

Plant Morphology

A) ROOTS:

1. Fibrous roots arise from base of stem.
2. Adventitious roots- roots having origin other than radicle.
 - a. Tap Root of Grass.
 - b. Prop Root of Banyan (*Ficus benghalensis*).
 - c. Supporting Roots of Monstera.
 - d. Stilt root of Maize and Sugar Cane.
3. Stilt roots- roots arising from lower nodes usually to support plant stem.
-present in Maize (*Poaceae*).
4. Regions of Root:
 - a. Root Cap: Absent in water plants.
Calyptogenic origin.
 - b. Region of Meristematic Activity:
Actively dividing small cells, large nucleus, dense cytoplasm.
Newly formed cells, hence no vacuole and thin walls.
 - c. Region of Elongation:
Cells gradually differentiate and mature.
Also, elongate.
 - d. Region of Maturation:
Root hairs appear.
-unicellular, thread like.
5. Modifications of Root:
 - a. Storage:
 - i. Tap roots of Carrot (*Daucus carota*) & Turnip (*Beta vulgaris*).
 - ii. Adventitious roots of Sweet Potato (*Ipomoea batata*).
 - b. Support:
 - i. Prop roots.
Hanging roots of Banyan.
 - ii. Stilt roots.
Lower nodes of Maize and Sugar Cane.
 - c. Respiration:
Pneumatophores of Rhizophora, a plant of marshy areas.
-Grow vertically up into the air for oxygen.

B) STEM:

1. Develops from pumule.

2. Modifiatios of Stem:

a. Food Storage and Organs of Perennation:

in Potato, Ginger, Colocasia, Zaminkand and Turmeric.

b. Stem Tendrils:

Coiled loops of soft stem arising from axillary buds.

in Gourds (cucumber, pumpkin and watermelon)

and in Grapevine.

c. Thorns:

Woody structures arising from axillary buds.

in Citrus and Bougainvillea.

d. Phylloclade:

Photosynthetic mature stem in xerophytic plants.

i. Flattened- Opuntia.

ii. Cylindrical- Euphorbia.

e. Vegetative Reproduction:

i. Runners:

Grasses and Strawberry.

Long internodes, roots at nodes.

ii. Suckers:

Crysanthemum, Banana and Pineapple

Lateral branches from base or underground part of stem.

Grow horizontally then surface to give rise to plant.

iii. Stolons:

Mint and Jasmine

Like offset but with longer internodes.

vi. Offset:

Pistia and Eichhornia(Water hyacinth)

Lateral branch with short internodes,

nodes bearing rosette of leaves and tuft of roots.

C) LEAF:

1. Arise from shoot apical meristem of axillary bud.
2. Arranged in Acropetal Order.
3. It has two surfaces:
 - Adaxial (Dorsal)
is the surface which can be folded on the axis without breaking the leaf,
here, the upper surface.
 - Abaxial (Ventral)
uh, it's the other surface,
the lower one.
4. Parts of Leaf:
 - a. Leaf Base:
 - i. Pulvinis:
 - swollen leaf base in legumes.
 - ii. Sheathing:
 - covers the stem,
 - in Monocots.
 - iii. Stipulate:
 - may bear two small leaf life structures, called stipules.
 - b. Petiole:
 - Present in Dicots.
 - is a small branch which holds the lamina to light.
 - c. Lamina:
 - i. Isobilateral:
 - Same color and structure on both sides.
 - Monocots.
 - ii. Dorsiventral
 - Clearly distinguishable surfaces.
 - Dicots.
 - d. Midrib:
 - Central vein on Lamina.

5. Types of Leaf:

a. Simple:

Incisions on lamina do not touch midrib.

b. Compound:

Incisions reach lamina, dividing leaf into leaflets.

i. Pinnately compound:

Number of leaflets on a rachis.

Rachis: midrib serving as an axis for leaflets.

-Neem.

ii. Palmately compound:

All leaflets are attached at a common point. The tip.

-Silk Cotton.

