALUATION

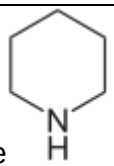
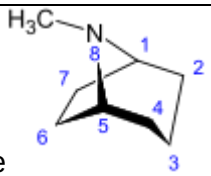
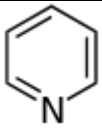
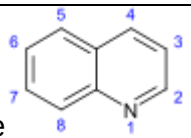
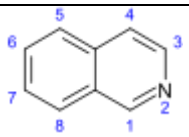
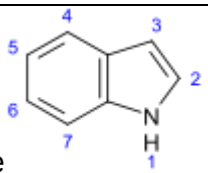
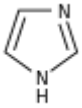
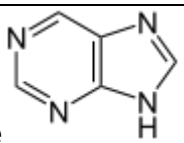
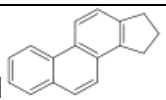
# OF

# CRUDE DRUGS

# Alkaloids


**Alkaloids** are a group of naturally occurring chemical compounds, that contain mostly nitrogen atoms. This group also includes some related compounds with neutral and even weakly acidic properties. Some synthetic compounds of similar structure are also attributed to alkaloids. In addition to carbon, hydrogen and nitrogen, alkaloids may also contain oxygen, sulfur and more rarely other elements such as chlorine, bromine, and phosphorus.

Alkaloids are classified according to the nature of the basic chemical structure from which they are derived eg.

| S.No. | Name | Example |
|---|---|---|
| **1.** |  Piperidine | Lobelia (Lobeline) |
| **2.** |  Tropane | Belladone (Atropine) |
| **3.** |  Pyridine & Pyrvolidine | Tobacco (Nicotine) |
| **4.** |  Quinoline | Cinchona (Quinine) |
| **5.** |  Isoquinoline | Ipecac (emetine) |
| **6.** |  Indole | NuxVomica (Strychnine) |
| **7.** |  Imidazole | Pilocarpous Jaborandi |
| **8.** |  Purine | Tea (Caffeine) |
| **9.** | Phenanthrene | Opium (Morphine) |
| **10.** |  Steroidal | Aconite (Aconitine) |

## Alkaloidal Bases-

The powdered crude drug is moistened with sodium bicarbonate solution for overnight and alkaloidal bases are extracted by macerating it with chloroform. The chloroform extract is separated and concentrated and acidified with dilute hydrochloric acid. The aqueous layer is separated and basified with ammonia solution. This basic solution is again extracted with chloroform which on removing the solvent gives alkaloidal bases in crude form.

## Alkaloidal Salt-

The powdered crude drug is moistened with dilute mineral acids like hydrochloric acid or Sulphuric acid for overnight. Then the drug is extracted with water. For purification the aqueous extract is basified and extracted with chloroform and then chloroform solution is extracted with dilute acids which contain alkaloidal salt in crude form.

## Alkaloidal Bases & Salts in Mixture

The powdered crude drug is extracted with ethanol (95%) by maceration and alcoholic layer separated and concentrated. The alkaloid bases and salts are easily soluble in 95% ethanol.

## A. General Tests for alkaloids-

### Procedure-

Take four test tubes each having 2 ml approximately of cold alkaloidal extract and acidify it with minimum quantity of dilute hydrochloric acid. Add drop by drop one test reagent in one test tube and observe the change.

Repeat the procedure with other test reagents in remaining three test tubes (Dragendorffs reagent, Mayers reagent, Hagers reagent, Wagner reagent)

Compare the observation as given in the table. Appearance of some color or precipitate confirms presence of alkaloids.

| S.No. | Test reagent | Observation |
|---|---|---|
| **1** | Dragendorffs reagent | Orange to orange red precipitate |
| **2** | Mayers reagent | White or pale yellow |
| **3** | Hagers reagent | Crystalline precipitate |
| **4** | Wagners reagent | Brown or reddish brown precipitate |

## B. Specific group tests for alkaloids-

## Procedure-

### 1. Piperidine

Take 2 ml of alkaloidal extract and add 2 drops of formaldehyde solution and 2 ml of sulphuric acid, an orange red color development confirms the presence of piperidine type of alkaloids.

### 2. Tropane

Take about 2 ml of alkaloidal base extract add 2 ml of fuming nitric acid & evaporate to dryness. Dissolve it in acetone and add drop by drop metabolic potassium hydroxide. Appearance of violet colour confirms the presence of Tropone alkaloids

### 3. Pyridine & Pyrrolidine-

Take about 2 ml of alkaloidal extract add 6 ml of cyanogen bromide solution and 1 ml of aniline solution. Appearance of golden yellow colour confirms the presence of pyridine & pyrrolidine type of alkaloids.

### 4. Quinoline

a. Take about 2 ml of alkaloidal extract add 2 or one drop of dilute sulphuric acid a vivid blue fluorescence is produced.

b. Take about 2 ml of alkaloidal extract add 2 or 3 drops of solution of bromine and 1 ml of dilute ammonia solution an emerald green colour is produced.

Appearance of the above given colors confirms the presence of quinolone type of alkaloids.

### 5. Isoquinoline

Take about 2 ml of alkaloidal extract add 0.5 g potassium chlorate or chloramine. Appearance of yellow colour which on standing turns red confirms the presence of isoquinoline type of alkaloids.

