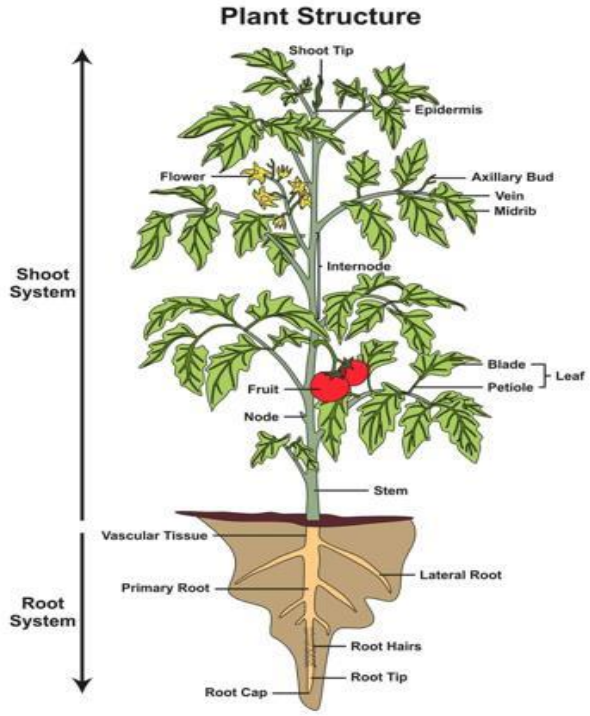
CLASS XI BIOLOGY NOTES

CHAPTER 5: MORPHOLOGY OF FLOWERING PLANTS

Morphology is the branch of biological science that deals with the study of form, size, colour, structure and relative position of various parts of organisms

Parts of Flowering Plants

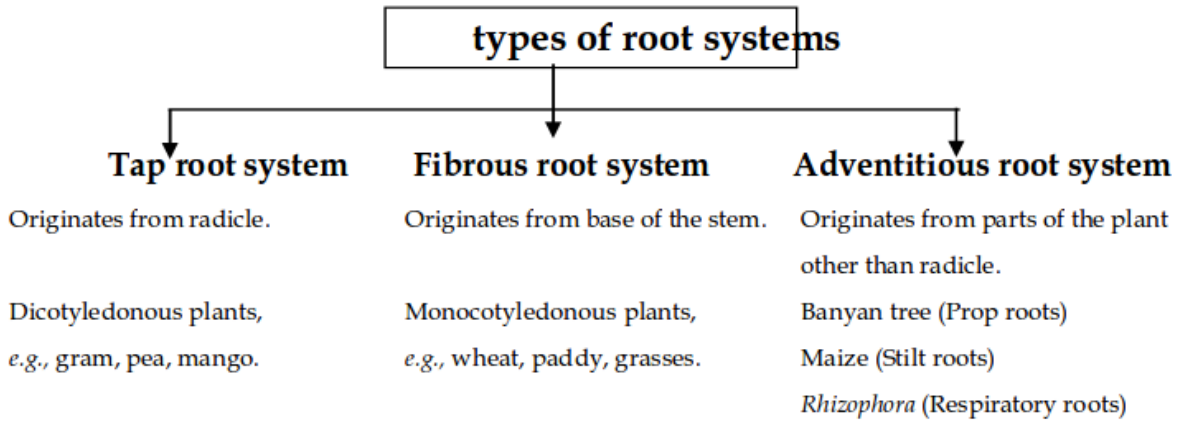
All the flowering plants have roots, stem, leaves, flower and fruits. The underground parts of flowering plant are the root system and the portion above the ground forms the shoot system.



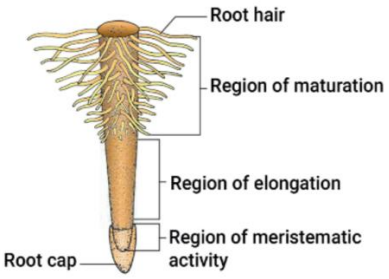
After Seed germination Plumule makes shoot or stem and Radical makes root.

