

**Pinnacle Academy**  
**Dashain homework**  
**Subject: Botany**  
**Class: XI**

1. Define term species. What is binomial nomenclature? Write the rules of binomial nomenclature. What are the basis for five kingdom classification system (1+1+2+1)
2. Among artificial, natural and phylogenetic classification, which one is considered most advanced and why? Write difference between artificial and natural classification system. According to two kingdom classification system, write differences between kingdom plantae and Animalia. (1+2+2)
3. Why *Spirogyra* is called pond silk or water silk? Describe the life cycle of Spirogyra with necessary diagrams (1+7)
4. A carbohydrate consists of 10 glucose and 1 fructose, what is this type of carbohydrate called? Write two importances of carbohydrates. A lipid contains additional molecule, what is this lipid called? Give an example. Write two importances of lipids. (1+1+1+1+1)
5. **Copy all the notes from morphology of angiosperm which I have sent**
  - **Root**
  - **Stem**

- **Leaf**
- **Flower**

## **Angiosperms (Gr. Angios-covered, sperma-closed seeded plants)**

Angiosperm are considered as most advanced group of flowering plants

### **Characteristics of Angiosperm**

- The plant body is differentiated into roots, stem, leaves , flowers and fruits
- They may be annual, biennial or perennial herb, shrubs, climbers or trees
- They show great variation in their habitat , habit and mode of life

Smallest angiosperm- *Wolffia microspica* (0.5cm diameter)

Tallest tree- *Eucalyptus regnans*

largest angiosperm- *Ficus benghalensis*

- Usually angiosperm are autotrophs and few are heterotrophs ( Eg. *Cuscuta reflexa*- Aakasbeli)
- They have taproots or adventitious root with branched or unbranched stem
- The vascular tissues (the xylem and phloem are well developed)
- Sexual reproductive structure are present in flower
- Flower consist of calyx, corolla, androecium (male reproductive part) and gynoecium (female reproductive part)
- Ovules are covered by ovary.
- Double fertilization and triple fusion is the characteristics features of angiosperm

On the basis of types of cotyledon present angiosperm are classified into two classes

- a) Dicotyledon ( two cotyledons in their seed)
- b) Monocotyledons (one cotyledon in their seeds)

## Morphology

The study of external features of living organism is called morphology

## Root

Root is underground, non green part of plant. It helps in absorption of water and minerals and also helps in anchorage

## Types of root

1. **Tap root :** The roots which arises from radicle of embryo of seed and develops into a primary root that grows vertically downwards is called tap root. Ex. Roots of dicot plants
2. **Adventitious root:** The root that develops from any part of plant except radicle is called adventitious root. Eg. Roots of monocot plant

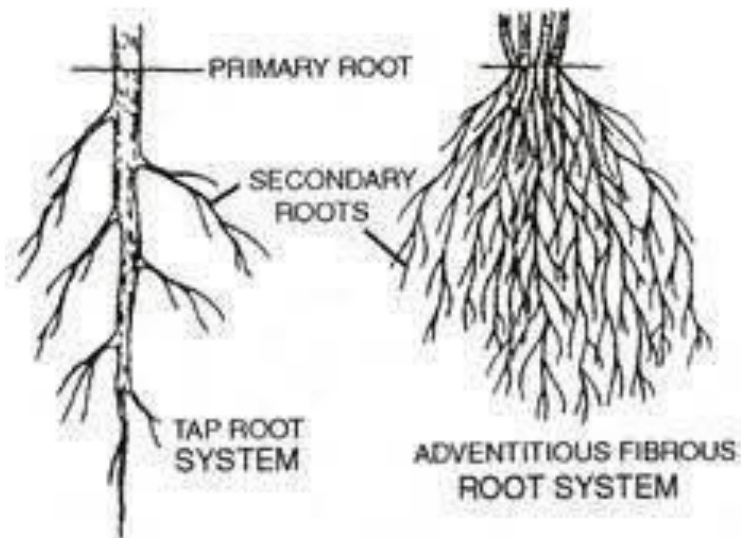
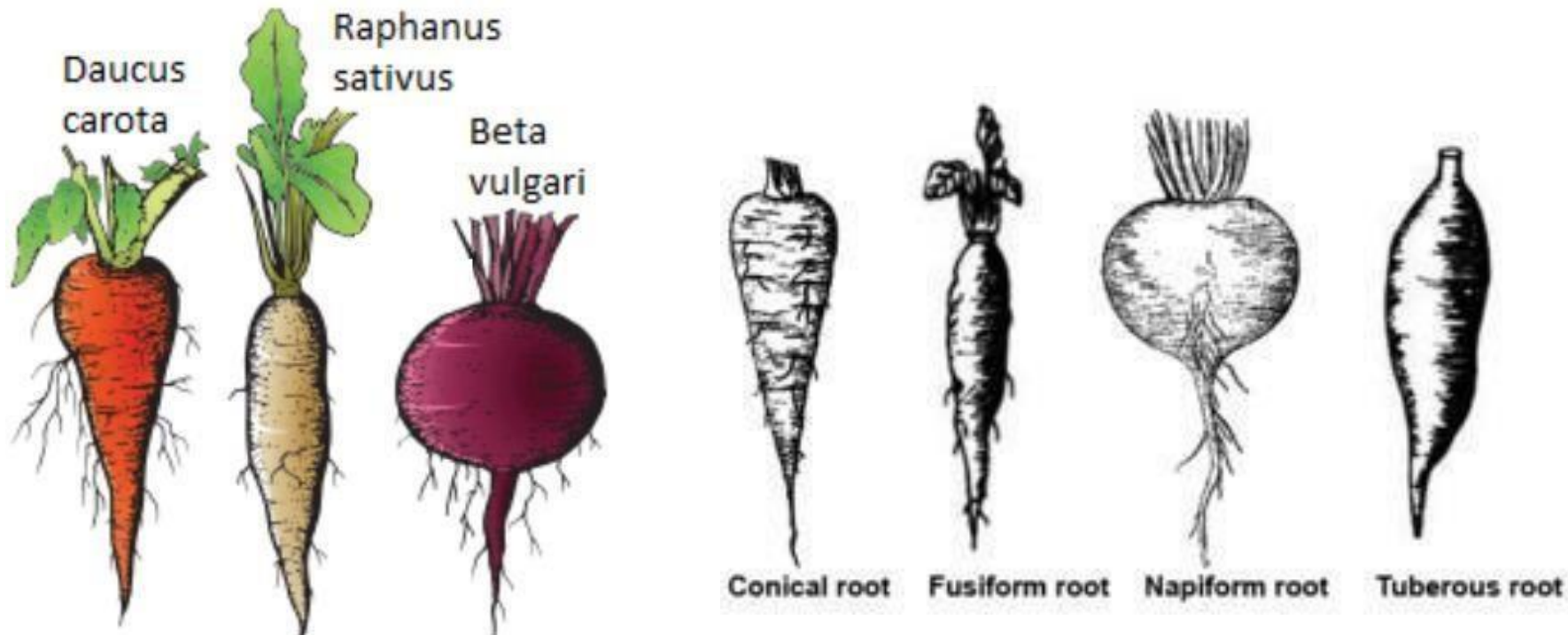


Fig. 5.24. Tap and adventitious root systems.

## Modification of Tap root

### 1. For storage of food

- a. Fusiform root:** This is spindle shaped i. e. thick at middle and narrow towards both ends. Eg. Radish (*Raphanus sativus*)
- b. Napiform root:** This type of root is spherical at the base and suddenly tapering towards the apex like thread. E.g. Turnip
- c. Conical root:** The primary root is broad at the base and tapers gradually towards the apex to form cone shaped structure. Eg. Carrot
- d. Tuberous root:** These are fleshy tap roots having irregular shape ( no definite shape). Eg. *Mirabilis jalapa*



## 2. For Nitrogen fixation

**a Nodulated or tuberculated roots:** In legume plants ( eg. Pea, Soyabean), the secondary roots and sometimes primary roots may bear many small and large irregular swelling called root nodules. These root nodules contain nitrogen fixing bacteria (*Rhizobium leguminosarum*) and help to fix atmospheric nitrogen into nitrogenous compound. Eg pea (*Pisum sativum*)

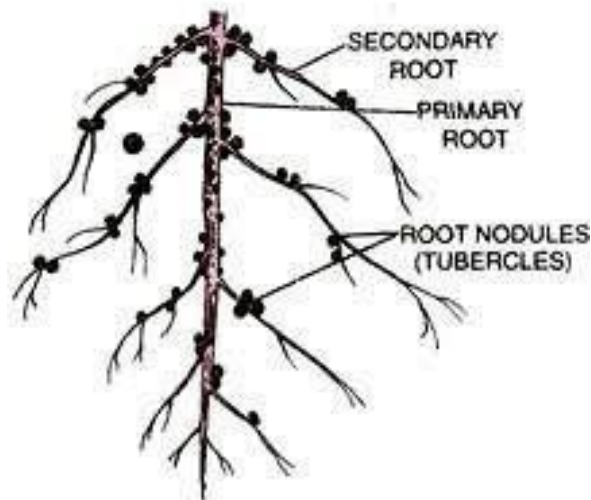
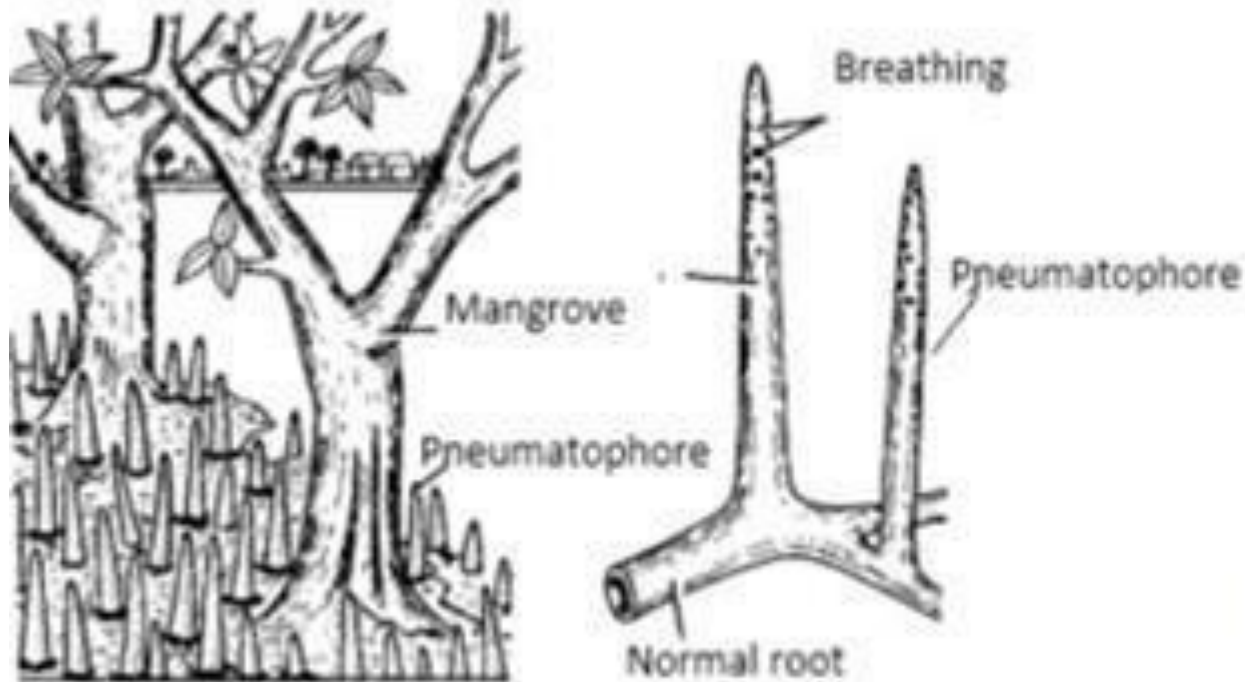


Fig. 5.8. Nodulated root of a legume.



### 3. For respiration

The branches of taproot of some plants growing in saline marshy soils grow vertically upright in air. Such aerial roots are called pneumatophores which contain small breathing pores which help in respiration. Eg. Mangroove plant (*Rhizophora*)





#### 4. For nutrient absorption

**Mycorrhizal roots:** In some plants, the root lacks root hair and absorption is supported by kind of fungi called mycorrhiza. This fungi penetrate hyphae up to the inner part of root. E.g *Pinus*



**6. Reproductive roots:** Some of the tap roots bear adventitious buds that can grow to form new plants. e.g Sisso



## Modification of adventitious root

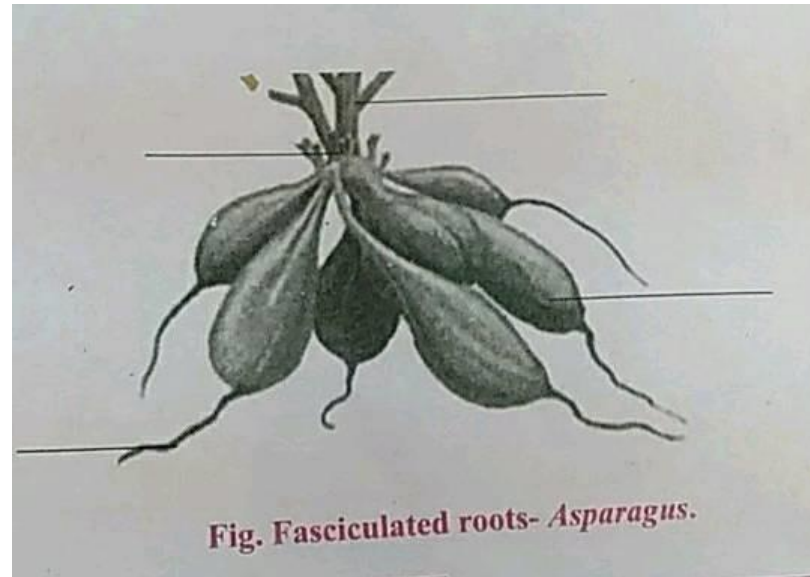
### 1. For storage of food

**a. Tuberous root:** Irregular swollen roots occurring singly which arises from the nodes of horizontal branch (without any definite shape) e. g. Sweet Potato

**b. Fasciculated root:** It is the cluster of swollen roots which arises from the base of the stem E.g. Dahlia, Asparagus



**Tuberous root**



## 2. For Mechanical support

**a. Stilt root:** The cluster of thick roots which arises from the basal nodes of stem E.g. Maize ( *Zea mays* )



**b. Prop roots:** They are modified adventitious roots arises from the branches of trees and grows vertically downward and provides support e.g. Banyan tree





**3. Climbing roots:** These roots originate from the nodes and attach themselves to any support near to them E.g. Money plant



#### 4. For vital function

**a. Parasitic or haustoria roots:** The parasitic plant (*Cuscuta*) develop a sucking apparatus and penetrate tissue of host to absorb nutrients. This apparatus is termed as parasitic roots or haustoria



**b. Epiphytic roots:** Epiphytes are the plants that grow on the trunks or branches of other plants. The roots of epiphytes are called epiphytic roots



**c. Assimilatory or photosynthetic root:** These are long slender aerial roots that develop from the branches of certain plants which contain chlorophyll that helps in photosynthesis. E.g. *Tinospora*



Source: Roberta Hill, VLMP © 2007

**d. Floating roots:** The adventitious roots of some aquatic plants are modified into spongy roots which help in floating on the surface of water. E.g. Pistia



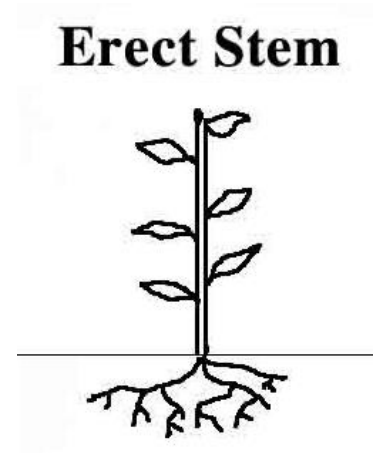
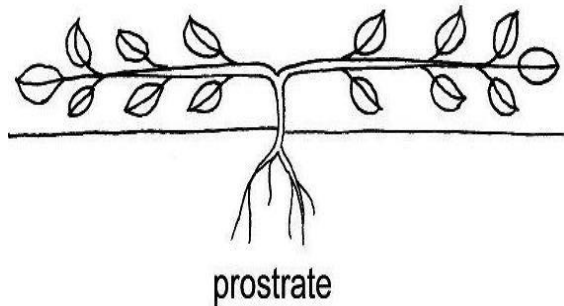


# STEM

The stem is the **aerial part of the main axis of plant developed from plumule of embryo**. It helps in **conduction of water and minerals, photosynthesis and mechanical support**.