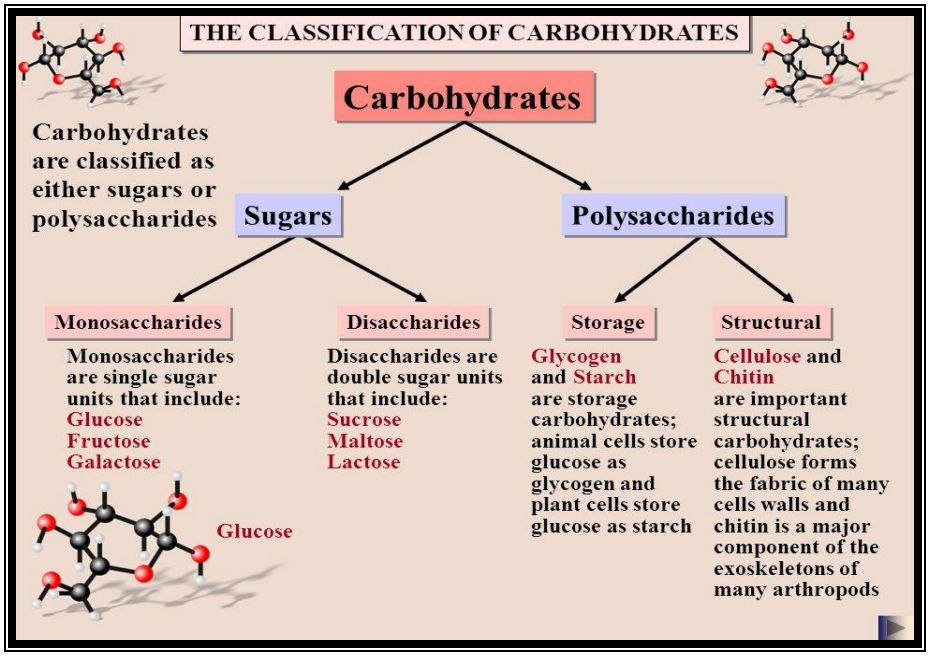
# Carbohydrates

**Object- Identification of Carbohydrates in crude drugs**

**a.** To differentiate between carbohydrates & glycosides
**b.** To differentiate between reducing and non-reducing carbohydrates.
**c.** To identify the monosaccharaides, disaccharides and polysaccharides
**d.** To identify the chemical nature of glycoside

**Theory-**

Carbohydrates contain carbon, hydrogen and oxygen, the last two element being usually present in the proportions as in water. They are among the most abundant constituents of both plants and animals. Many such as the sugars and starches are important food reserve for the plant and foodstuffs for man and other animals. Celluloses and other polysaccharides are constituents of cell wall of plants and provide important fiber.



## Chemical Tests for Polysaccharides-

1. **Starch-** It gives deep blue colour with dilute Iodine solution which disappears on heating and reappears on cooling.
2. **Glycogen-** It gives wine coloration with iodine solution which disappears on heating & reappears on cooling.
3. **Cellulose-** Insoluble in hot & cold water. Cellulose dissolves in Schweitzer's reagent and is precipitated by dil. acids.

## Experimental –

1. **Molish's Test-** Take powdered drug in a test tube and add Molish's reagent. Purple colour develops.
2. **Fehling's Solution-** To the solution of carbohydrate and equal quantity of Fehlings solution A & B after hating brick red coloured precipitate is obtained.
3. **Barfoed's Test-** To 0.5 ml of 20 % solution of carbohydrate add 50 ml of Benedicts solution and boil for 2 minutes, a red precipitate of cuprous oxide is formed in presence of reducing sugars & solution remains clear in absence of reducing sugars.

**REACTIONS OF SUCROSE**

| S.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| 1) | Molisch Test | Purple ring at the junction of two liquids | Sucrose is a carbohydrate |
| 2) | Benedict's Test | No color change | It is a non reducing carbohydrate |
| 3) | Barfoed's test | No change in color | It is not a mono saccharide |
| 4) | Seliwanoff test | Cherry red color | Keto hexose containing disaccharide |
| 5) | Hydrolysis (Inversion) test | The hydrolytic products give positive reaction with Benedict's and Barfoed's reagents. | Confirmatory test for Sucrose |
| 6) | Osazone test | No reaction | Sucrose does not form osazone crystals |

## REACTIONS OF GLUCOSE

| S.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| 1) | Molisch Test | Purple ring at the junction of two liquids | Glucose is a carbohydrate |
| 2) | Benedict's Test | Brick red ppt (Color depends on amount of sugar) | Glucose is a reducing carbohydrate |
| 3) | Barfoed's test | Scanty red ppt at the bottom of test tube | Glucose is a reducing mono saccharide |
| 4) | Seliwanoff's test | Cherry red color is not observed | Glucose is not a keto hexose |
| 5) | Osazone test | Needle shaped crystals | Confirmatory test for glucose |