THE ROOT

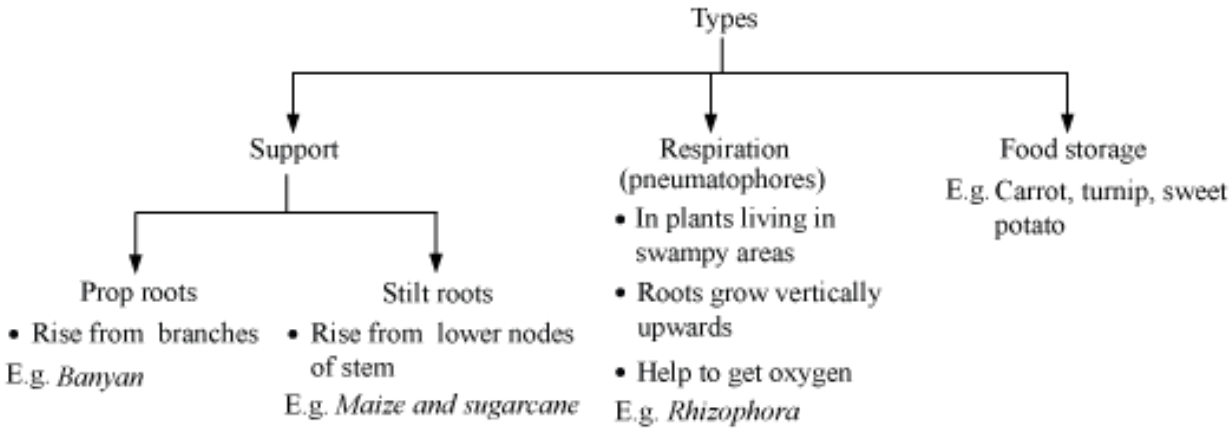
Types of roots - Taproot, Fibrous root, Adventitious root.

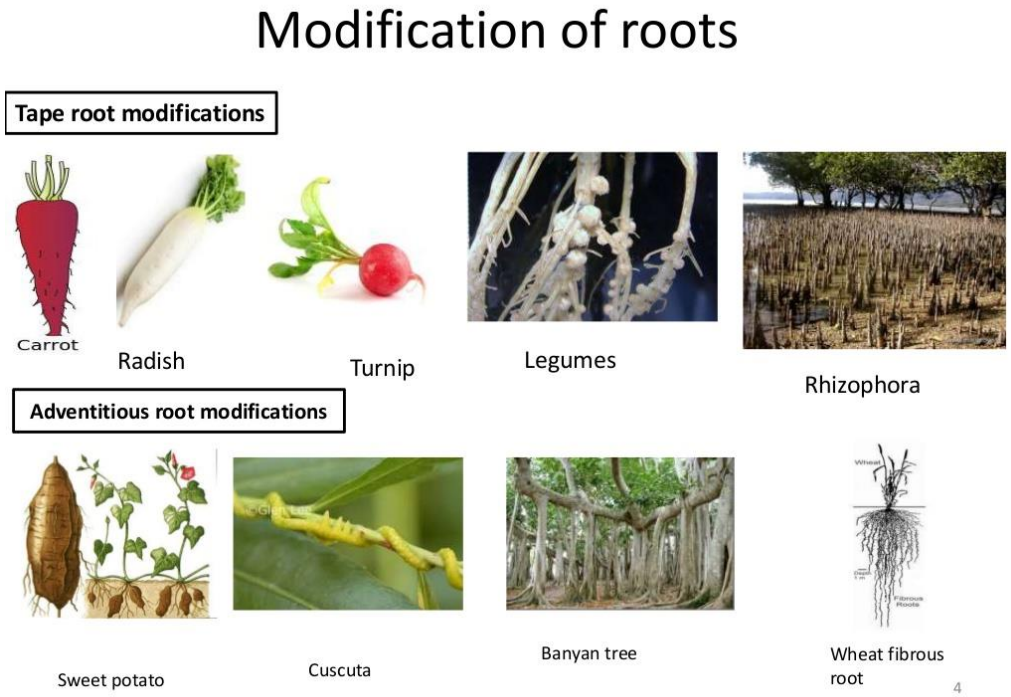


Regions of root - Region of maturation
Region of elongation
Region of meristematic tissues, Root cap