How is a compound leaf different from a branch bearing leaves?

There are no nodes on the rachis where leaflets are present, unlike nodes on stem where leaves, simple or compound, are present.

6. Phyllotaxy:

a. Alternate:

China Rose, Mustard and Sunflower.

b. Opposite:

Calotropis and Guava.

c. Whorled:

Alistonia.

7. Modification of Leaves:

a. Food Storage.

Bulb (fleshy leaves) of Garlic and Onion.

b. Tendrils:

Peas. (Analogous organ to tendrils of gourd family.)

c. Spines:

Cactus. (Note the difference between spine and thorn.)

d. Cladodes:

Australian Acacia.

Photosynthetic petioles, reduced lamina.

D) INFLORESCENCE

1. Racemose:

Main axis continues elongating.

Flowers born laterally in acropetal succession.

2. Cymose:

Main axis terminates in flower. Basipetal order.

E) FLOWER

1. Lily has peianth- inseparable calyx and corolla.
2. Canna has assymmetric flower.
3. Zymorphic: Cassia, Gulmohar, Bean and Pea.
4. On basis of position of Ovary:
 - a. Hypogynous:
Below+ovary. Ie, ovary is superior.
eg- Brinjal, Mustard and China Rose.
 - b. Perigynous:
Around+ovary. Ie, half inferior ovary.
eg- Plum, Rose and Peach.
 - c. Epigynous:
Above+ovary. Ie, inferior ovary.
eg- Cucumber, Sunflower and Guava.
5. Aestivation of Corolla:
 - a. Valvate:
Calotropis.
 - b. Twisted:
China rose, cotton and lady's finger.
 - c. Imbricate:
Gulmohar and Cassia.
 - d. Vexillary:
Papilionaceae.
Bean and Pea.

6. Androecium:

On basis of attachment to other whorls:

a. Epipetalous, attached to petals:

Brinjal.

b. Epiphyllous, attached to perianth:

Lily.

On basis of degree of unision among themselves:

a. Polyandrous:

Each one is free.

b. Monoadelphous:

One big bunch.

China Rose.

c. Diadelphous:

2 bunches.

Pea (9 + 1).

d. Polyadelphous

Many bundles.

Citrus.

The length of filament may be different for different sets.

eg- Salvia and Mustard.

Sterile stamens are called staminodes.

7. Gynoecium

On basis of number of carpels:

a. Apocarpous:

Lotus.

b. Syncarpous:

Fused carpels.

Mustard and Tomato.

Placentation:

a. Axile:

Multilocular ovary.

-Chinarose, Tomato and Lemon.

b. Marginal:

-Pea.

c. Parietal:

False septum called replum divides ovary into multiple chambers.

-Mustard and Argemone.

d. Free Central:

Dianthus and Primrose.

e. Basal:

Sunflower and Marigold.

F) FRUIT

1. Drupe:

Mango and Coconut.

Develop from monocarpellary superior ovary.

One seeded.

Endocarp is stony hard.

2. Mango:

a. Thin skin of epicarp.

b. Juicy edible mesocarp.

c. Hard endocarp.

3. Coconut:

a. Fibrous mesocarp.

b. Edible seed.

c. Free nuclear endosperm= Coconut water.

d. Cellular endosperm= Coconut.

G) SEED

1. Castor:

dicot seed with residual endosperm.

2. Orchids:

non-endospermic monocot seed.

3. Monocot Seeds:

a. Membranous seed coat fused with fruit wall.

b. Coleoptile covers plumule.

c. Coleorhiza covers radicle.

d. Aleurone layer contains enzymes to digest endosperm.

H) FAMILY FACTS

1. Liliaceae:

a. Colchicine is extracted from *Colchicum autumnale*.

2. Fabaceae/Papilionaceae:

a. *Indigofera* is the infamous indigo dye plant.

b. *Mulathi* is a plant of medicinal value.

3. Solanaceae:

a. *Belladonna* is a plant of medicinal value.