## REACTIONS OF GALACTOSE

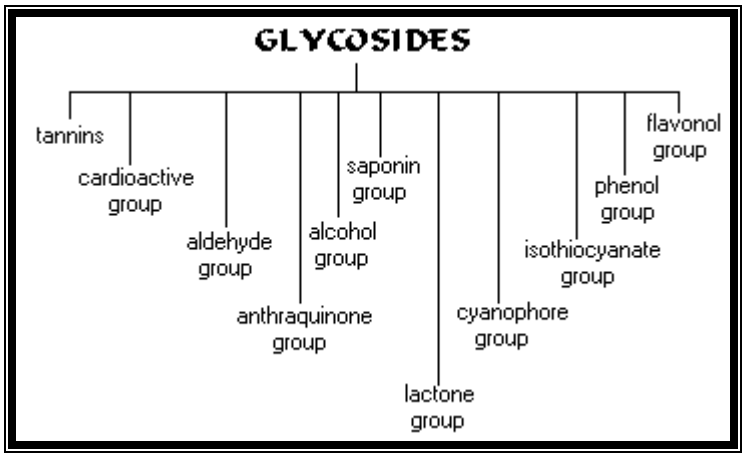
| S.NO. | TEST | OBSERVATION | INFERENCE |
|---|---|---|---|
| 1) | Molisch Test | Purple ring at the junction of two liquids | Galactose is a carbohydrate |
| 2) | Benedict's Test | Brick red ppt (Color depends on amount of sugar) | It is a reducing carbohydrate |
| 3) | Barfoed's test | Scanty red ppt at the bottom of test tube | It is a reducing mono saccharide |
| 4) | Seliwanoff's test | Cherry red color is not observed | It is not a keto hexose |
| 5) | Osazone test | Rhombic plate shaped crystals | Confirmatory test for galactose |

# Glycosides

## Theory-

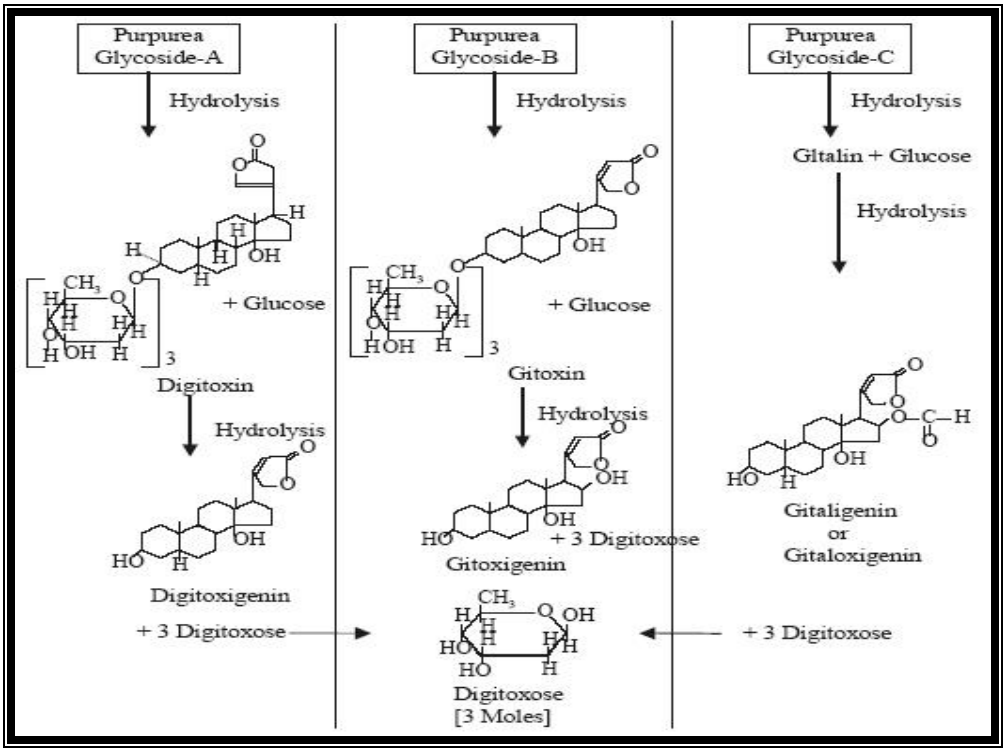
Glycosides are compounds that yield one or more sugars among the products of hydrolysis. Although most frequently occuring sugar is D-glucose, sugar such as rhamnose, digitoxose, cymarose and other sugars are also found in Glycosides. When the sugar formed is glucose, the substance may be called glucoside, howeyer as other sugars may also be formed during hydrolysis, the word glycoside is applied commonly.

- Chemically agycosides may be considered as sugar ethers. The nonsugar component of the glycosides is known as aglycone, where as sugar component is called glycone.
- Glycosides are colourless, crystalline, non-reducing optically active compound, usually 1-rotatory. They are water soluble, as well as alcohol soluble.They are hydrolysed with dilute acids and with various enzymes present in the same plants hlycosides.
- Glycosides perform important functions in plant like growth & protection. Therapatically they are important due to their aglycone content the sugar portion makes them water soluble and move absorbant.
- The crude drugs containing glycosides as the active constituents are classified on the basis of the chemical nature of their aglycone moiety as follows-




## Extraction of Glycosides-

The finely powdered plant part is extracted with water or alcohol in continuous soxhlet apparatus. The enzymes present in the plant tissue are destroyed by heating at suitable temperature. Special care should be taken in case of thermo labile glycosides and they should be extracted at low temperatures. The non-glycoside impurities are precipitated with lead acetate solution and excess of latter is removed by passing $H_2S$ gas through the extract. The concentration of extract gives crude glycoside, which is further purified using suitable solvent.



## To Identify the presence of Glycoside in crude drugs

### Legal test

The extract is to be dissolved in pryridine and a few drops of 2 per cent sodium nitorprusside together with a few drops of 20 per cent NaOH are to be added. A deep red colour which faded to a brownish yellow indicates the presence of cardenoloides.