**Terminologies of stem used to describe morphology of plants are as follows**

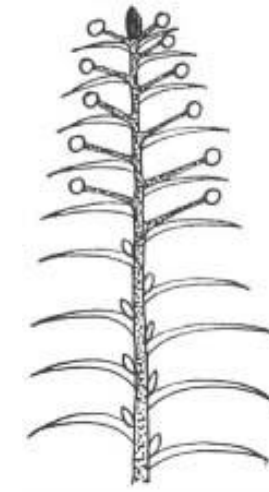
- **Erect:** Plant grows **directly upwards without any support** E. g maize
- **Climber:** plant grows **directly upwards with support**
- **Prostrate:** Stem **lie parallel to soil**



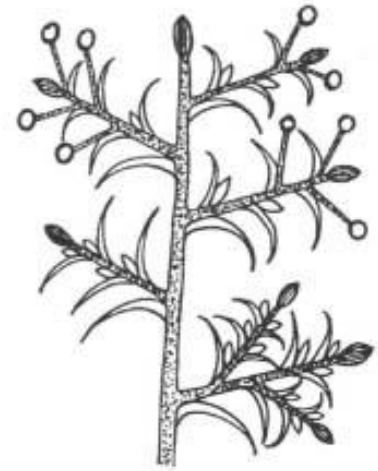
Climber



- **Unbranched:** Plant with **only primary axis or trunk**
- **Branched:** Plant body with **primary as well as secondary axis**
- **Herbaceous:** **soft and flexible stem with less amount of xylem** e.g. Pea
- **Woody:** **Hard non-flexible stem with more amount of xylem**
- **Solid:** **Stem without hollow cavity**



unbranche



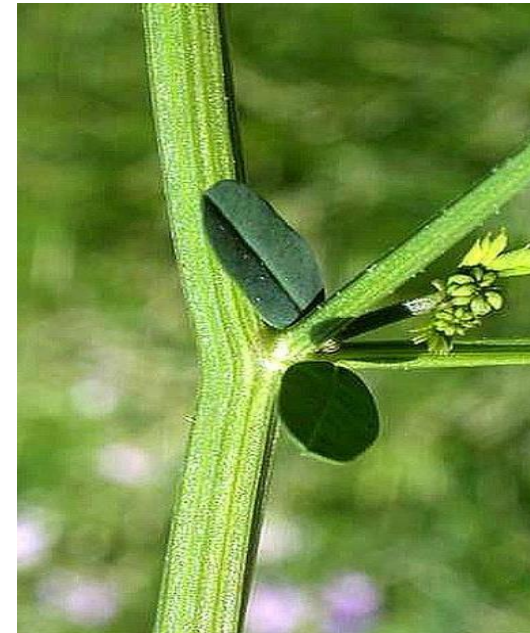
branche



herbaceous



woody



Angular

- **Fistular:** Stem with **hollow cavity**
- **Culm:** **Nodes are solid and internodes** are fistular eg. Bamboo
- **Pubescent:** **Stem with hair**
- **Glabrous:** Dull green stem **without hairs**
- **Glaucous:** **Shining stem** without hairs
- **Cylinder or slender:** Stem **without ridges and furrows**
- **Angular:** Stem **with ridges and furrows**



Pubescent

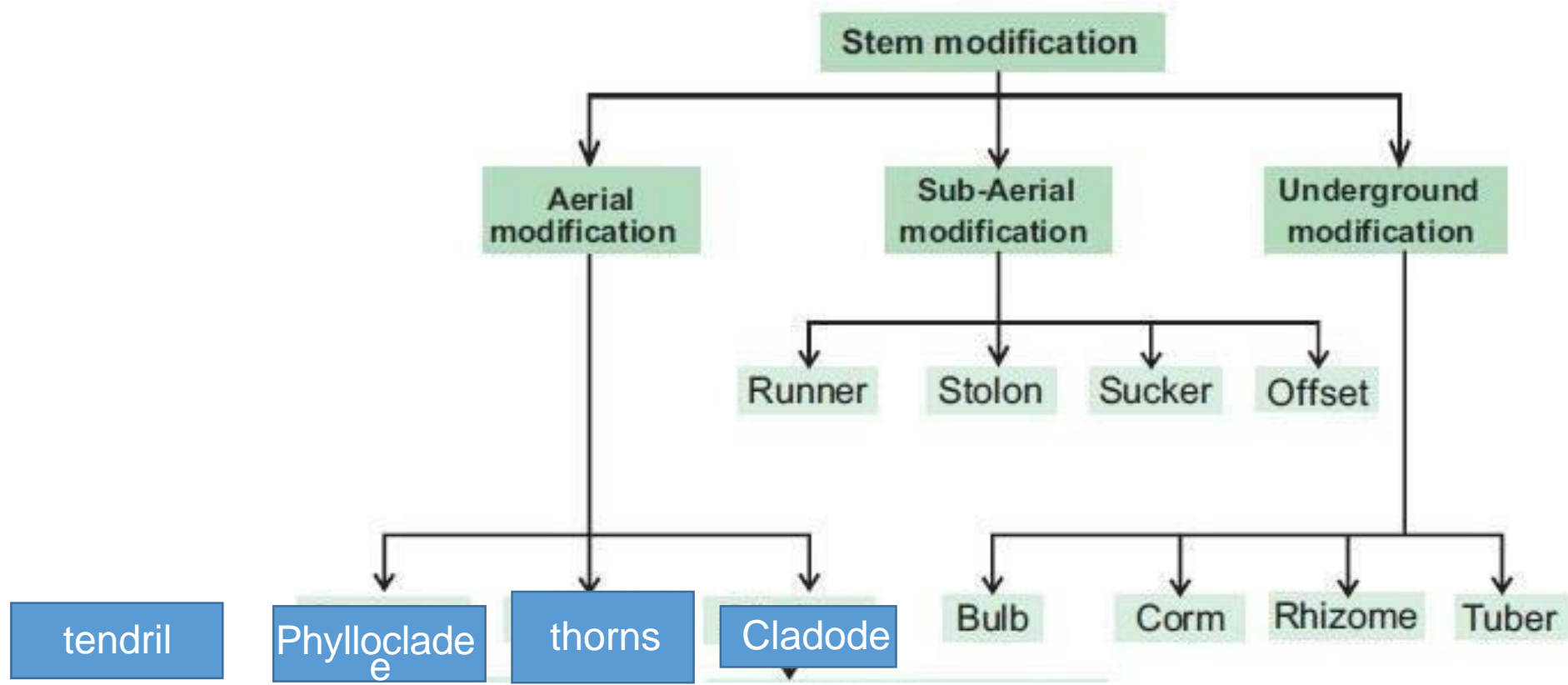


Glabrous stem of *Rhus glabra*



Pubescent stem of *Rhus glabra*



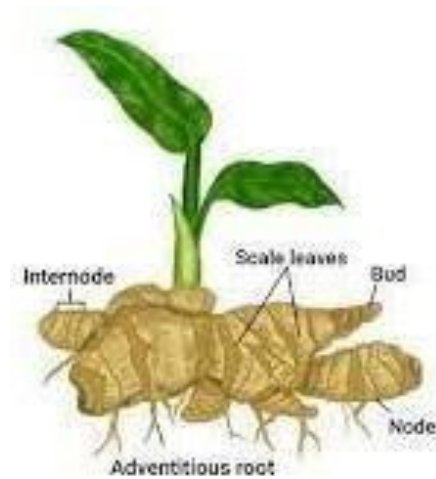


## Underground stem

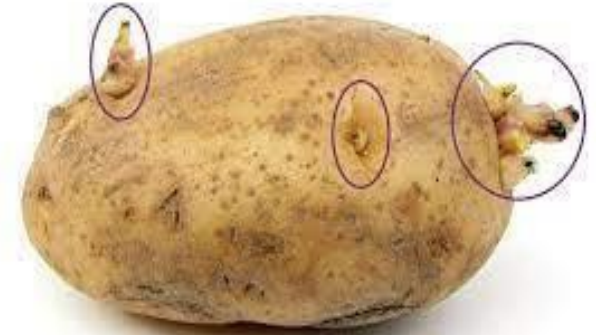
**Stem present completely inside the soil** is underground stem. It consist of buds, nodes, internodes, scale leaves and branches. Some underground modified stems are as follows

### a. Rhizome

It is **thick and fleshy underground stems** which grows horizontally near soil surface. The stem bear **scaly leaves and axillary buds in the nodes**. If the rhizome containing bud is **broken into pieces, each piece develop to form independent plant**. E. g. Ginger, Banana, Turmeric



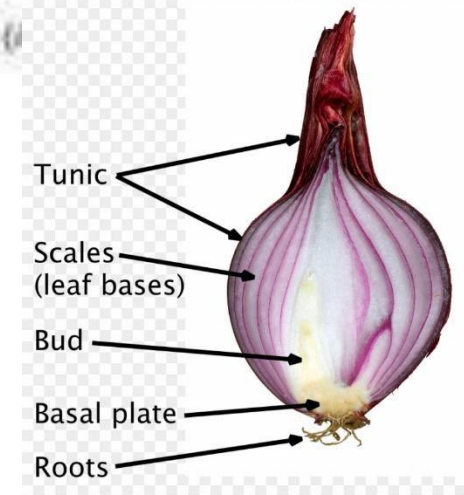
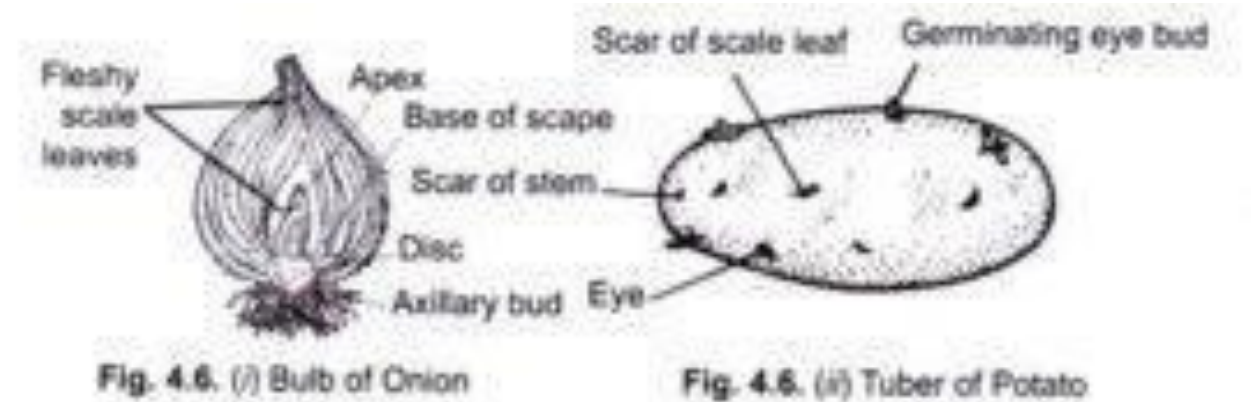
**b. Stem tuber:** They are **oval or spherical fleshy underground modified stem without any adventitious roots**. Each tuber consists of number of eyes and each eye contain number of buds. Eg. *Solanum tuberosum* (Potato)



**c. Corm:** Corm is **underground vertical stem** which is **short, stout, swollen and fleshy**. It bears **scale leaves at each nodes**. During favorable conditions corms produce a number of buds in the axils of scale leaves.

E. g. *Colocasia*

**d. Bulb:** A bulb is **underground highly reduced stem** which has **number of buds**. On being separated and planted, these buds gives rise to new plants. E.g Garlic, Tulip, Onion, etc





## Subaerial modification of stem

The type of **modification of stem** in which few parts of stem lie below the **ground** and the remaining parts of stem lie above the ground is called subaerial stem. Subaerial stems are divided into four types i.e runner, sucker, stolon and offset

- a. **Runner:** It is **a slender prostrate shoot** lie parallel to the soil, developed adventitious roots from lower side of each node and leaves from upper side of each node. E.g *Cynodon* (Duroy), *Oxalis*, *Centella*, *Grasses*, etc
- b. **Suckers:** They **arise from the base of erect stem**, grow horizontally in the soil and **then come out to grow into a new plant** and become **independent after detachment from parent plant**. E. g Mint (Pudina), *Chrysanthemum*
- c. **Offset:** It is **one internode short runner**. It is similar to runner but lie parallel to the surface of water with **tuft of leaves at apex**. E.g Pistia

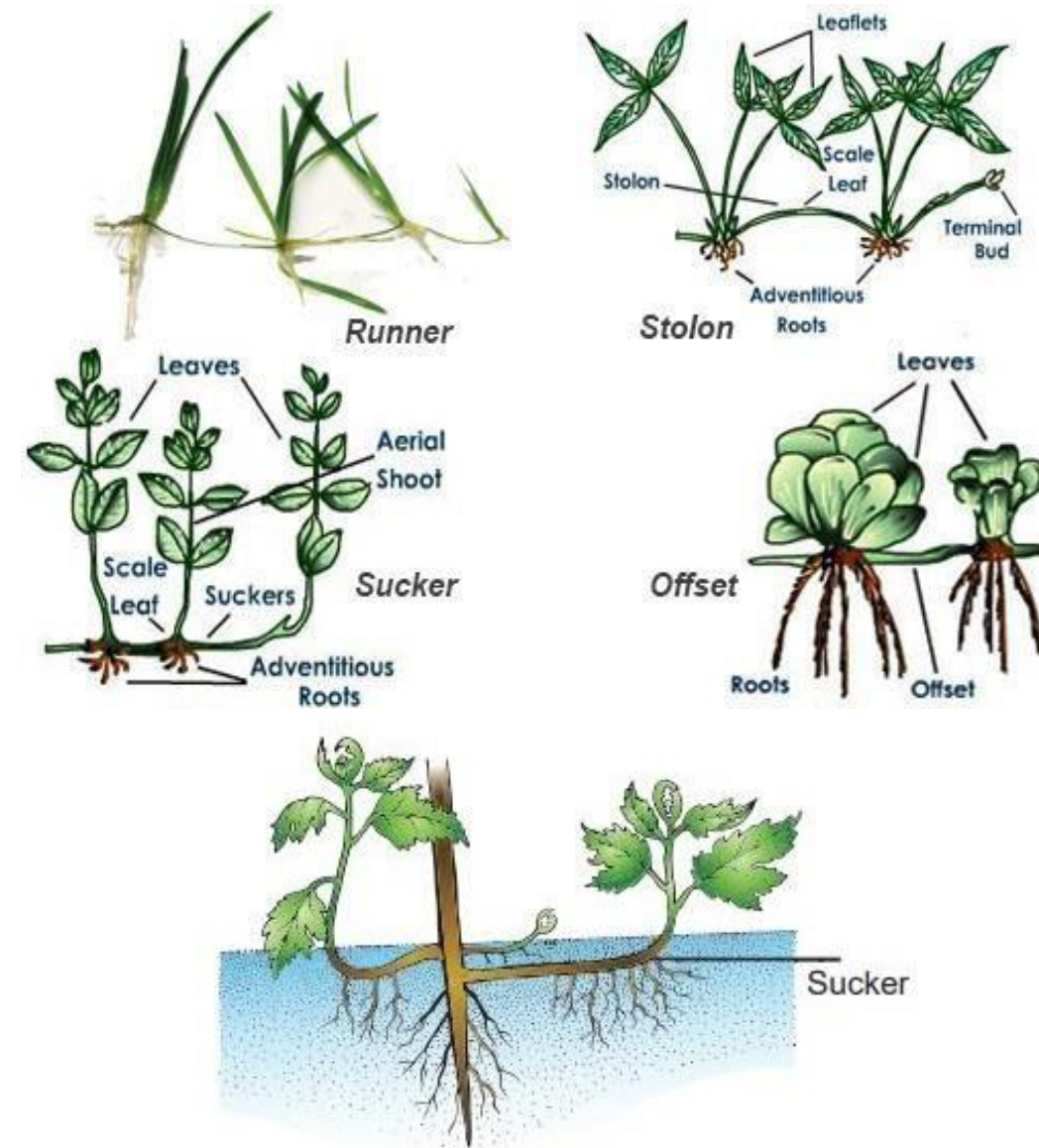
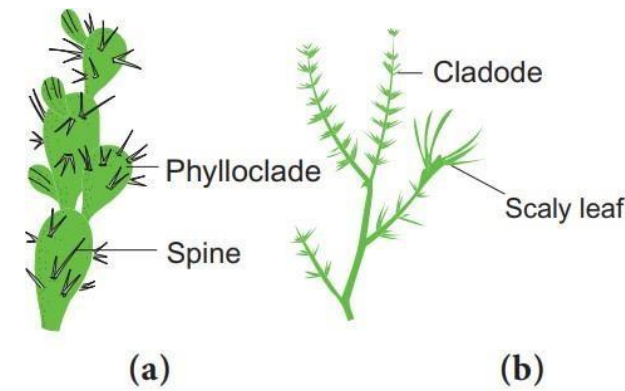


Figure 4b: Sucker - *Chrysanthemum*

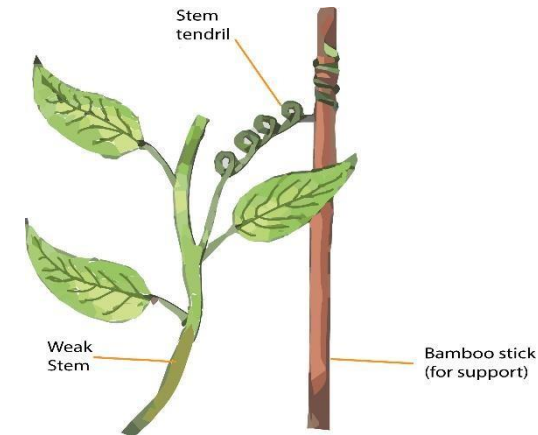
**d. Stolon:** It arises from the base of aerial stem and bends downward. At the places where it touches the ground, it gives adventitious roots. E.g. *Fragaria* (Strawberry), Jasmine, etc.