Modification of roots:





The stem:

- It is the ascending part of axis bearing branches, leaves, flowers and fruits. It develops from Plumule of the embryo.
- Stem bears nodes and internodes. The region of stem where leaves are born are called nodes and portion between two nodes are called internodes.
- The main function of stem is spreading branches, bearing leaves, flowers and fruits. It also conducts water and minerals from root to leaves and product of photosynthesis. Some stem perform special functions like storage of food, support, protection and vegetative propagation.

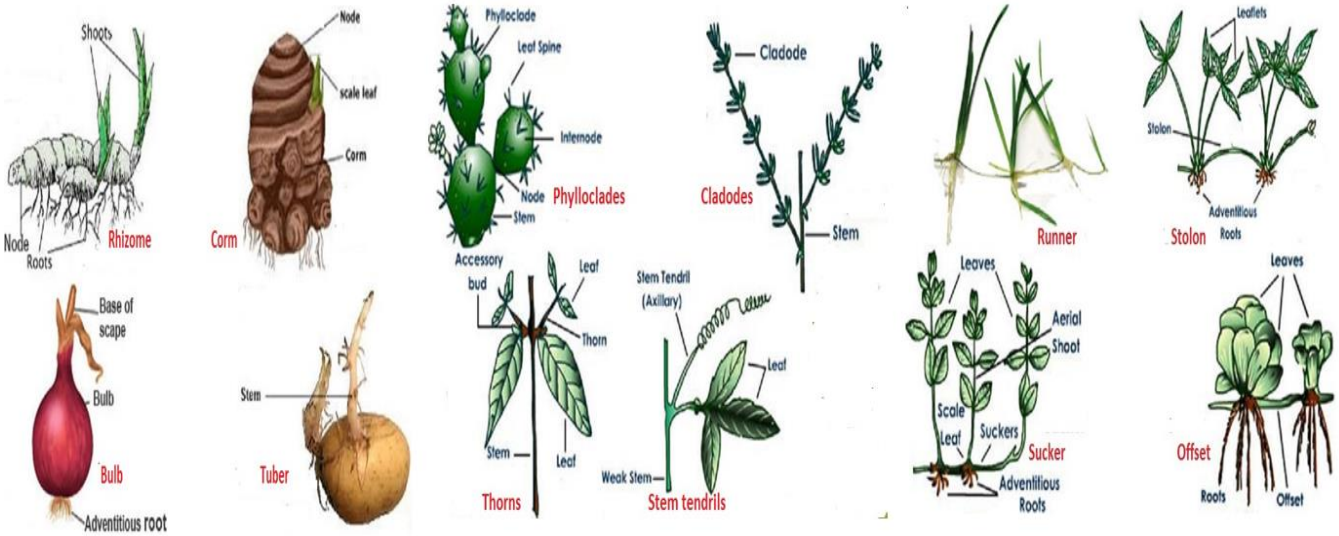
Modification of stems:

1. Storage - potato,ginger, tturmeric (perennation)
2. Tendrils – axillary buds –coils - support (watermelon)
3. Thorns - axillary buds – citrus (protection)
4. Flattened stem – opuntia (do photosynthesis)
5. Vegetative propagation (grass, jasmine, banana)