### Kedde test

1ml of an 8 per cent solution of the extract in methanol will be mixed with 1ml of a 2 per cent solution 3, 5-dinitrobenzoic acid in methanol and 1ml of a 5.7 percent aqueous sodium hydroxide. An immediate violet colour will indicate the presence of cardenolides in the extract, the colour fading gradually through reddish-brown to brownish-yellow with the precipitation of a whitish crystalline solid. The test indicates the presence of a lactone ring in the cardenolide.

### Lieberman's test

0.5g of the extract will be dissolved in 2ml of acetic anhydride and cooled well in ice sulphuric acid was then carefully added. A colour change from violet to blue to green will indicate the presence of a steroidal nucleus (i.e. aglycone partion of the cardiac glycoside)

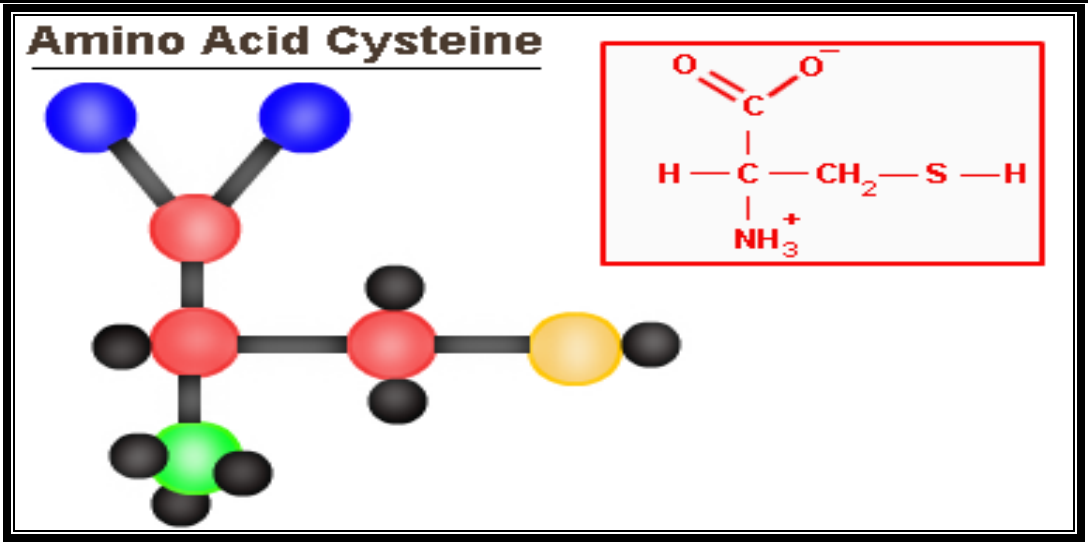
### Salkowski test

0.5 of the extract will be dissolved in 2ml of chloroform. Sulpuric acid is then carefully added to form a lower layer. A reddish-brown colour at the interface will indicate the presence of a steroidal ring (i.e. aglycone portion of the cardiac glycoside).

### Keller kiliani test

0.5 of extract will be dissolved in 2ml of glacial acetic acid containing one drop of ferric chloride solution. This will then be underlayed with 1ml of concentrated sulphuric acid. A brown ring obtained at the interface will indicate the presence of a desoxy sugar characteristic of cardenolides. A violet ring may appear below the brown ring while, in the acetic acid layer a greenish ring may form just above the brown ring and gradually spread throughout this layer.

# Proteins & Amino Acids



## Theory-

Proteins are the most abundant macromolecules present in living cells. 'Protos' is a Greek word means primary. Proteins play an important role in our body. Some of the chief functions of the proteins are -

- Proteins are a part of the cell membrane structure.
- Structural proteins are present in different organs of our body.
- All enzymes are proteins.
- Contractile proteins, like actins, myosin and others are essential for muscular contraction.
- Many clotting factors are proteins.
- Immunoglobulins are proteins in nature.
- Conjugate protein-like hemoglobin is very essential for oxygen transport from blood into the cells.

Many hormones are polypeptides in nature (e.g. Insulin, Parathyroid).

**Proteins are further classified as-**

| S.No. | Proteins | Example |
|---|---|---|
| 1. | Simple | Albumin Globulin |
| 2. | Conjugated | Nucleoproteins, Phosphoproteins |
| 3. | Derived | Protons, meta proteins |

## Determination of primary structure of protein

**It involve two steps-**

**(i)** Qualitative identification and quantitative estimation of amino acid residue

**(ii)** Determination of linear order or sequence peptide bond.

Hydrolysis or proteolysis is done by proteolysis enzymes, acid or alkali and the free amino acids are separated by chromatography.

**Chemical Tests for Proteins**

1. **Millon's Test-** Freshly prepared mercuric nitrate solution gives white precipitate which turns red on heating the solution.
2. **Xanthoproteins Test-** Proteins when treated with concentrated nitric acid followed by excess of ammonia gives orange colour.
3. **Biuret Test-** To the protein solution add 1 ml of 10% sodium hydroxide solution and heat,cool and add a drop of copper sulphate solution. A violet or pink colour is produced . (This test is negative for amino acids)
4. Proteins also get precipitated with alum, picric acid and tannic acid.