**Aerial Stem:** The stem that lies completely above the ground. It is of following types

- a. Tendril:** Stem tendrils are thin, thread like spirally coiled leafless structure which act as climbing organs of the plants. They help a weak plant to climb E.g Grapevine, Cucurbita
- b. Stem Thorns:** They are stiff sharp pointed straight or curved structure that reduces the rate of transpiration and protect from animals E. g. Citrus, *Duranta*, etc.
- c. Phylloclade:** An aerial stem that is modified to have appearance and function of leaf is called phylloclade. They are green fleshy stem and contain spines throughout their surfaces that represent the modified leaves. E.g Xerophytic plants (*Euphorbia*, *Opuntia*)
- d. Cladode:** They are generally green stem of limited growth with leaves reduced to scales or modified into spines. E. g. *Asparagus*



**Figure 3.8:** (a) Phylloclade-*Opuntia*  
(b) Cladode-*Asparagus*



# Leaf

- A leaf is **an expanded green structure borne on the node of a stem or its branch**
- It helps in **photosynthesis, transpiration and exchange of gases**
- It consists of 3 main parts i.e. **leaf base, petiole and leaf lamina**

**Leaf base:** It is the **lowermost and first developed part of leaf which is attached to the node of the stem**. It may consist of two reduced lateral outgrowths called stipules.

**leaf with stipule- Stipulate**

**Leaf without stipule- Exstipulate**

**Petiole (Stalk of the leaf):** It is the stalk of the leaf

**Leaf with petiole- Petiolate**

**Leaf without petiole- Sessile**

**Leaf with highly reduced petiole- su**





**Lamina:** Leaf lamina or leaf blade is the main terminal flattened green part of leaf that helps in photosynthesis and transpiration

**Apex of lamina- leaf apex**

**The boundary of lamina- Leaf margin**

## **Leaf Insertion**

There are three types of leaf insertions

1. Radical: Leaves which arise from near the root. E. g. Onion
2. Cauline: Leaves which arise from the main stem is called Caul
3. Ramal: Leaves which arise from the branch is called Ramal



## Phyllotaxy

The arrangement of leaves on the stem or branches of plant is called phyllotaxy

It may be alternate, opposite, whorled

### 1. Alternate

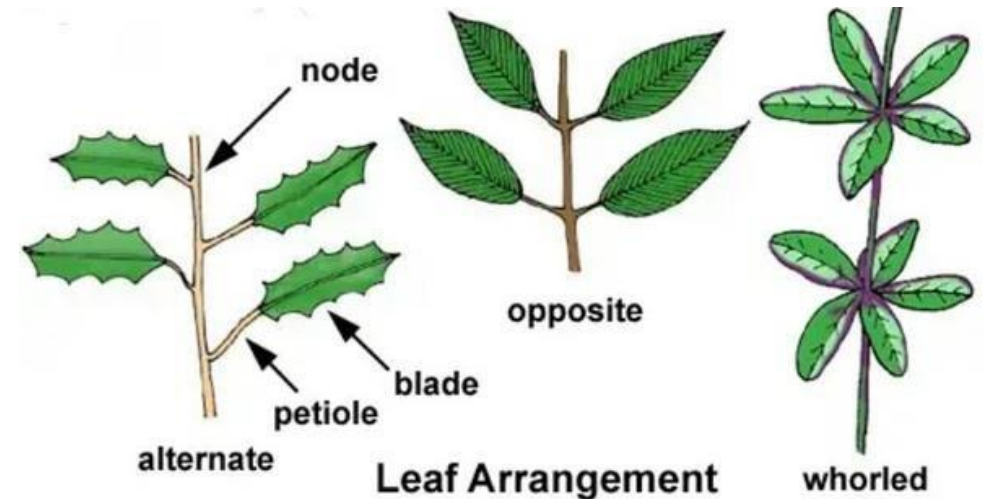
If single leaf arises from the one node and arrange alternately is called alternate

### 2. Opposite

It two leaves arises at each node opposite to each other. It is of two types

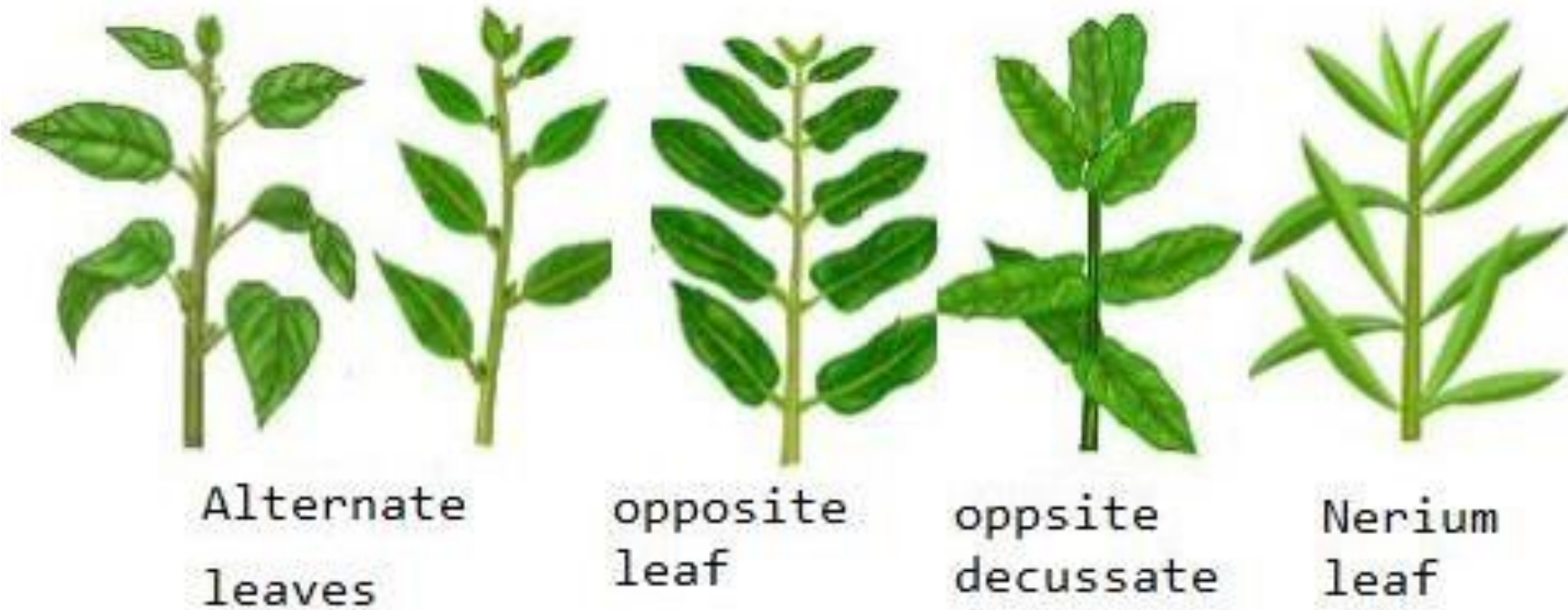
a. Opposite decussate: When one pair of leaf is placed right angle to next or lower pair of leaf, it is called opposite decussate. E.g *Ocimum* (Tulsi)

b. Opposite superimposed: When all the pairs of opposite leaves on the stem are arranged one above the other. E. g. Guava



### 3. Whorl

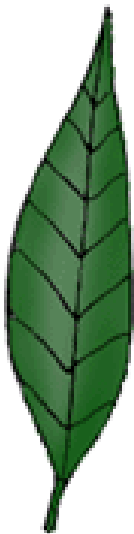
When more than 2 leaves arise from the one node and form a whorl around it. E. g. *Nerium* (Oleander)



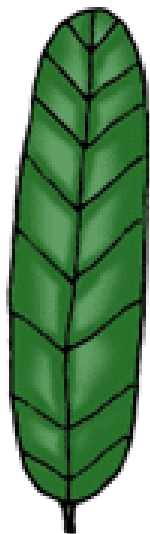
Shape of the leaf



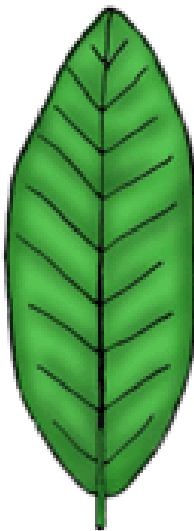
linear



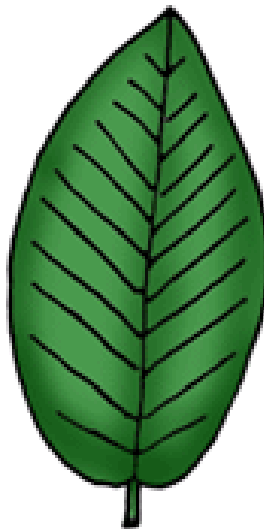
lanceolate



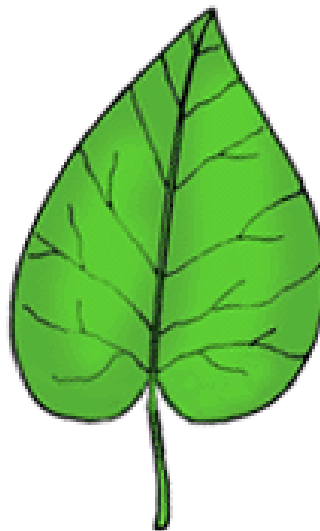
oblong



elliptical



ovate



cordate



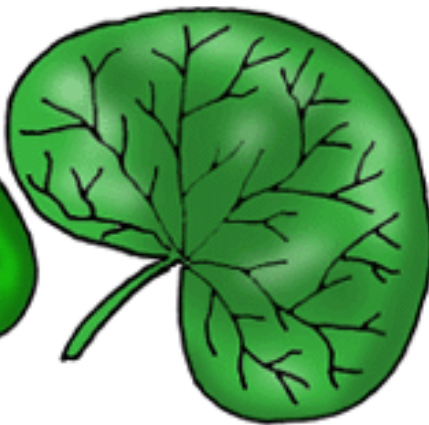
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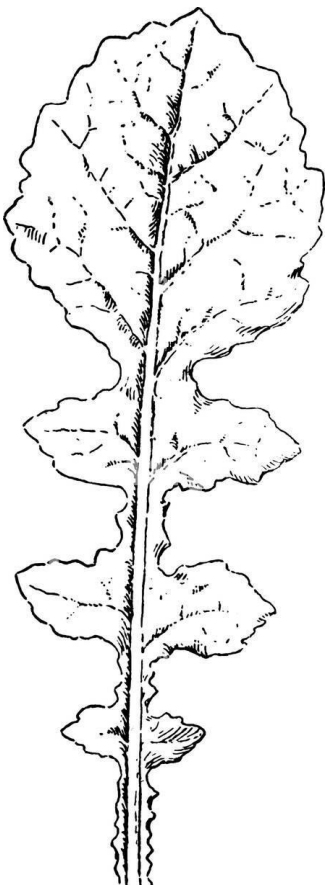
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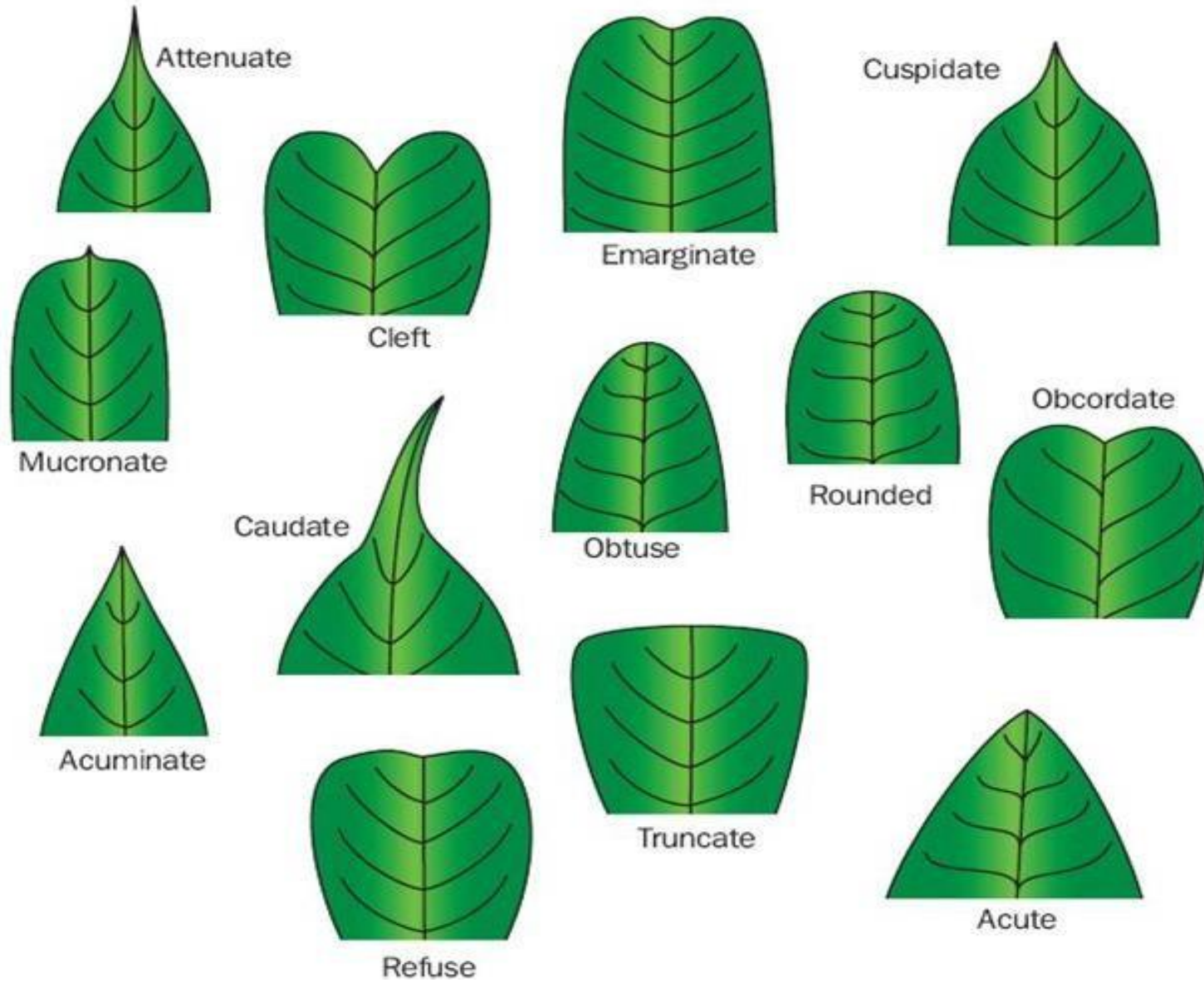
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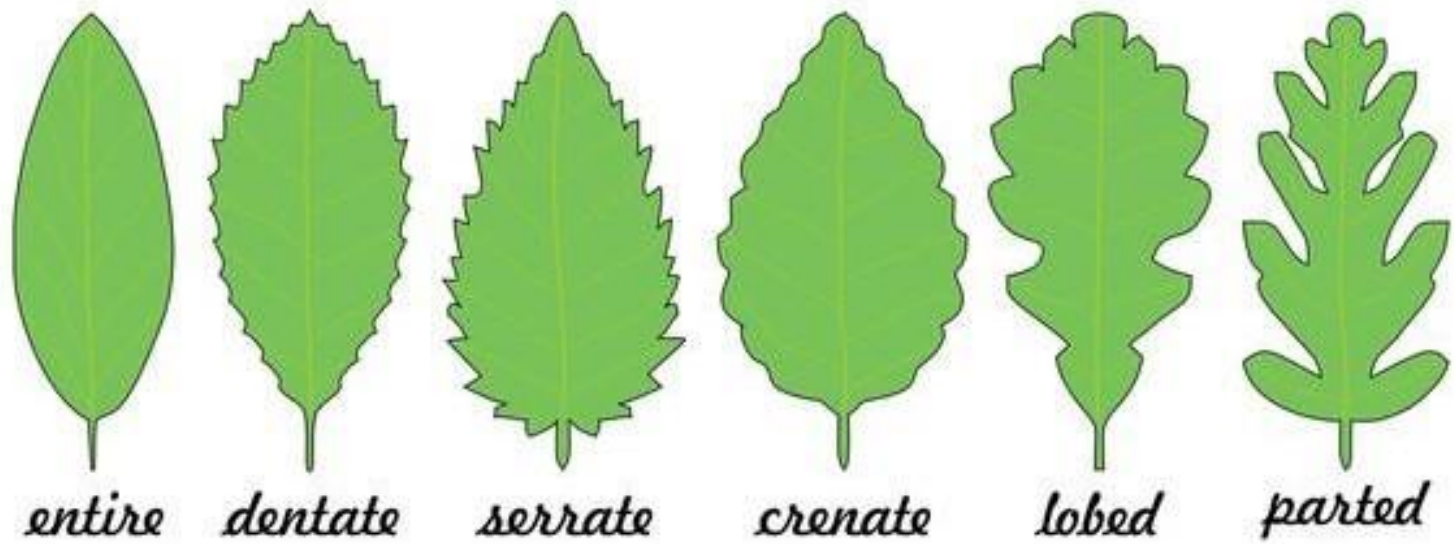
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## 1. Leaf apex