Stem Modification

- **I. Underground modifications**
  - Rhizome *e.g.* Ginger
  - Bulb *e.g.* Onion, Garlic
  - Corm *e.g. Colocasia, Amorphophallus*
  - Tuber *e.g. Potato*
- **II. Sub-aerial modifications**
  - Runner *e.g. Cynodon*
  - Sucker *e.g. Chrysanthemum, Musa.*
  - Stolon *e.g. Jasmine, Colocasia*
  - Offset *e.g. Pistia, Eichornia*
- **III. Aerial modifications**
  - Tendril *e.g., Passiflora*
  - Thorn *e.g. Citrus, Aegle*
  - Phylloclade *e.g. Opuntia, Cocoloba*
  - Cladode *e.g. Asparagus, Ruscus*
  - Bulbil *e.g. Dioscorea, Agave*

Underground modification of stem | **Aerial modification of stem** | **Sub-aerial modification of stem**

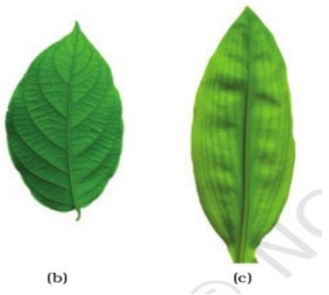


The leaf:

- Short apical meristem gives rise to leaves arranged in acropetal order
- Do photosynthesis
- Three main parts are leaf base, petiole and lamina (leaf blade)
- Have stipules
- Leguminous petioles have pulvinus. (midrib)

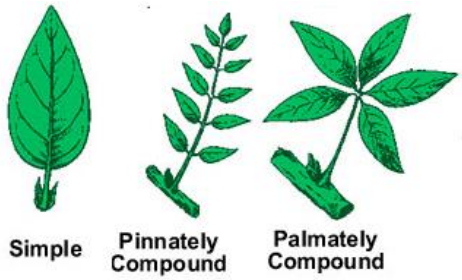
Venation - arrangement of veins and veinlets on a leaf.
Types of venation: The arrangement of veins and the veinlets in the lamina of leaf is termed as venation

- Parallel- monocot leaves
- Reticulate – dicot leaves



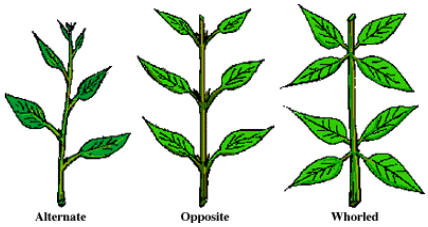
Types of leaves:

- Simple leaves
- Compound leaves - Pinnately compound (eg. Neem) and Palmately compound (eg. Silk cotton)



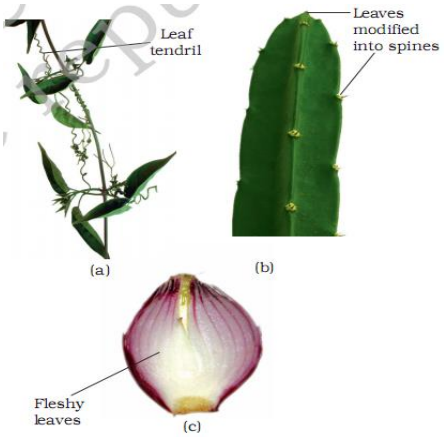
Phyllotaxy: Pattern of arrangement of leaves on the stem /branch.

- Alternate- china rose
- Opposite- guava
- Whorled-alstonia



Modification of leaves:

1. Tendrils - pea (support)
2. Spines - cacti (protection, water loss)
3. Storage - onion/ garlic
4. Petiole leaves – acacia
5. Pitcher leaves – insectivorous plant (venus fly trap)



Modifications of leaf for: (a) support: tendril (b) protection: spines (c) storage: fleshy leaves

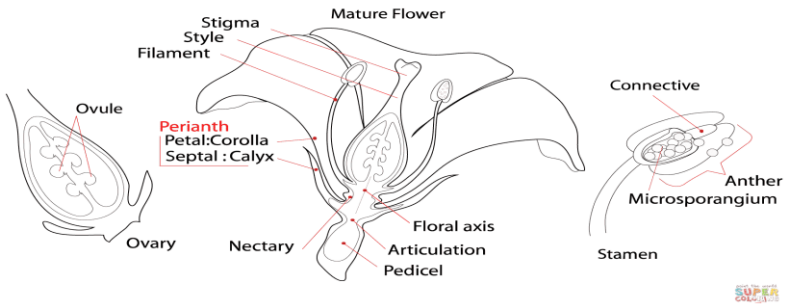
The inflorescence: Arrangement of flowers on the floral axis.