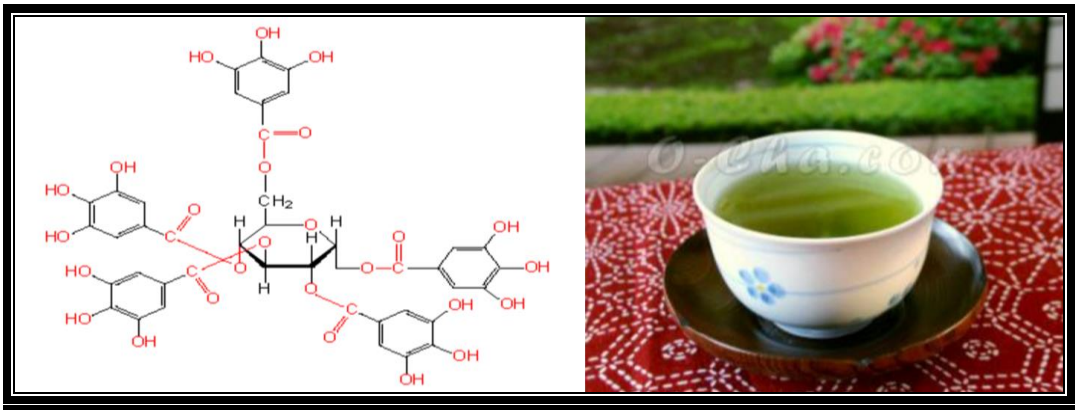
**Chemical Test for Amino acid**

1. The solution of amino acid gives blue, violet or yellow colour with solution of ninhydrin.

# Tannins

**Object- Systematic Identification of Tannins in Crude Drugs**

1. To extract the tannins from crude drugs.
2. To test the presence of tannins in crude drugs
3. To identify the type of tannins in crude drugs.



## Theory-

The names of tannins got to be used because these natural products were used in tanning of skins. Tannins can be broadly defined as the derivatives of polyhydroxy benzoic acid, capable of combining with proteins. They are further characterized as non crystalizable, alcohol and water soluble compounds with acid reaction and astringent taste. They cause precipitation of proteins and alkaloids, impart dark blue or green black colour with ferric salt when applied to smooth muscles, they cause their contraction.

Tannins are classified into two classes, according to their behavior on dry distillation.

1. Condensed Tannins- These are true tannins which on acid or enzyme treatment get decomposed into red insoluble compounds known as phlohaphens. On dry distillation, they yield catchall tannins. The examples of this group are kinotannic acid, Catechu tannic acid and cinchotannic acid.
2 Hydrolysable tannins- These tannins are hydrolyzed by acids or enzymes quickly and the products of hydrolysis are Gallic acid or illogic acid. On dry distillation, gallic aid and other component get converted to pyrogallol. The examples are gallotonnin & ellagitannins.

**Test with ferric chloride:**
Add 5 % **ferric chloride** solution drop by drop to 2-3 ml of the extract and observe the color produced.
**Hydrolysable tannins** (gallitannins and ellagitannins) give **bluish-black** color or precipitate and **condensed tannins brownish-green** ones.
If the test is carried on an extract that contains both types of tannins, a blue color is produced which changes to olive-green as more ferric chloride is added.

**Test with bromine water:**
Add **bromine water** to an aqueous extract of the drug.
**Condensed tannins** gives a **buff-colored precipitate**
**Hydrolysable tannins do not form any precipitate**.

# Frequently Asked Question

1. Define alkaloids.
2. Classify alkaloids giving one example from each class.
3. Why alkaloids are basic in nature?
4. In which chemical form they occur in plants?
5. How is the importance of Cinchona alkaloids?
6. Name a alkaloid present in bodies.
7. What are carbohydrates?
8. All carbohydrates & glycosides are same?
9. Give the classification of carbohydrates with example.
10. What are plant sugars?
11. How will you perform Molish test?
12. How will you prepare Barfoed's reagent?
13. What glycosides are called glucosides?
14.. Give the name of any five glycosides.
15. What are amino acids? Give the importance of essential amino acids.
16. What are Proteins? Classify & what happens when proteins are heated?
17. What is Million’s Reagent.

# Reagents

**Alkaloids-**

1. Bismuth Nitrate
2. Nitric Acid Conc.
3. Potassium Iodide
4. Mercuric chloride
5. Picric Acid
6. Iodine
7. Formaldehyde Solution
8. Sulphuric Acid Conc.
9. Ammonia Solution Strong
10. Bromine Solution
11. Cynogen Bromide Solution
12. Aniline
13. Hydrochloric Acid Conc.
14. Potassium Chlorate
15. Sodium Bicarbonate
16. P-dimethyl aminobenzaldehyde
17. Ferric Chloride Solution
18. Potassium Dichromate
19. Hydrogen Peroxide
20. Potassium hydroxide solution
21. Acetic anhydride
22. Chloroform
23. Alcohol
24. Acetone
25. Methanol

**Preparation of Reagents**

1. **Dragendorff's Reagent-** Dissolve 8.0 g of Bismuth nitrate in 20 ml of nitric acid (conc.) and 27.2 gm of Potassium iodide in about 50 ml of water. Mix the two solutions and make up the volume to 100 ml with water.
2. **Mayers Reagent-** Dissolve 1.3 gm of mercuric chloride in 60 ml of water and 5 g of Potassium iodide in 20 ml of water. Add mercuric chloride solution in Potassium Iodide solution and make up the volume to 100 ml with water.
3. **Hagers Reagent-** Dissolve 1 g of picric acid (Trinitrophenol) in 100 ml of water.
4. **Wagners Reagent-** Dissolve 2 g of iodine and 3 g of Potassium iodide in 100 ml of water.
5. **Formaldehyde Solution-** A 35% w/w solution of formaldehyde in water.
6. **Methanolic Potassium Hydroxide**- Dissolve 10 g of Potassium hydroxide in 100 ml of methanol.
7. **Cynogen Bromide Solution-** Add drop by drop a 10% w/v solution of Potassium Cyanide in water to solution of bromine until the colour disappears.
8. **Bromine Solution-** A saturated solution of bromine in water.
9. **Aniline Solution-** Dissolve 2.5 ml of aniline in mixture of 65 ml of water ,add 2 ml of hydrochloric acid (conc.)