1. Leaf margin



# Venation

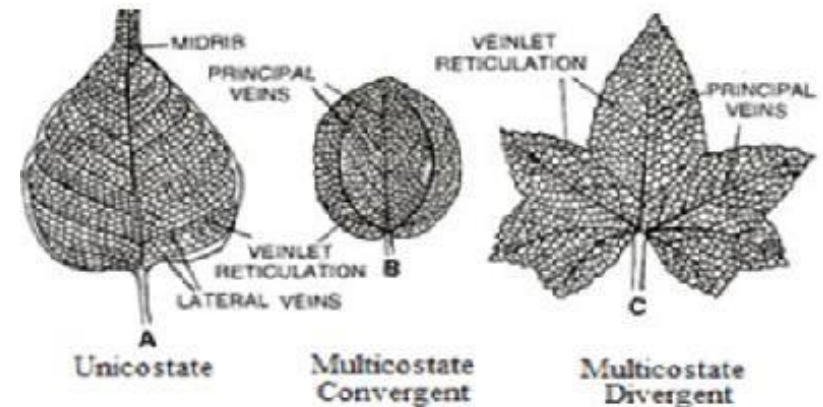
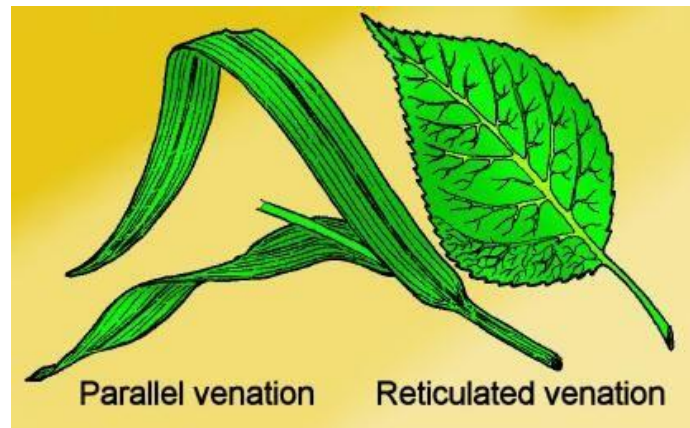
The pattern of arrangement of veins in a leaf is called venation. There are two main types of leaf venation

1. Reticulate- In this type of venation, **veins and veinlets form network like structure**. E. g Dicot leaf
2. Parallel – The venation in which **veins are arranged parallel to each other**. E. g. Monocot leaf

Both types of venations (reticulate and parallel) have two subtypes

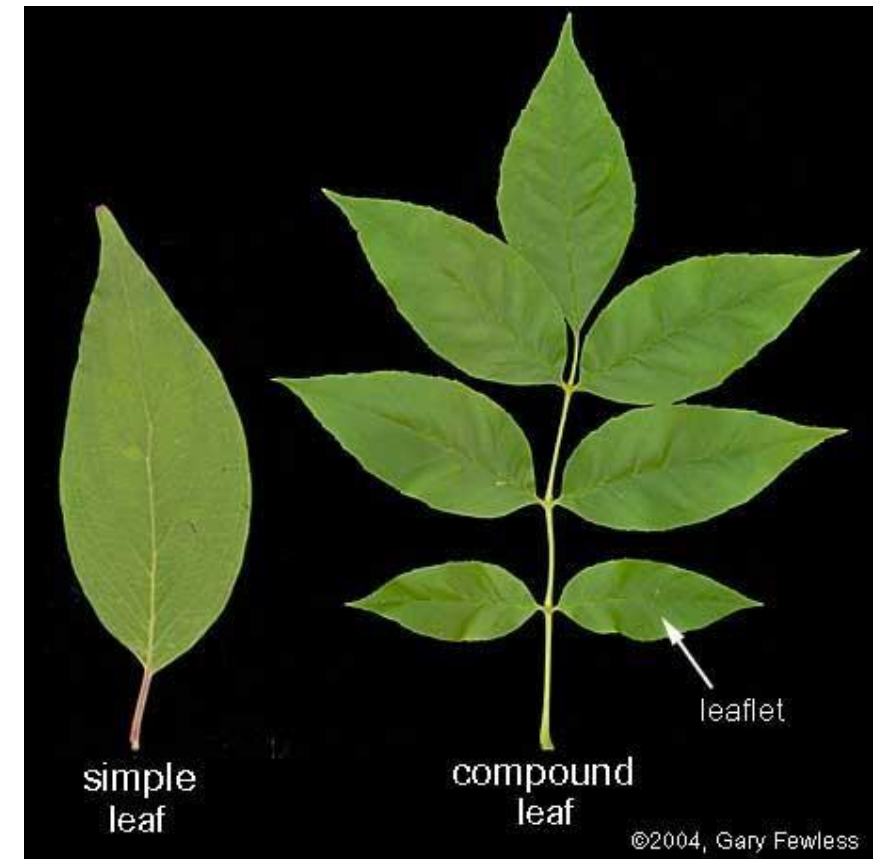
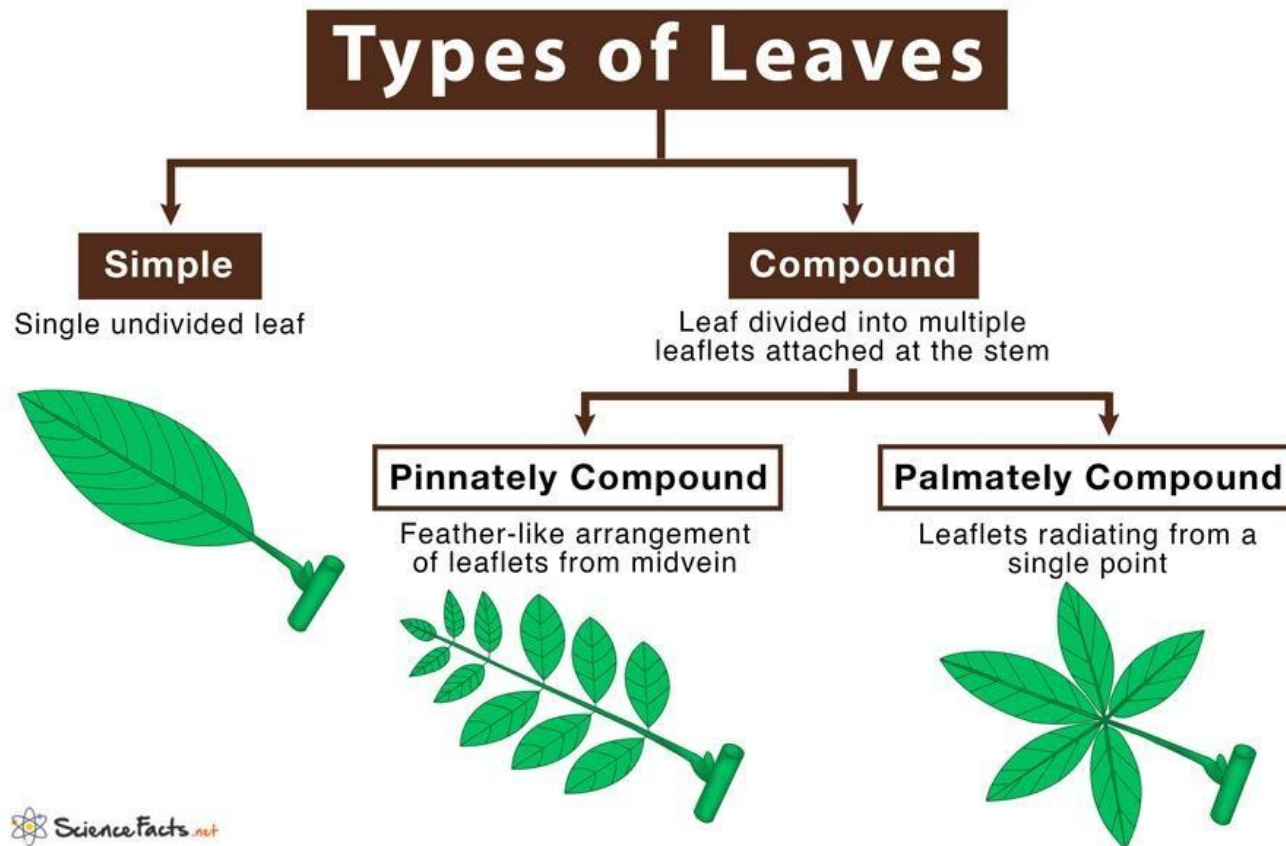
*a.* Unicostate: A leaf with **single midrib** E.g. *Ficus*

*b.* Multicostate: A leaf venation with **many principal veins** E. g. *Geranium*



# Types of leaves

1. **Simple leaves:** If the lamina is not divided or presence of single lamina or leaf may be deeply incised but the incision don't touch the midrib



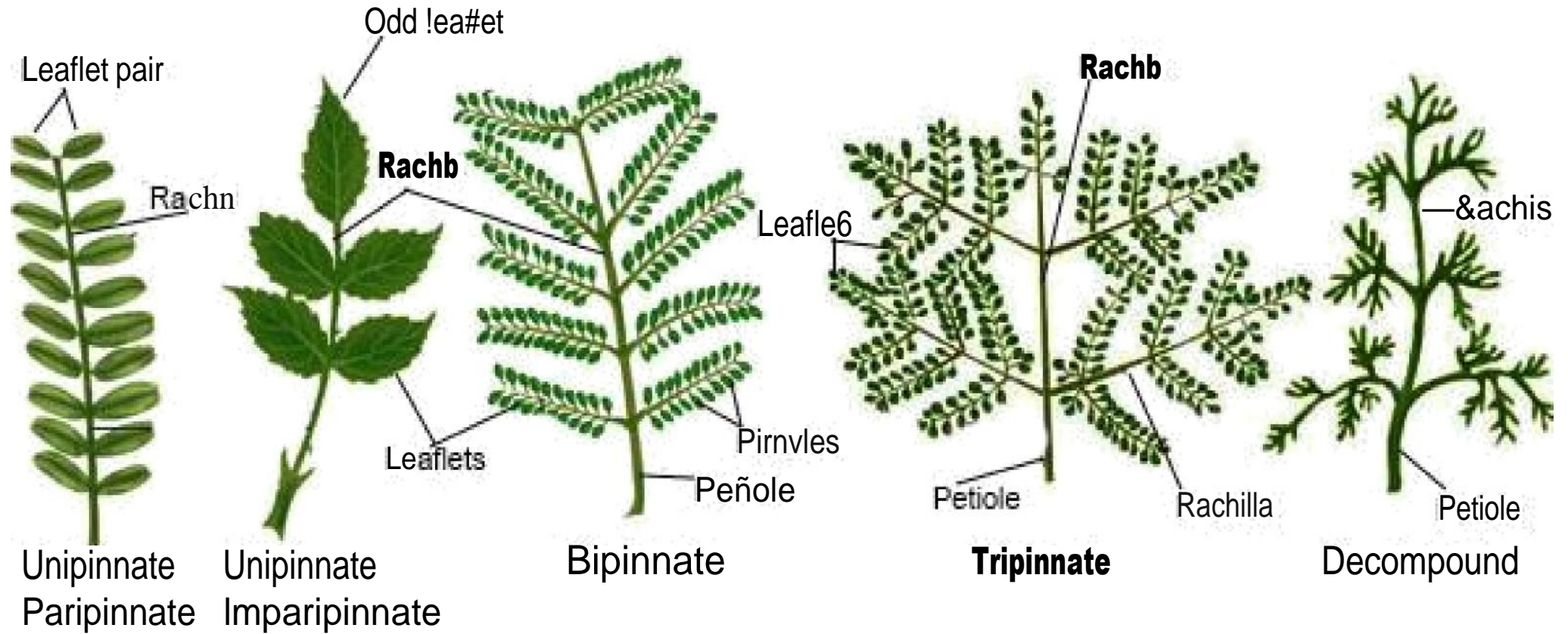


1. **Compound leaves:** The lamina is divided into different leaflets. Axil of leaflets don't bear axillary bud

a. **Pinnately compound:** If the leaflets are arranged on either side of rachis. E. g Rose

- **Unipinnate-** All the leaf lets touch the midrib of the leaf E.g. Rose
- **Bipinnate-** The midrib gives out number of secondary axis and the leaflets are attached to these axes. E.g *Acacia*
- **Tripinnate-** The secondary axes divide further into tertiary axes and leaflets are attached to tertiary axes. E. g. *Moringa* (Drumstick)
- **Decompound-** The tertiary axes are further divided and they bear the leaflets. E.g *Coriadrum*, *Cosmos*

## Pinnotely compound leaf



## **b. Palmately compound leaf**

A compound leaf in which **all the leaflets are connected to common point** so that the leaf appears like a palm