Types of inflorescence: Depending on whether the apex gets converted in to a flower/continues to grow there are two major types;

1. Racemose - Main axis continues to grow laterally (in an acropetal succession)
2. Cymose - Main axis terminates in a flower so limited growth (basipetal order)

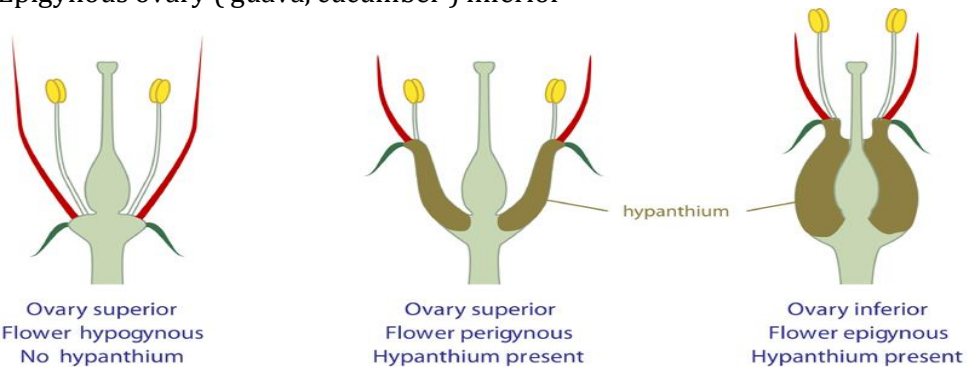
The flower:

- Four whorls. Sepal, petal, gynoecium, and androecium
- Thalamus/receptacle
- Trimerous/tetramerous/pentamerous/polymerous
- Bracteates/ebracteate/bract. (Protective sheet around the flower)
- Bisexual/unisexual
- Actinomorphic (mustard) zygomorphic (pea)asymmetric (canna)



Based on the position of ovary:

1. Hypogynous ovary (mustard) superior
2. Perigynous ovary (rose) half inferior
3. Epigynous ovary (guava, cucumber) inferior

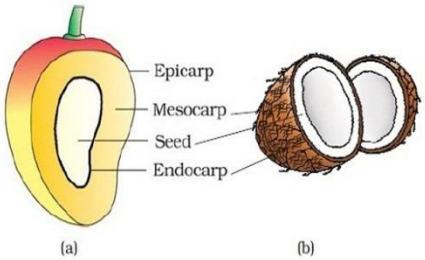


Parts of flower:

1. ***Calyx***. Made of sepals. Can be gamosepalous/polysepalous
2. ***Corolla***. Made of petals. Gamopetalous/ polypetalous
   - ***Aestivation***: Arrangement of sepals/ petals in floral bud
   - Main types are valvate (petunia alba , calotropis) twisted(china rose), imbricate(gulmohur) vexillary(pea, bean)
3. ***Androecium***.
   - Staminode- sterile stamen
   - Epipetalous. Attached to the petal
   - Epiphyllous- attached to the perianth
   - Polyadelphous- Free stamens
   - Monoadelphous- united as one bunch (china rose)
   - Diadelphous – united two bundles (pea)
   - Polyadelphous – many bundles (citrus)
3. ***Gynoecium***- one/ more carpels
   - Ovules attached on the wall of ovary called placenta.
   - Apocarpous - Free carpels (lotus, rose)
   - Syncarpous - Carpels are fused (mustard, tomato)
   - After fertilization ovules devopls intoseed.
   - Ovary develops intofruit
   - ***Placentation:*** Arrangement of ovuleswithinthe ovary.
   - Different types are marginal (pea), axile (china rose, lemon, tomato),
     - Parietal (mustard),freecentral (primrose)andbasal (sunflower)

The fruit:

- ***Parthenocarpic fruit***: Formation of fruits without fertilization of ovary. Ex. Seedless grapes, seedless orange.
- Two parts of a fruit are pericarp and seeds.
- Pericarp has epicarp, mesocarp and endocarp
- Both mango and coconut are known as drupe fruits (fruits formed from single ovary /carpel)
- ***Perianth***: Fused petals and sepals.