10. **Ferric Chloride Solution-** A 5 % w/v solution of ferric chloride in water.
11. **Potassium Dichromate Solution-** A 5%w/v solution of potassium dichromate in water.
12. **Hydrogen Peroxide Solution-** A 6%v/v solution of hydrogen peroxide in water.

**Carbohydrates**

**Reagents-**

- Molish's Reagent,
- Conc. $H_2S0_4$
- Fehling A
- Fehling B
- Barfoed's Reagent,
- Phenylhydrazine HCl,
- Iodine solution

## Preparation of reagents-

**1. Molish's Reagent-** 1 percent alcoholic solution of α –nephthol.

**2. Fehling's Solution-**

**a. Alkaline solution of Cupric Tartrate-** The copper solution (Fehling.A) Dissolve 34.66 g. of small crystals of copper sulphate. $C_uSO_4$ 5 $H_2O$, showing no trace of efflorescence or adhering moisture, in sufficient water to make 500 ml. Keep this solution in well stopper bottles.

**b. Alkaline Tartrate Solution-** Dissolve 176 g of sodium potassium tartrate, and 77 g of sodium hydroxide in sufficient water to produce 500 ml.

**3. Barfoed's Reagent-** Dissolve13.3 g of crystallized neutral copper acetate in 200 ml of 1 percent acetic acid solution. The reagent does not keep well; it should be freshly prepared.

**4. Benedict's Reagent-** Dissolve 86.5 g of crystallized sodium citrate and 50 g anhydrous sodium carbonate in about 350 ml water. Filter if necessary. Add a solution of 8.6 g of crystallized copper sulphate in 50 ml water with constant stirring. Dilute to 500ml. The resulting solution should be perfectly clear.

**5. Iodine Solution-** Dissolve 2.8 g of Iodine and 3.0 g of potassium iodide in water to produce 100 ml

**Glycosides**

**Preparation of reagents-**

1. **Molish's Reagent-** This is 1 percent alcoholic solution of α – nephthol.
2. **Benedict's Reagent-** Dissolve 86.5 g of crystallized sodium citrate and 50 g anhydrous sodium carbonate in about 350 ml water filter if necessary, add a solution of 8.6 g of crystallized copper sulphate in 50 ml water with constant stirring dilute to 500ml. The resulting solution should be perfectly clear.

**Tanins**

**Chemicals**

1. Ferric Chloride
2. Quinine sulphate
3. Lead Acetate
4. Methanol
5. Acetone

6. Ethylocetate

**Preparation of Reagents-**

1. **Ferric Chloride Solution-** A 5% w/v solution of Ferric Chloride in water.
2. **Quinine Sulphate Solution-** A 1 % w/v solution of Quinine sulphate in water.
3. **Lead Acetate Solution-** A 1 % w/v solution of Lead Acetate in water.