- Unifoliate-It has **single leaflet and winged base** joined to petiole. This type of leaf has been regarded as simple leaf by some botanists
- Bifoliate- It has **two leaflets joined** to a petiole
- Trifoliate- It has **three leaflets joined** to petiole
- Quadrifoliate-It has **four leaflets joined** to a petiole
- Multifoliate- It **has five or more leaflets joined** to a petiole

## TYPES OF PALMATELY COMPOUND LEAVES



UNIFOLIATE COMPOUND LEAF  
(Ex: *Citrus*)



BIFOLIATE COMPOUND LEAF  
(Ex: *Hardwickia*)



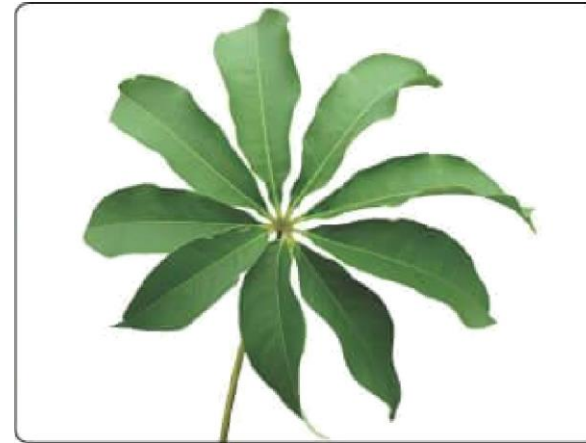
TRIFOLIATE COMPOUND LEAF  
(Ex: *Dolichos*)



TETRAFOLIATE COMPOUND LEAF  
(Ex: *Jussiaea*)



PENTAFOLIATE COMPOUND LEAF  
(Ex: *Gynandropsis pentaphylla*)



MULTIFOLIATE COMPOUND LEAF  
(Ex: *Crotalaria pentaphylla*)

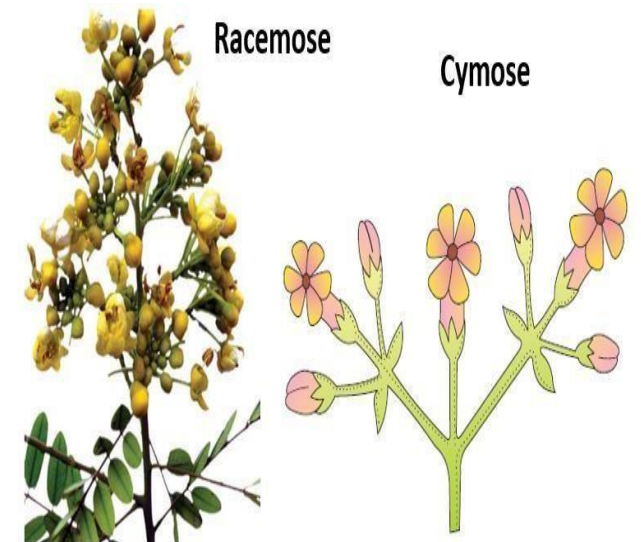
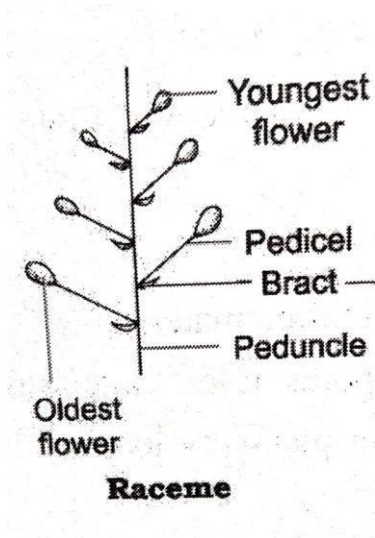


# Inflorescence

The **pattern of arrangement of flower in a floral axis or on the peduncle** is called an inflorescence.

Inflorescence is mainly categorized into two types.

1. **Racemose inflorescence**
2. **Cymose inflorescence**

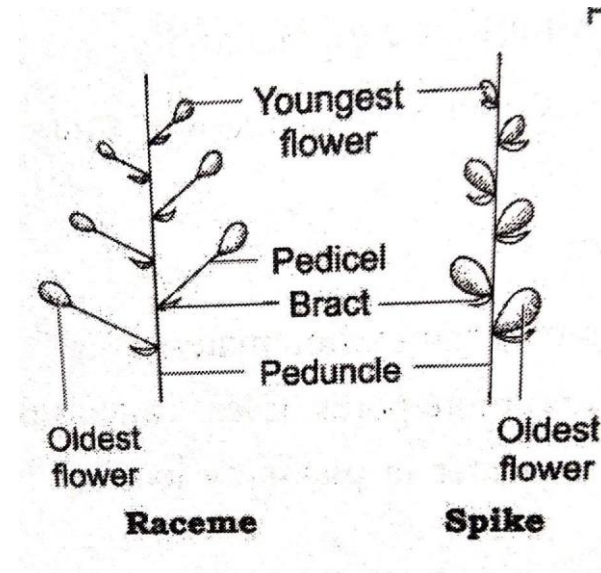


## 1. Racemose inflorescence/ Indefinite type of inflorescence

In this type of inflorescence the flower is arranged in acropetal manner i. e. older flowers towards the base and younger flowers towards the apex and the growth of main axis continuous with development of lateral flower.

### Types of racemose inflorescence

1. **Raceme:** An unbranched elongated peduncle bears pedicellate flowers in acropetal fashion. E. g. Mustard (*Brassica campestris*)



2. **Corymb**: An **unbranched peduncle bears pedicellate flowers** in acropetal fashion but the **pedicel of lower flowers is longer**. In this way all the flowers come to lie at the same level E.g Cherry (*Prunus cerasus*).

3. **Umbel**: All the **pedicellate flowers arise from a single point in a centripetal fashion** because peduncle is reduced to **a short axis**. E. g. Hydrocotyle (*Centella asiatica*)

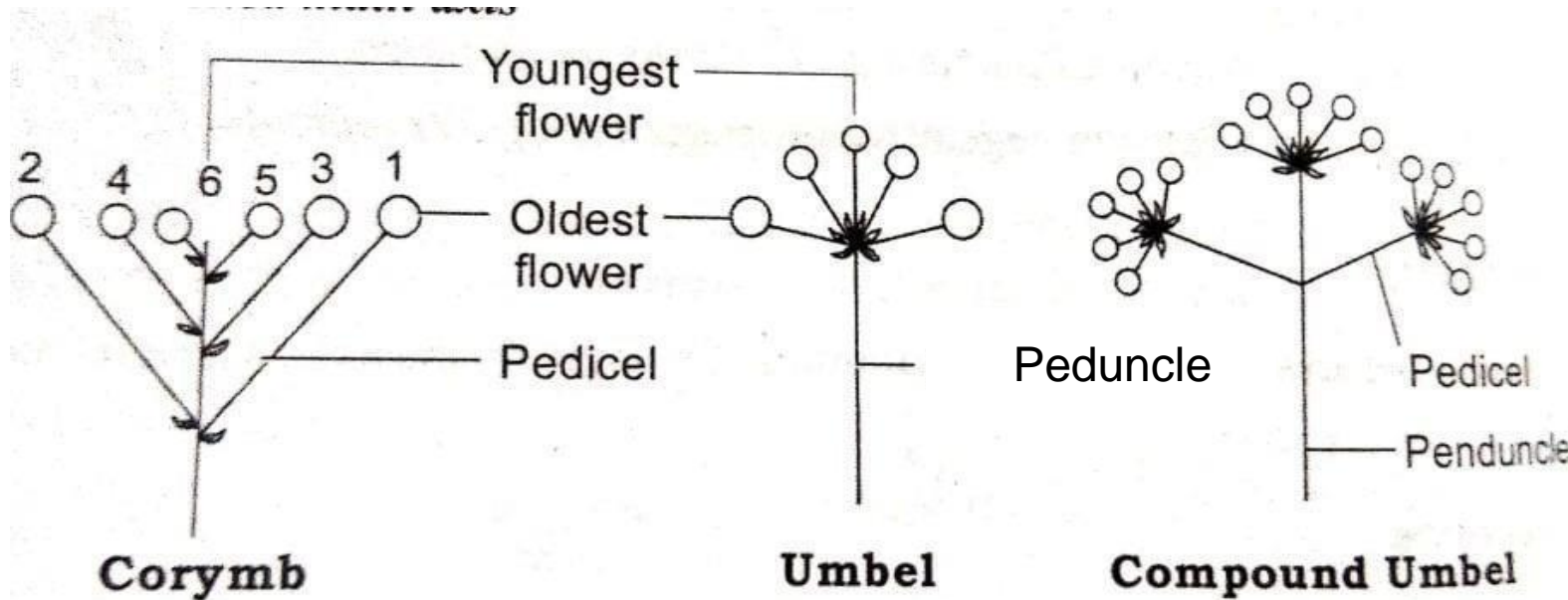


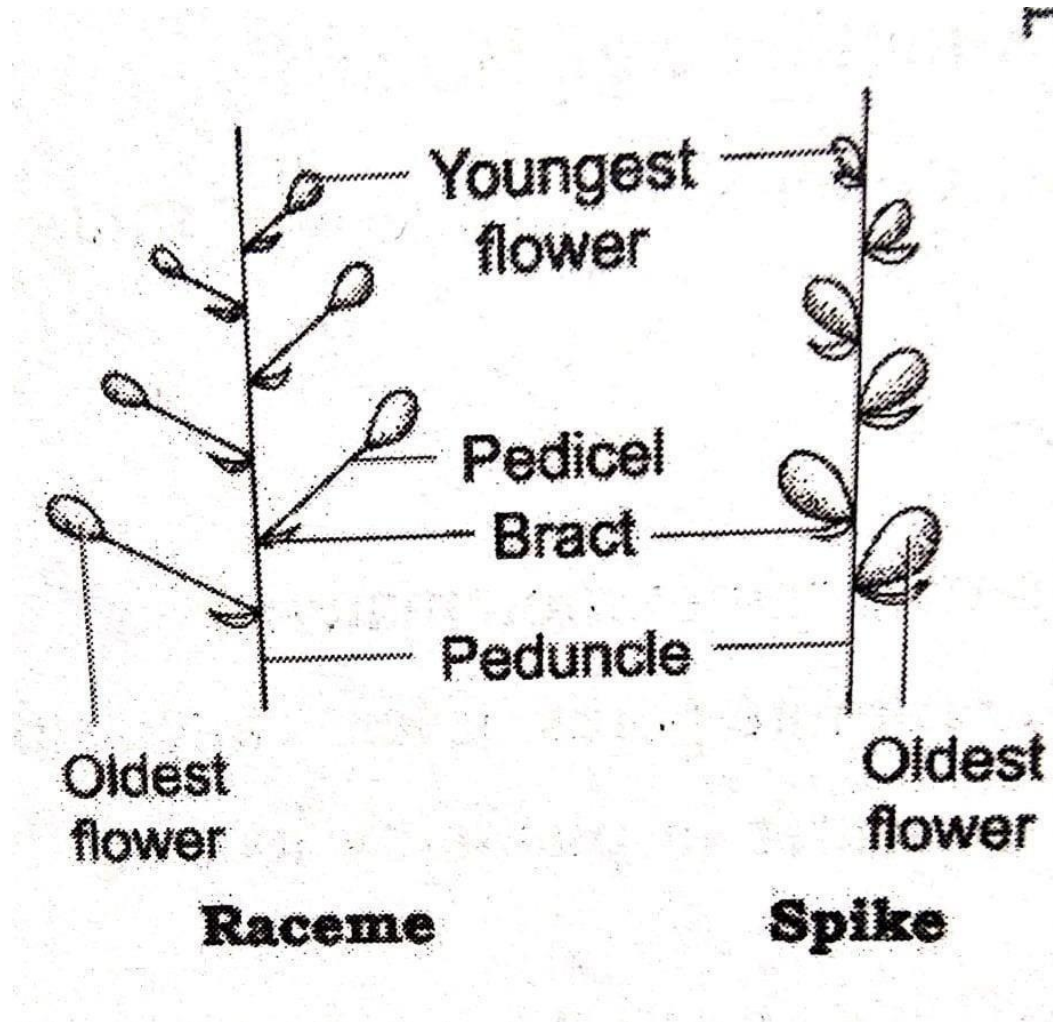
Fig. - 2.8.44: Types of racemose inflorescence (main axis shortened)



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4. Spike: An elongated unbranched peduncle bears sessile flowers in an acropetal fashion. E.g. Spinach (Palungo)

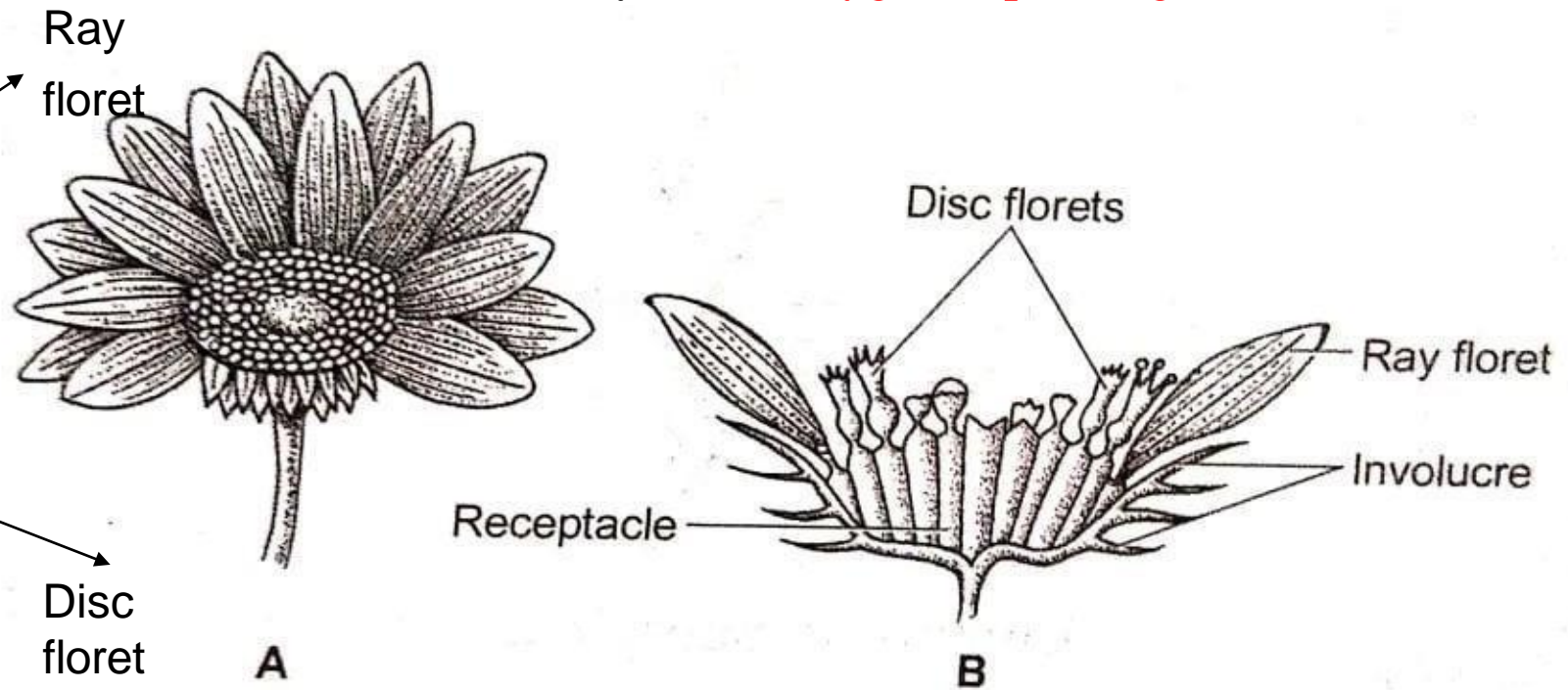




## 5. Head and Capitulum (with the main axis reduced)

In head and capitulum, flattened peduncle forms **disc like receptacle** from where **the numbers of small sessile flowers (florets) are developed in centripetal manner**. The florets are of two types:

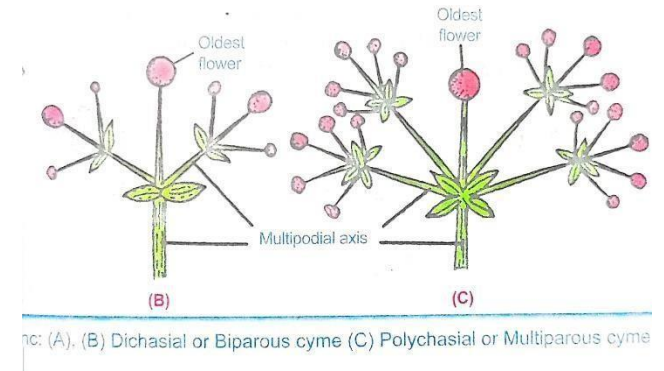
disc florets (**actinomorphic, tubular and bisexual**) and ray florets (**zygomorphic, ligulate and unisexual (pistillate)**)



**Fig. 2.8.45: Head (capitulum). (A) a head; (B) a head in L.S.**

## Cymose Inflorescence

- The flowers are arranged in basipetal manner i.e. older flower towards the apex and younger flower towards the base.
- The growth of main axis is stopped due to development of flower.
- The main axis terminates into flower.