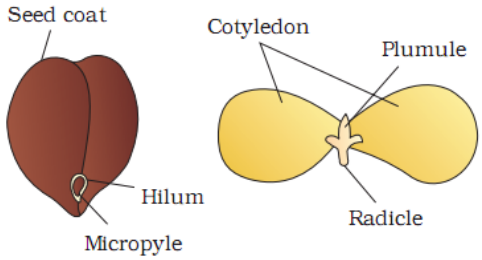
Parts of a fruit : (a) Mango (b) Coconut

The seed:

- Fertilized ovules.
- Made up of seed coat and an embryo
- Embryo with radical and plumule with one cotyledon or two cotyledon

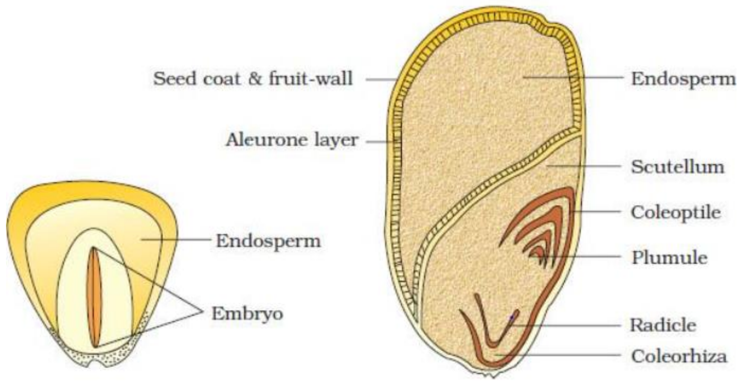
Structure of a dicot seed:

- Seed coat, Testa and tegmen
- Hilum - small pore (place where it is attached to fruit)
- Micropyle. (water enters)
- Endosperm, cotyledons, embryonal axis (plumule and radicle)
- Mature seeds in dicot do not have endosperm called non-endospermic seeds. (stored food is utilized by embryo)



Structure of monocotyledonous seed:

- Mostely endosperm except orchids
- Endosperm is bulky and store food
- Aleurone layer (produce enzymes to hydrolise proteins for embryo)
- Cotyledon is scutellum
- Protective coats- coleoptiles (plumule), coleorhizae (radical)



SOLANACEAE

commonly called as the ‘potato family’, s widely distributed in tropics, subtropics and even temperate zones. mostly herbs, shrubs and rarely small tree

Stem: herbaceous rarely woody, aerial; erect, cylindrical, branched, solid or hollow, hairy or glabrous, underground stem in potato (Solanum tuberosum)

Leaves: alternate, simple, rarely pinnately compound, exstipulate; venation reticulate

Floral Characters

Inflorescence : Solitary, axillary or cymose as in Solanum

Flower: bisexual, actinomorphic

Calyx: sepals five, united, persistent, valvate aestivation

Corolla: petals five, united; valvate aestivation

Androecium: stamens five, epipetalous

Gynoecium: bicarpellary obligately placed, syncarpous; ovary superior, bilocular, placenta swollen with many ovules, axile

Fruits: berry or capsule

Seeds: many, endospermous

Floral Formula: $\oplus ⚥ K_{(5)} \overbrace{C_{(5)}\ A_5}\ \underline{G}_{(2)}$

Economic Importance - Many plants belonging to this family are source of food (tomato, brinjal, potato), spice (chilli); medicine (belladonna, ashwagandha); fumigatory (tobacco); ornamentals (petunia).

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