# CHAPTER-5

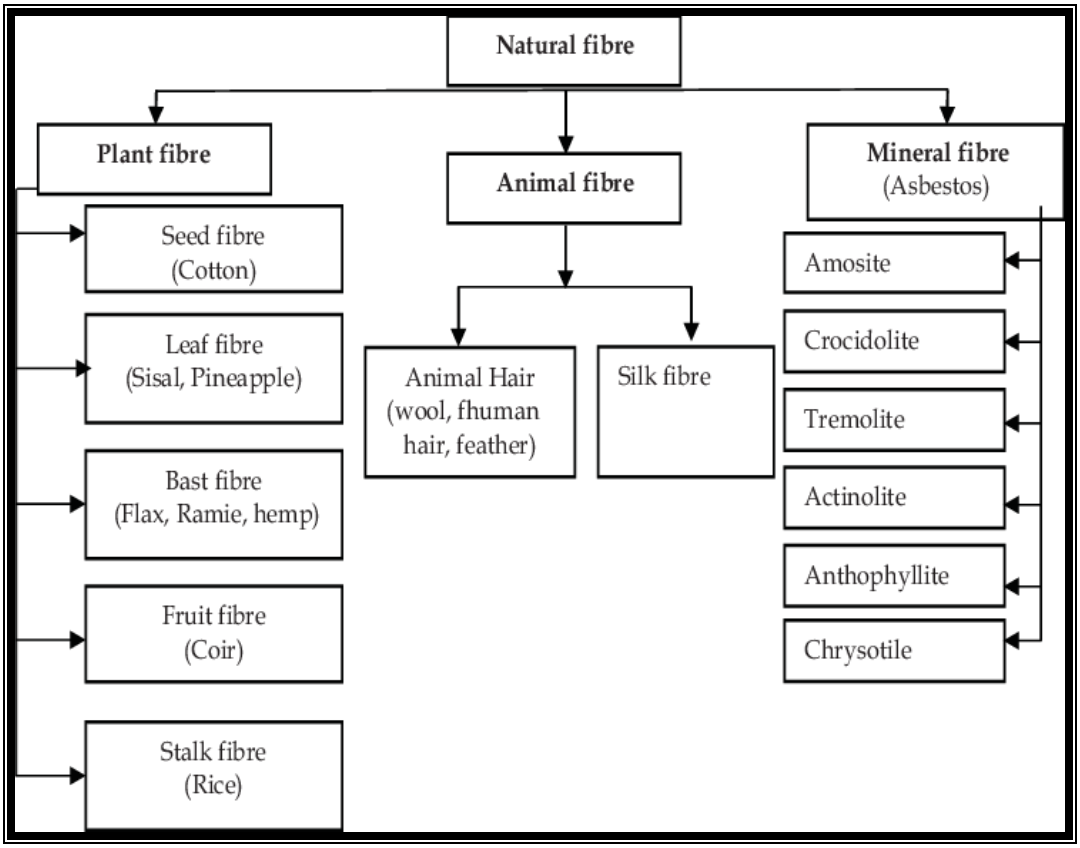
# IDENTIFICATION OF FIBRES

Animal Fibre

Vegetable fibre

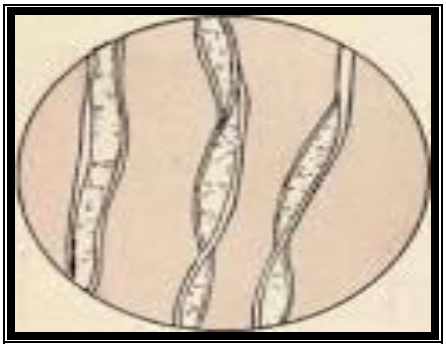
Fibres used in surgical dressings and as filtration aids are obtained from plant, animal and synthetic or semi synthetic sources. Fibres of different origins can be conveniently grouped as follows-

1. **Vegetable fibres-** Cotton, jute, hemp, flax, wood, cellulose.
2. **Animal fibres-** Wool, silk.
3. **Mineral fibres-** Asbestos, glass.
4. **Synthetic fibres-** Terylene, orlon, nylon.
5. **Fibres regenerated from carbohydrate material-** Rayon, pyroxyline, alginate yarn.
6. **Fibres regenerated from protein material-** Fibrolin, aridil



# Absorbent Cotton

**Object:** To study the characters of absorbent cotton



## 1. Biological Source-

Absorbent cotton is the epidermal hairs of the seeds of cultivated species of Gossypium herbaceum or other species of Gossypium that are freed from impurities, deprived of fatty material, bleached and sterilized.

## 2. Geographical Source-

Cotton is cultivated in India, Egypt, U.S.A., South America and Africa.

## 3. Family-Malvaceae.

## 4. Characters-

Absorbent cotton is a pure form of cellulose which occurs in the form of thin fine filament like hairs. The trichomes are unicellular 2-4 cm in length and 25-40 μ in diameter. It is a loosely felted mass of delicate filament, soft to touch and white in colour. Raw cotton has slight brown tint, a colour which is due to the dried remains of protoplasm and cell contents, the wall of the trichomes being quite transparent and colourless. Absorbent cotton rapidly sinks when placed on water, the non absorbent or raw cotton floats due to the presence of fatty material in the cuticle.

## 5.Constituents-

Absorbent cotton consists entirely of cellulose. The cellulose molecule is built up of glucose residues united by 1,4 ß glucosidic links. The unit is the cellobiose unit many of which are united in the polysaccharide molecule of cellulose.

## 6. Uses-

Absorbent cotton is employed as a surgical dressing; it serves as a mechanical protection to absorb blood, mucus or pus and to keep bacteria from infecting wounds. Absorbent gauze, microcrystalline cellulose, purified rayon and other cellulose derivatives as carbozymethyl cellulose, methyl cellulose, methylcellulose, oxidised cellulose, etc find many applications in pharmacy.

# Jute

**Object:** To study the characters of Jute

## 1. Biological Source-

Jute consists of the strands of phloem fibres from the stem bark of Co chorus capsularis.

## 2. Geographical Source-

Jute plants which are 3-4 m high grow in India in the delta region of the Ganges and Brahmaputra rivers in Bengal. It is also cultivated in Assam, Bihar and Orissa.

## 3. Family-

Tiliaceae

## 4. Characters-

The individual jute fibres are about 0.8-5 mm in length and 10-25 μ in diameter. The commercial stands are upto 3 m long. Jute is yellowish brown in colour.

## 5. Constituents-

Jute fibres are composed of lingo-cellulose. The middle lamella of the fibres is heavily lignified.

## 6. Storage-

In connection with storage, the following facts must be considered-

- When dry, jute becomes brittle and dusty.
- Exposure to light darkens the colour of jute.
- Bleaching of jute greatly reduces the tensile strength of the fibre.

## 7. Uses-

Jute is used in the manufacture of yarns and ropes. The short fibres which are separated mechanically from long ones are used for making medicated tows. Jute fibres are also used as filtering and straining media.

# Hemp

**Object:**To study the characters of Hemp

## 1. Biological Source-

Hemp is prepared from the pericycle fibres of the stems of Cannabis sativa

## 2. Geographical Source-

The plant is grown in large quantities for its fibres in Russia. The plant also grows in Italy, France and America.

## 3. Family-

Cannabinaceae.

## 4.Characters-

Hemp fibres are 35-40 mm long and have an average diameter 22 µ. The fibres ends, unlike those of flax, are bluntly rounded. In some cases the ends are forked. The lumen of the fibre is flattened or oval.

## 6.Constituents-

The hemp fibre is chiefly composed of cellulose. Lignin is also present to some extent.