## Types of cymose inflorescence

### a. Uniparous or monochasial cyme

- Main axis terminates into flower and produces one lateral branch which also terminates into a flower.

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### **Types of cymose inflorescence**

#### **a. Uniparous or monochasial cyme**

- Main axis terminates into flower and produces one lateral branch which also terminates into a flower.

## B. Biparous or Dichasial Cyme

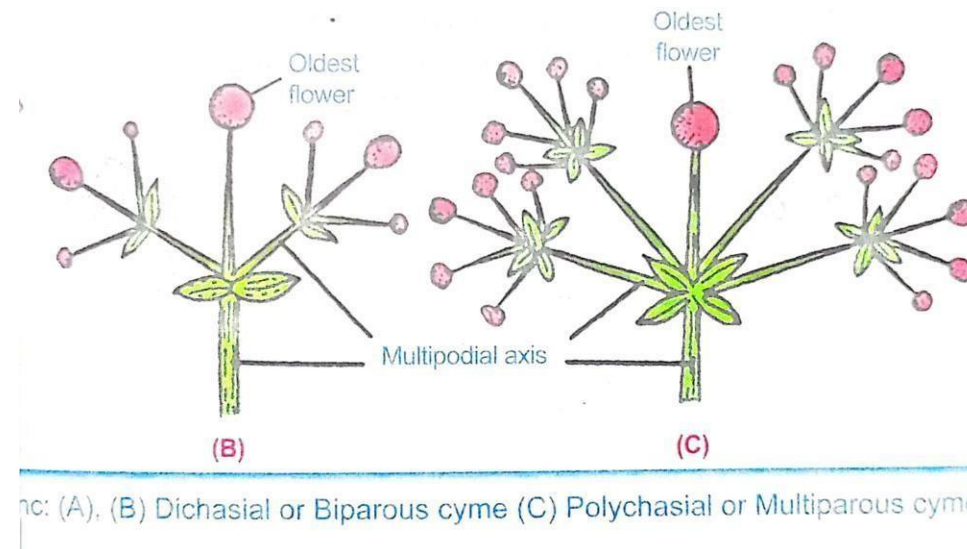
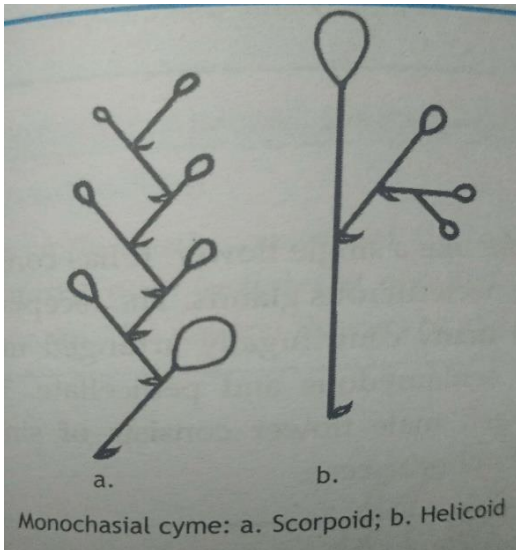
- The **main axis** terminates into **flowers** and produces **two lateral branches**.

eg. *Bougainvillea*



## C. Multiparous or Polychasial Cyme

- The **main axis** terminates into **flowers** and produces **many lateral branches**, each lateral branches also **terminates into flower**. Example-*Viburnum* (आँक)



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## Flower

- Flower is a **condensed modified shoot of angiosperm** that helps in **sexual reproduction**
- The typical flower is borne on a shoot known as floral axis or **peduncle(motheraxis)**
- The **stalk of flower** is called **Pedicel**

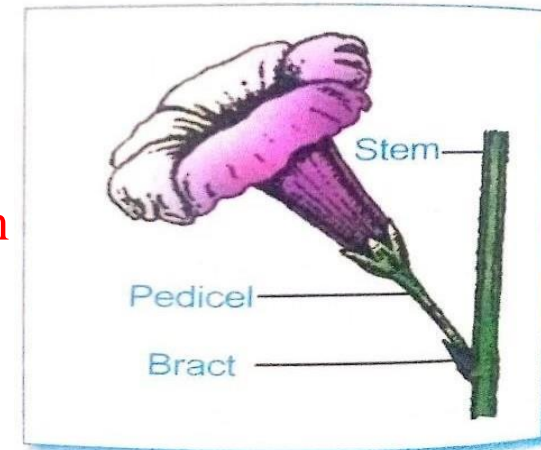


Fig. 2.8.37: A flower with pedicel and bract

Flower with stalk(pedicel)- **Pedicellate**

Flower without stalk(pedicel)- **Sessile**

- **Reduced lateral appendage** developed at the base of flower is called **bract**.

Flower with bract- **Bracteate**

Flower without bract- **Ebracteate**

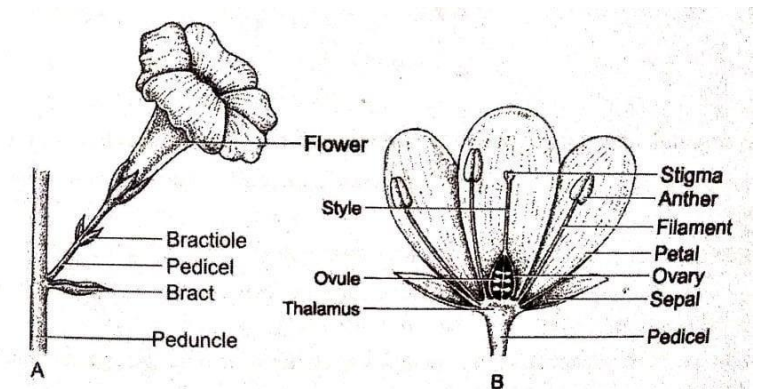


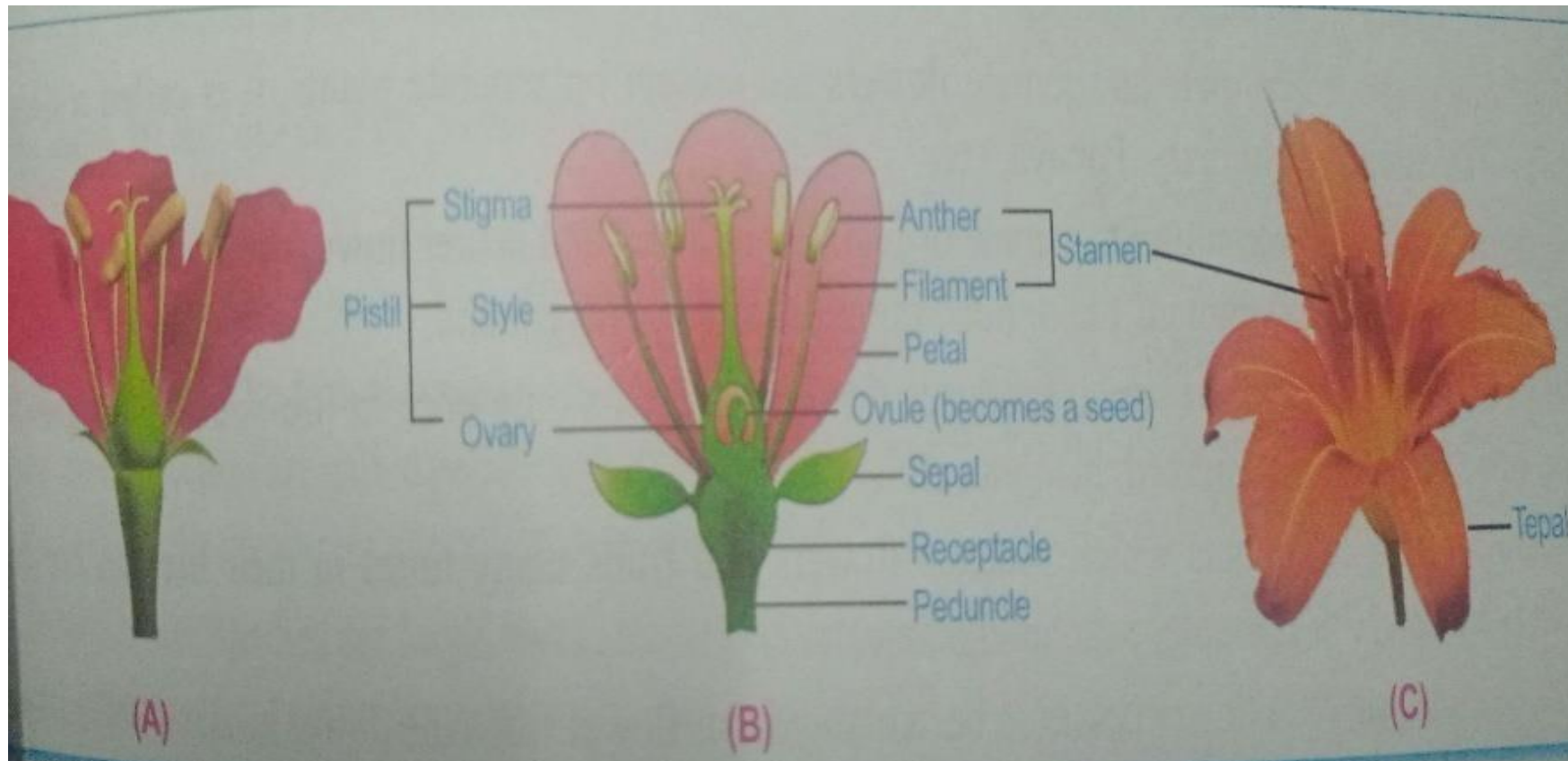
Fig. - 2.8.50: A, An axillary flower; B, Parts of a typical flower in longitudinal section

- The **expanded tip of pedicel** in which different floral organs are developed , it is known **as thalamus**



## Flower...

- A typical flower of angiosperm consists of floral parts namely **calyx, corolla, androecium and gynoecium**
- Calyx and corolla-**Accessory whorls**
- Androecium and Gynoecium-**Essential whorls**



## Some terminologies related to flower

- **Pedice**l- stalk of flower
- **Pedicellate**- flower with pedicel
- **Sessile**- Flower without pedicel
- Complete- If all the floral whorls are present e.g. Mustard
- Incomplete: A flower that lacks any one of the four whorls E. g. Maize, *Cucurbita*
- Bisexual: A flower having both male and female reproductive organs Example- *Brassica* (Mustard)



## Terminologies.....

- **Unisexual:** A flower having only **one sex organ**, either **male flower or female flower** Eg. *Morus*

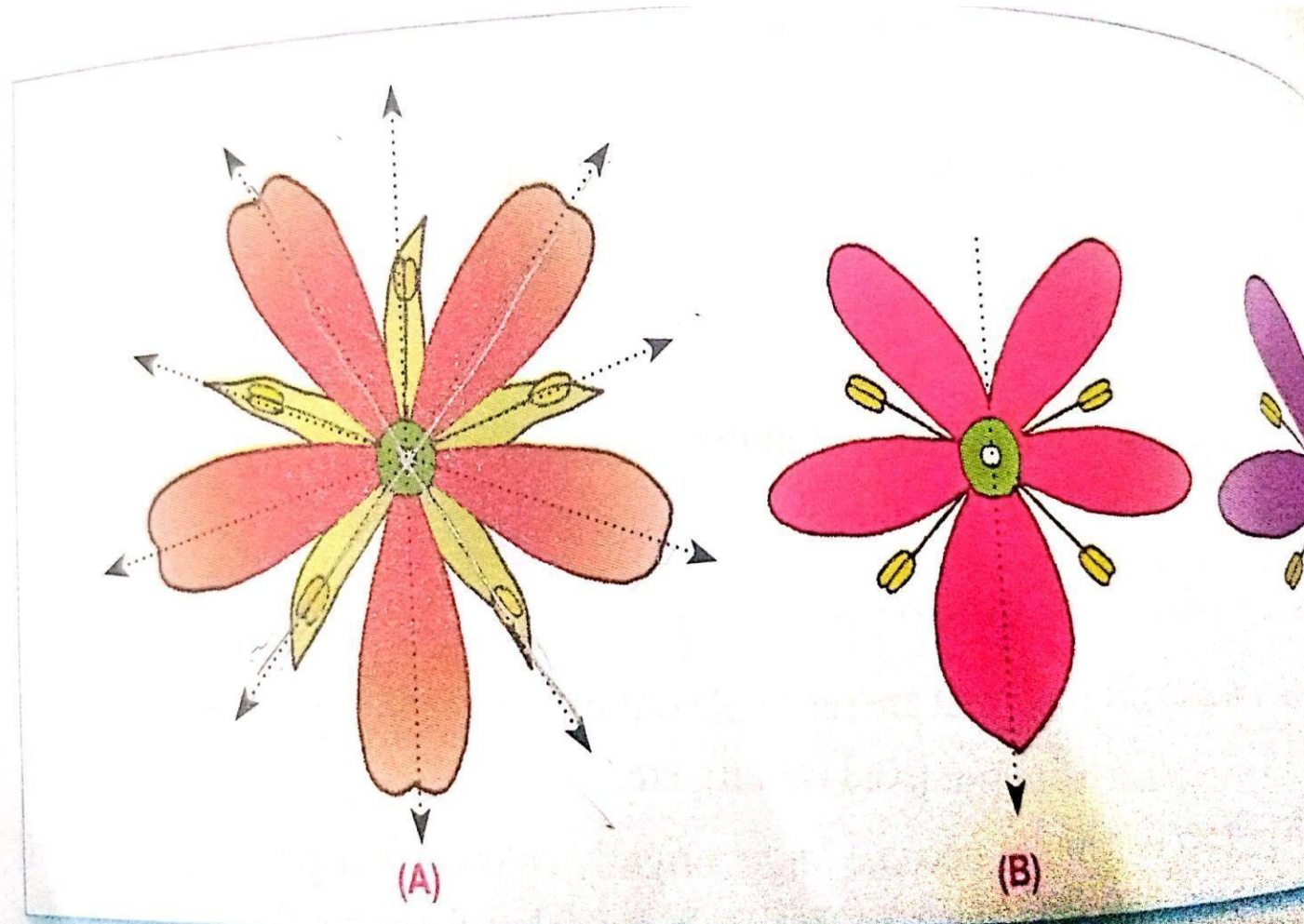
**Staminate-** Amale flower    **Pistillate-** A female flower

- **Trimerous :** Number of floral parts are **three or it's multiple** E. g. Flowers of monocotyledons(Onion, Asparagus)  $K_3C_3A_6G_3$ .....
- **Tetramerous :** Number of floral parts are **four or it's multiple**. E.g. Mustard

### Based on Symmetry

#### a. Actinomorphic

- If flower can be cut into **2 equal halves from any plane passing through centre**(radially symmetrical flower) Eg. Mustard
- **Zygomorphic flower:** If the flower can be **cut into two equal halves from any one plane through centre** (Bilaterally symmetrical Flower) Eg. Pea, Bean, etc.