**7.Uses-**Hemp is used in the manufacture of rope, twine and sail cloth.

# Wool

**Object:** To study the characters of Wool.

## 1. Biological Source-

Wool consists of hairs from the fleece of sheep

## 2. Geographical Source-

The main wool producing countries are Australia, Russia, Argentina and America. Wool is also produced in India

## 3. Family-

Bovidae

## 4. Characters-

Wool consists of elastic, lustrous more or less curly smooth hairs. The hairs are slippery to touch, and occur as loosely fitted mass. Wool is not appreciably soluble in warm hydrochloric acid or in cold sulphuric acid.

## 5. Constituents-

Wool fibres are composed of the protein keratin, which is responsible for the elastic nature of the fibres. Keratin, is rich in the amino acid cystine which contains sulphur in it. That is why a black precipitate is obtained when lead acetate is added to a solution of wool in caustic soda.

## 6. Uses-

Wool is used as a medium for filtration and straining. It is also used for the manufacture of crepe bandages and dressings.

# Silk

**Object:**To study the characters of Silk

## 1.Biological Source-

Silk is the prepared fibre from the cocoons of Bombyx mori. Commonly called the mulberry silk worm, and other species of Bombyx and Antheraea.

## 2. Geographical Source-

Silk, known as "Paat" in Eastern India, Pattu in southern parts of India and Resham in North India has a long history in India. Recent archaeological discoveries in Harappa and Chanhu-daro suggest that sericulture, employing wild silk threads from native silkworm species, existed in South Asia during the time of the Indus Valley Civilization dating between 2450 BC and 2000 BC, while "hard and fast evidence" for silk production in China dates back to around 2570 BC.

## 3. Family-

Bombycidae

## 4. Characters-

Silk fibres are soft and smooth and posses considerable tensile strength. Silk threads are usually yellowish in colour and are fine and smooth. Silk is soluble in an ammoniacal copper oxide solution and in concentrated hydrochloric acid.

## 5. Constituents-

Silk is composed of a protein called fibroin. The main amino acid constituting fibroin are glycine and alanine. Sulphur containing amino acids are not present that is why the solution of silk in potash does not give black colour when treated with lead acetate solution.

## 6.Uses-

Silk is used for making ligatures and sieves.

# Acetate Rayon

**Object:**To study the characters of Acetate Rayon.

**Synonym-Cellulose acetate**

## 1. Characters-

The acetate rayon filaments are highly lustrous, grooved and slightly twisted.

## 2. Constituents-

Acetate rayon consists of partially acetylated cellulose chains. The partial acetylation causes an increase of about 40 per cent gain in weight.

## 3. Uses-

Acetate rayon is mainly used for making cellulose acetate films. The acetate rayon is much less absorbent than viscose rayon, hence it is generally unsuitable for manufacture of surgical dressings.

**Identifiation test for Fibres-**

**General tests**

The fibres used in surgical dressings can be identified by the use of-

**1**.Microscopical examination **2**.Physical tests **3**.Chemical tests.

1. A fibre is treated with α-nephthyl and sulphuric acid- violet colour with vegetable and regenerated cellulose fibres; test is negative with all other fibres.
2. On ignition of a fibres- Foul odour or ammoniacal fumes with animal and regenerated protein fibres; glass fibres melt and bead on heating, whereas asbestos is infusible; no foul odour or ammoniacal fumes with vegetable, regenerated carbohydrate and synthetic fibres.
3. On boiling the fibres with aqueous picric acid solution- Permanent yellow stain with animal and regenerated protein fibres and acetate rayon; test is negative with all other fibres.
4. On boiling the fibre with Million's reagent- Red colour with animal and regenerated protein fibres; test is negative with all other fibres.

These are described given below-

| **Test** | **Fibres** | | |
|---|---|---|---|
| | **Cotton** | **Wool** | **Silk** |
| 1. Ignition<br>Advance slowly towards flame or heat in crucible. | Rapid burning with flame. No foul odour or fumes. White ash. No bead. | Brown gases alkaline to litmus. Foul odour (like burnt hair or flesh) It burns slowly giving bead followed by white ash. | Same as in a wool |
| 2. Solubility | | | |
| • 80% w/w sulphuric acid | Soluble | Insoluble | Soluble |
| • 60% w/w sulphuric acid | Insoluble | Insoluble | Soluble |
| • Cuoxam | Raw: soluble with ballooning | Insoluble but swell | Soluble |
| • 5%Potassium hydroxide | Insoluble | Soluble | Soluble |
| • Moisten with iodine followed by a drop of 8% w/w sulphuric acid. | Blue colour | Yellow | Yellow |
| • Warm/boil ub a test tube with picric acid solution. Then rinse well. | No permanent yellow stain | permanent yellow stain | permanent yellow stain |
| • Warm with Millon's | No red stain | red stain | red stain |

| | | | |
|---|---|---|---|
| reagent<br>• Warm with 5% potassium hydroxide solution. Then add lead acetate solution. | - | Black precipitate | White precipitate |

# Frequently Asked Question

1. Write the source-
   a. Absorbent cotton
   b. Flax
   c. Hemp
   d. wool
   e. Jute
   f. Silk
2. Write the Synonym-
   a. Jute
   b. wool
   c. absorbent cotton
   d. acetate rayon
3. Give the constituent of-
   a. Silk
   b. Jute
   c. Hemp
   d. Absorbent cotton
4. Give the identification tests-
   a. Absorbent cotton
   b. Wool
5. Give the uses-
   a. Silk
   b. Hemp
   c. Jute
   d. Cotton
   e. Acetate rayon

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