a. Actinomorphic

b. Zygomorphic

## Based on the position of floral organs on the thalamus

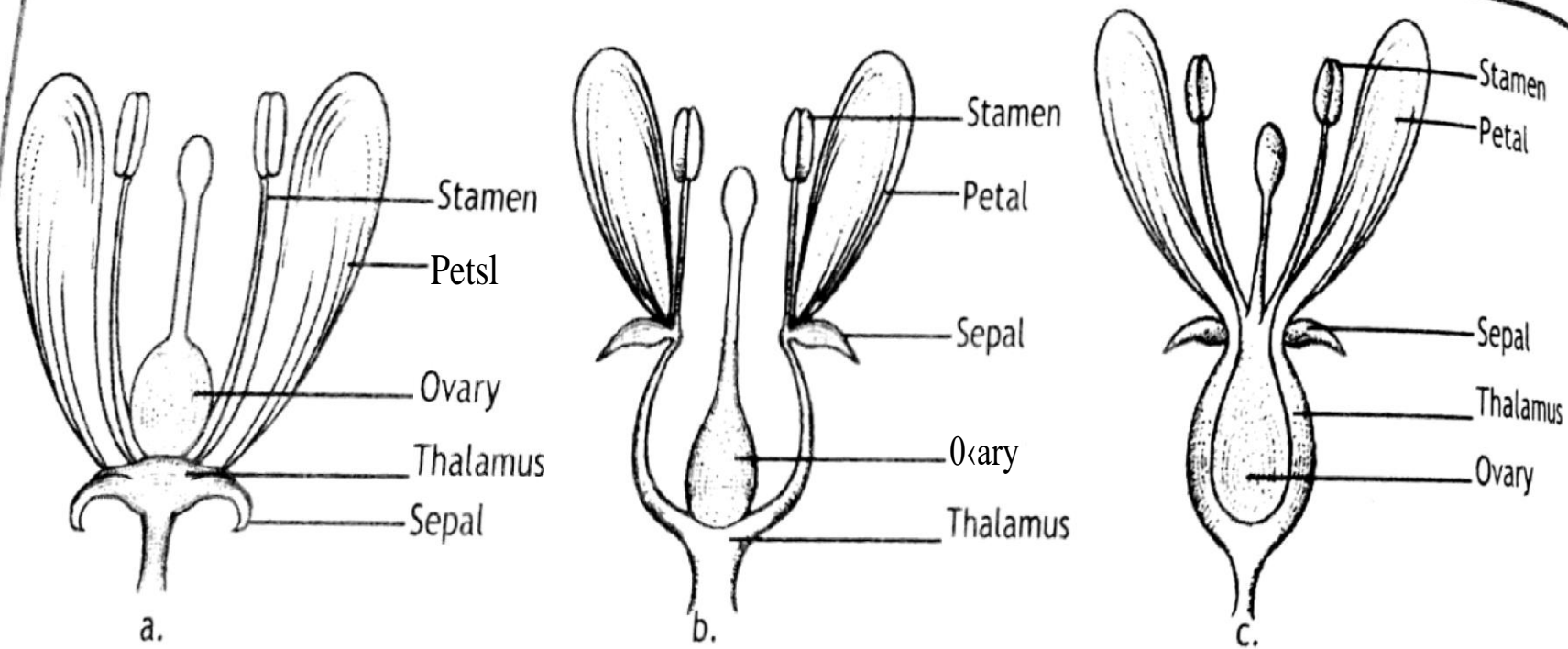
- **Hypogynous:** When three floral parts like sepals, petals and stamens are situated below the ovary, the flower on the thalamus is called hypogynous

Ovary in this condition is called superior. Eg. Mustard

- **Epigynous:** When three floral parts like sepals, petals and stamens are situated above the ovary, the flower on the thalamus is called epigynous.

Ovary in this condition is called inferior. Eg. Sunflower, Cucumber, etc.

- **Perigynous Flower:** Thalamus is cup shaped. Position of ovary neither superior nor inferior and ovary lies at the base of the cup and other floral parts lie at the rim of the cup is called perigynous flower. Eg. Rose



**Fig. 2.8.45: Position of floral organs on the thalamus: a. Hypogynous flower, b. Perigynous flower, c. Epigynous flower**



## CALYX

- It is the first and outermost whorl of the floral leaves which is composed of the **number of green or colored sepals**.

### color of Sepals

**Sepaloid**- Sepals are green eg. Pea

**Petaloid**- Sepals are other than green eg. *Cassia*

- **Poly**sepalous- If the sepals are free with each other eg. Mustard
- **Gamo**sepalous- If the sepals are fuse with each other eg. Pea

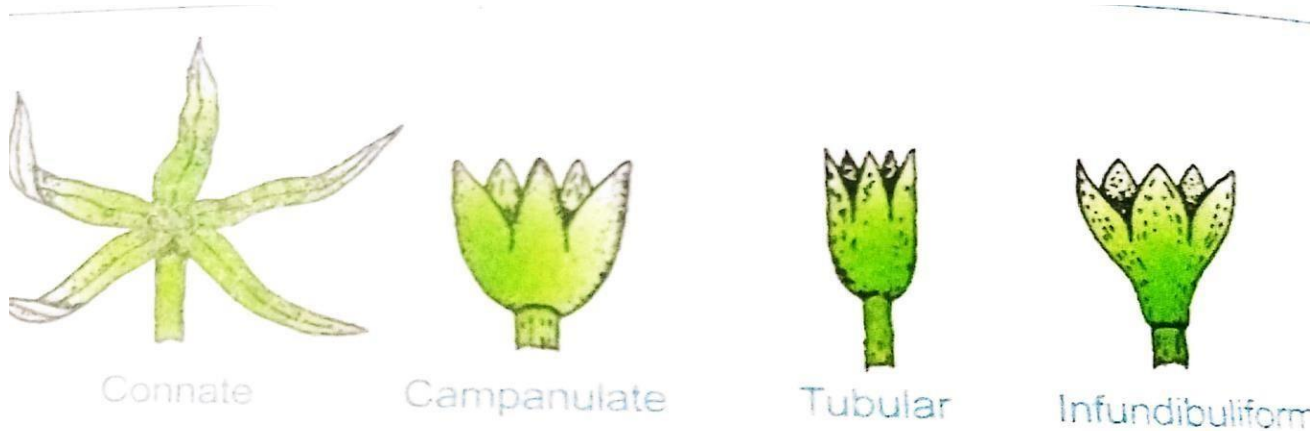


fig: Polysepalous

fig: Gamosepalous

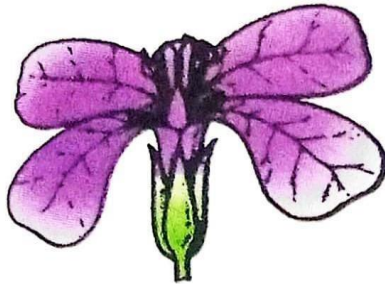
## Corolla

- It is the second whorl of the flower which is made up of **petals**

**Polypetalous**- Petals are free from each other eg. Mustard

**Gamosepalous**- Petals are fused to each other eg. *Ipomea* (morningglory)

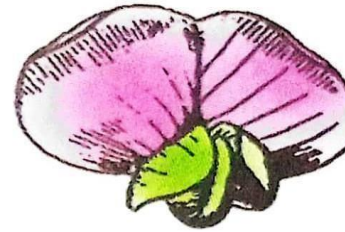
*petals*



Cruciform



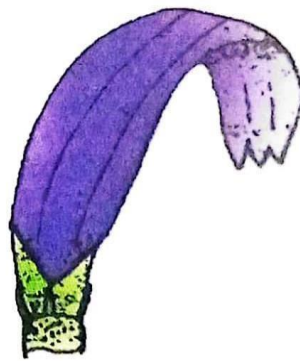
Campanulate



Papilionaceous



Rotate



Ligulate



Tubular



Bilabiate

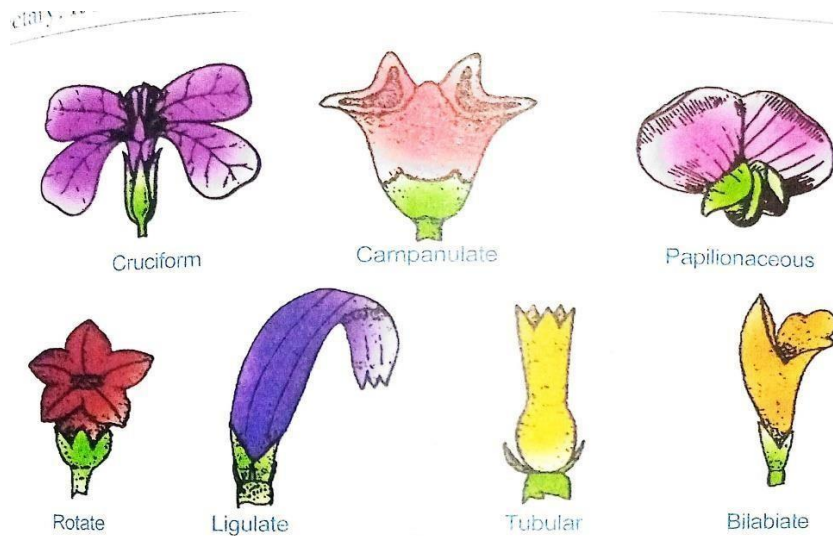
## FORMS OF COROLLA

### ➤ Polypetalous Corolla

**1. Cruciform corolla:** The corolla consist of **four free petals** are arranged in the form of a cross.

Example: Mustard

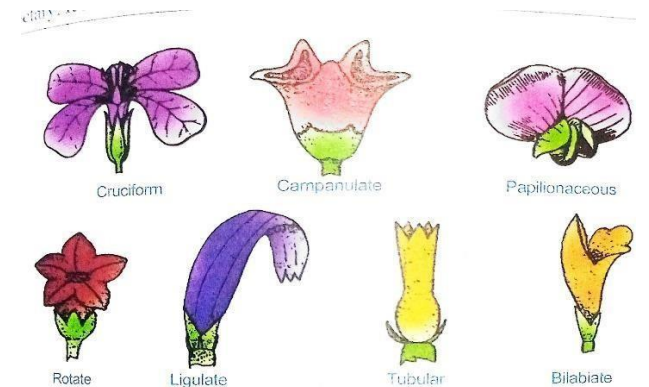
**2. Papilionaceous ( Butterfly like):** Corolla having **butterfly like lateral wings**(petals) e.g. Pea



## FORMS OF COROLLA....

### ➤ Gamopetalous Corolla

1. **Tubular:** Petals fuse to form **tube like structure** Eg. Disc floret of sunflower
2. **Ligulate:** Upper part of petals are **flat and expanded** and lower part are **short tube like structure** Eg. Ray floret of sunflower.
3. **Infundibuliform:** The petals fuse to form funnel shaped structure eg. *Datura*
4. **Campanulate:** The petals fuse to form bell-shaped structure Eg. *Ipomea, Tobacco*





## AESTIVATION OF CALYX AND COROLLA

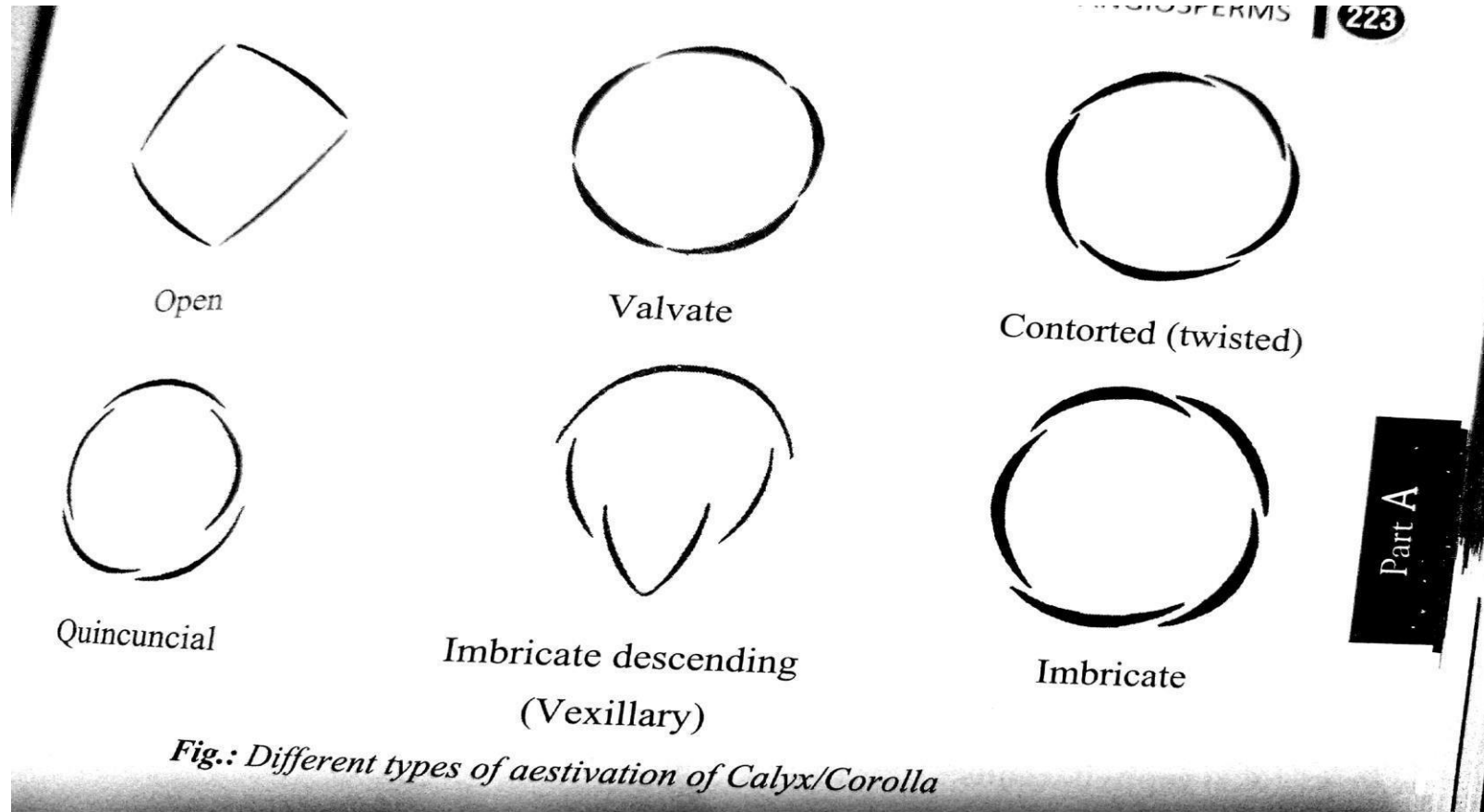
- The mode of arrangement of sepals/petals in a floral bud with respect to other members of same whorl.

### Types of aestivation

1. **Valvate aestivation:** The margin of the adjacent sepals or petals simple touch to each other without overlapping(margin of sepal/petal lie in same plane) eg. Mustard
2. **Twisted aestivation:** The margin of one sepal or petal overlaps with margin of other sepal or petal.  
Eg. Corolla of Hibiscus
3. **Imbricate aestivation:** One petal completely out, one completely in and remaining alternate( in and out) Eg. Calyx of Pea

## AESTIVATION OF CALYX AND COROLLA.....

4. **Quincuncial:** 2 completely in, 2 completely out, one alternate Eg. *Cucubita maxima*
5. **Vexillary:** Out of the five floral leaves ( petals or sepals) posterior largest petal overlaps, 2 lateral ones which again overlaps 2 anterior ones. Eg. Corolla of pea

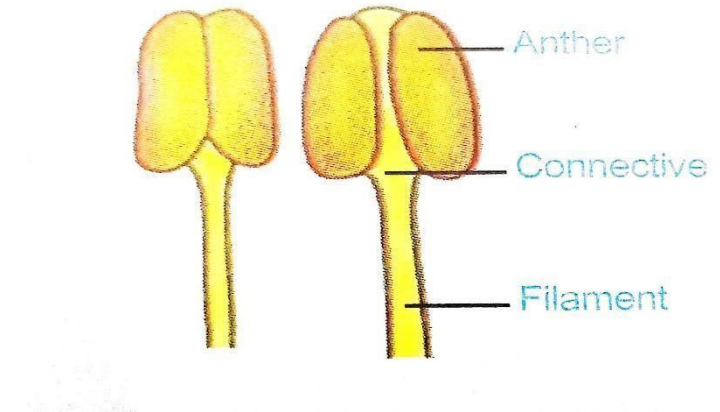


## PERIANTH

- If the **calyx and corolla** is not distinguished in a flower then it is known as **perianth**.
- Unit of perianth is called **tepal**

## ANDROECIUM

- It is third whorl of the flower (**male reproductive organ**) which lies inner to the corolla of the flower
- It is the collective term for all stamens
- Each stamen consist of two parts- **filament, anther**
- **Polyandrous**- If the stamens are free eg. Mustard
- when stamens are united by their filament

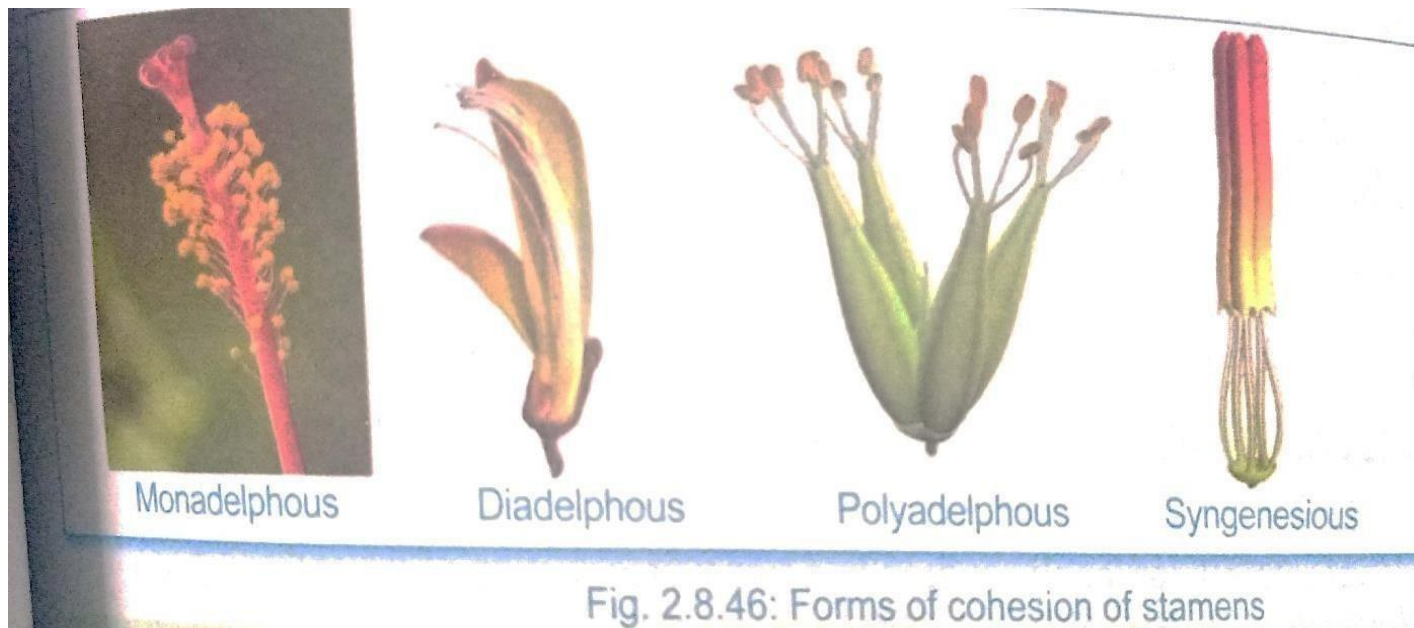


Adelphous  Syngenesious

## ANDROECIUM....

**Adelphous**-If the **filaments are fused** and **anther are free**

1. **Monadelphous**- If all the filaments are fused to form **one bundle** eg. Chin rose
2. **Diadelphous**- If all the filaments are fused to form **two bundles**. Eg. Pea
3. **Polyadelphous**- If all the filament are fused to form **more than 2 bundle** eg. Lemon





## ANDROECIUM....

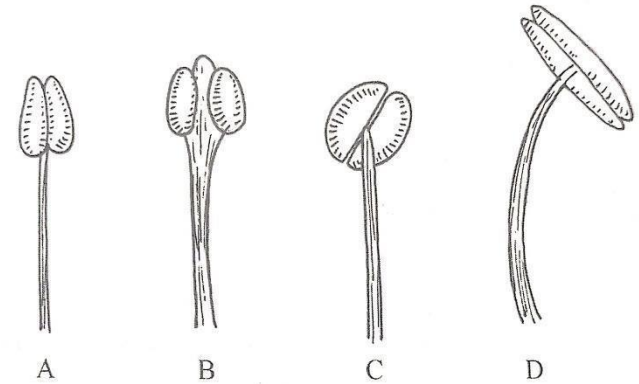
**Syngenesious:** The stamen in which **anther are fused and their filament are free**. Eg. Sunflower

**Synandrous:** When **both anthers and filaments of stamens are fused** throughout the whole length eg. *Cucurbita*

**Fig:** a. syngenesious      b. synandrous

### Attachment of filament to anther

1. **Basifixed-** The filament is attached at the **base of anther** e.g. Mustard
2. **Dorsifixed-** The filament is attached to **dorsal side(back) of the anther** e.g. *Prunus*
3. **Adnate-** The filament **runs throughout the whole length of anther** e.g. *Ranunculus*



*Fig.: Attachment of the filament to the anther*

A - Basifixed, B - Adnate, C - Dorsifixed and D - Versatile

## ANDROECIUM....

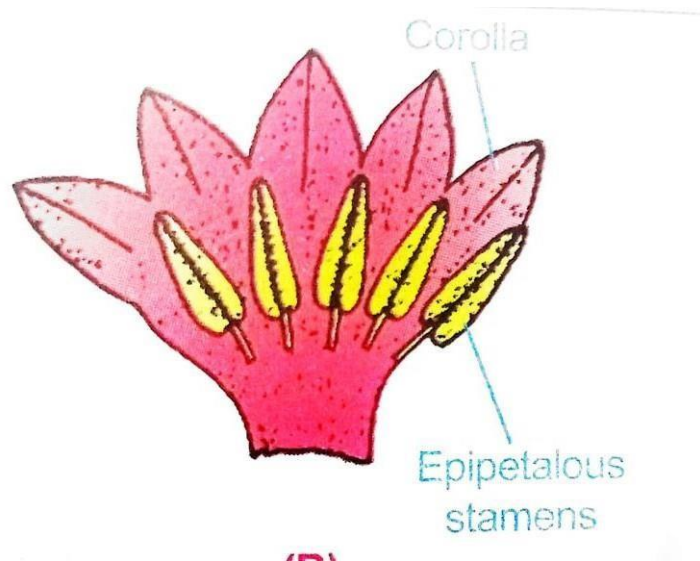
4. **Versatile-** The filament is attached to a point at back of anther and anther are seen hanging

### ANTHER CROSS SECTION

1. **Monothealous-** Single lobed anther e.g. *Hibiscus*

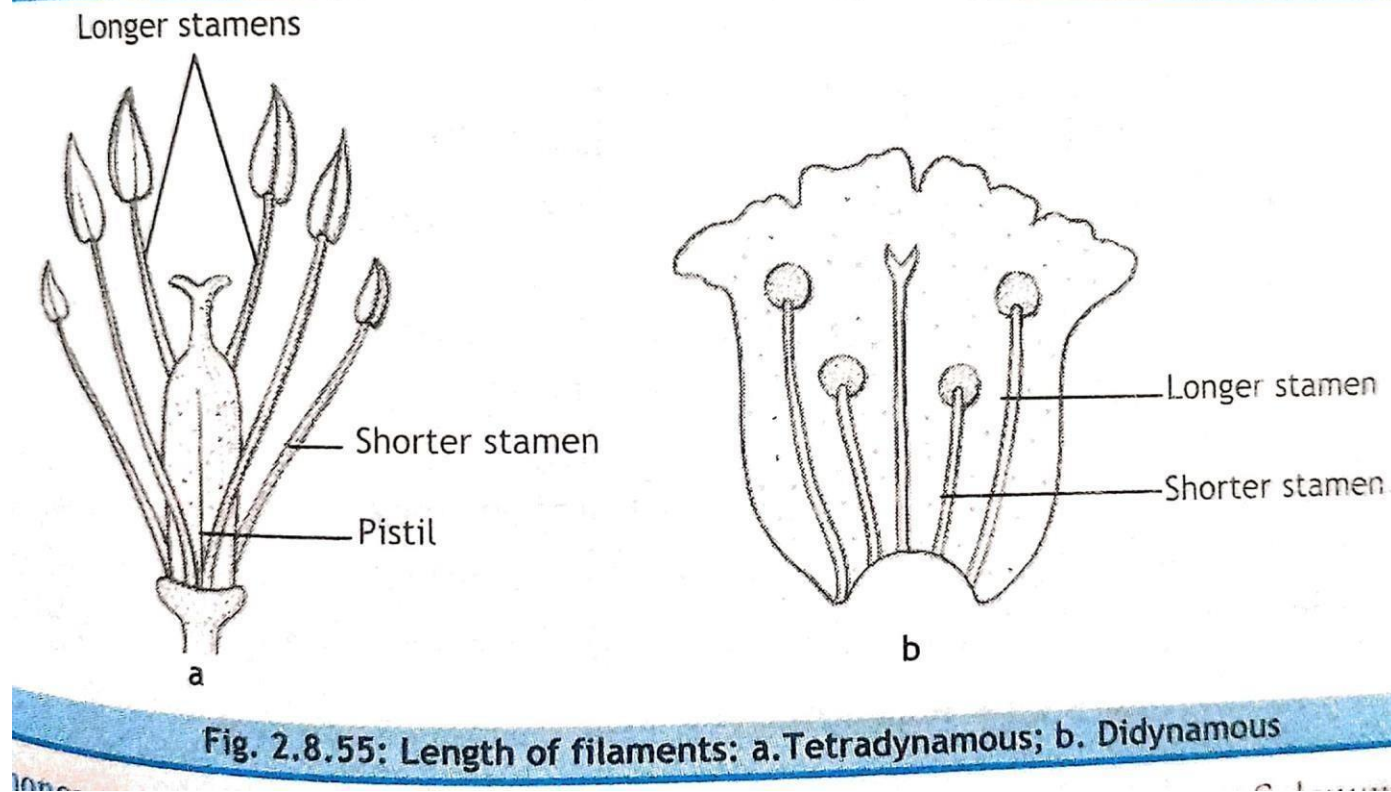
2. **Dithealous-** Two-lobed anther e.g. *Papaver*

**Epipetalous-** If the filament of stamen attached to petal e.g. Members of family Liliaceae



## Length of stamens

1. **Didynamous**- 4 stamens, 2- short and 2-long e.g. *Ocimum*
2. **Tetradynamous**- 6 stamens, 4-inner long, 2- outer short e.g. Mustard



## GYNOECIUM

- Innermost whorl of the flower that constitutes the female reproductive organ.
- Made up of one or more carpels
- Three different parts namely stigma, style and ovary

Number of carpels

- **Monocarpellary**- one carpel e. g. Pea
- **Bicarpellary**- two carpels e. g. mustard
- **Tricarpellary**- Three carpels e. g. Members of family poaceae
- **Polycarpellary**- Many carpels e. g. Rose

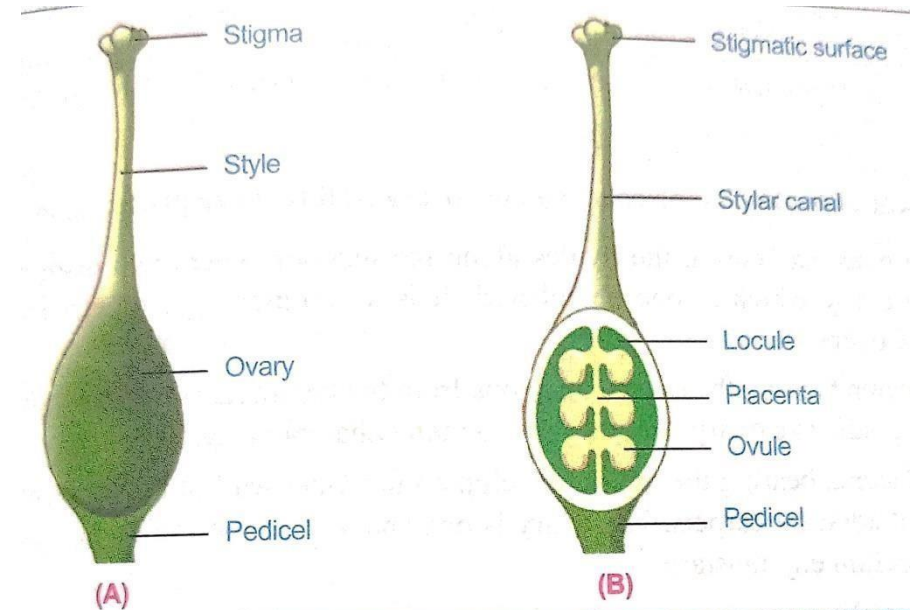


Fig. 2.8.50: Parts of pistil– (A) External view of pistil (B) L.S. of pistil



## **GYNOECIUM...**

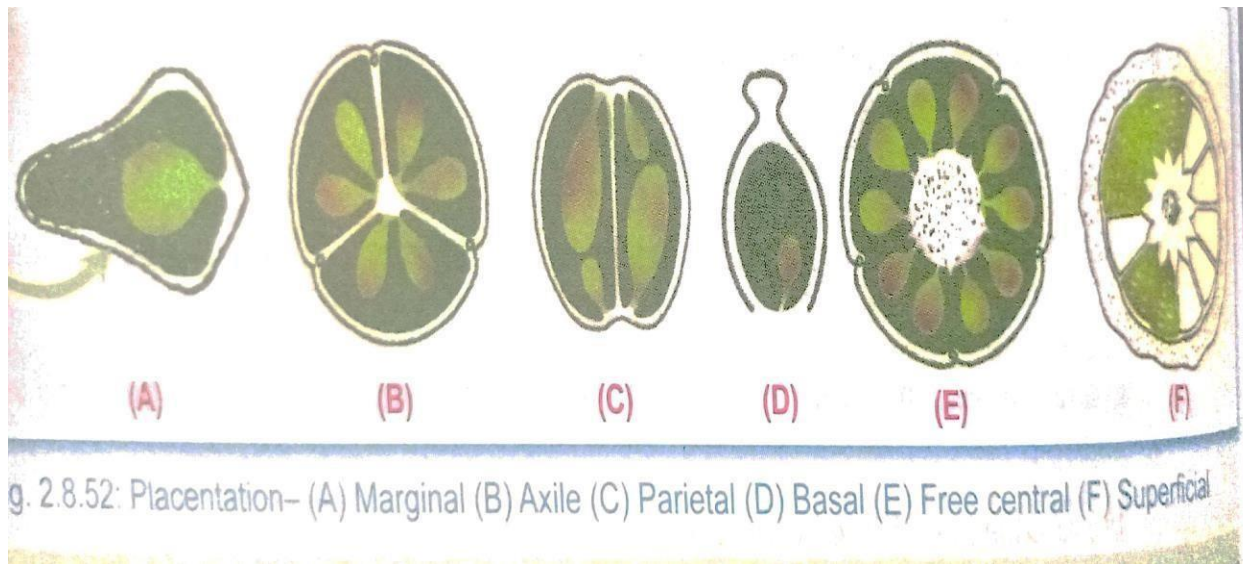
**Apocarpous-** When carpels are free e. g. Rose

**Syncarpous-** Carpels are wholly partially united e.g. Mustard

### **Locules or chambers of ovary**

- 1. Unilocular-** ovary with one chamber
- 2. Bilocular-** Ovary with two chambers
- 3. Trilocular-** Ovary with three chambers
- 4. Multilocular-** Ovary with many chambers

## Gynoecium...



## Gynoecium...

