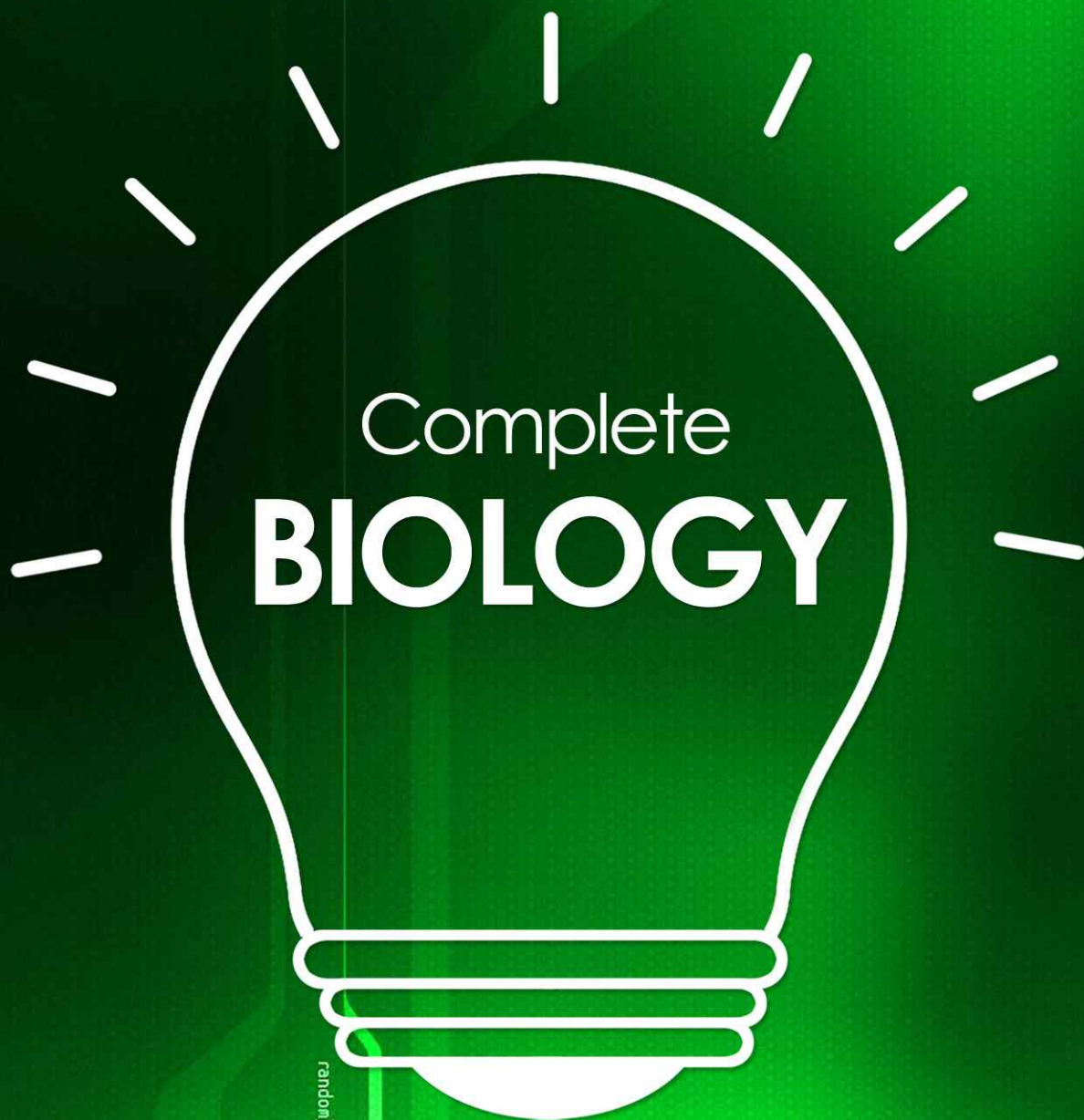




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CLASS 11th

Morphology of Flowering plants

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01. Introduction

Flowering plants are multicellular organisms. They grow by cell division and their morphological features and traits are genetically determined. Even though the angiosperms show such a large diversity in external structure, they are all characterised by presence of roots, stems, leaves, flowers and fruits. Morphology deals with the study of forms and features of different plant organs like roots, stem, leaves, flowers, seeds, fruits etc.

02. The Root

Roots are cylindrical, underground and non-green part of the plant. It is generally the descending portion of the plant axis i.e., it grows downward into the soil. It lacks nodes, leaves, buds but gives rise to endogenous lateral branches. There are three types of root system.

- (i) **Tap root system** : The primary root is directly elongated from the radicle and grows inside the soil (e.g. dicots). It bears lateral roots of several orders that are referred to as secondary, tertiary roots etc.
- (ii) **Fibrous root system** : In monocotyledonous plants, the primary root is short-lived and is generally replaced by a number of fine fibrous roots. These roots originate from base of the stem and constitute the fibrous root system as seen in wheat plant.
- (iii) **Adventitious root system** : Some plants have specialised roots called adventitious roots. These roots develop from any parts of the plant other than the radicle e.g., Grass, Monstera, Banyan tree.

Main Functions of Root

- (i) Absorption of water and minerals from the soil.
- (ii) Provide anchorage to the plant parts.
- (iii) Storage of reserve food material.
- (iv) Synthesis of plant growth regulators.

03. Regions of the Root

- (i) **Root cap** : The apex of the root is covered by a thimble-like, structure called root cap. It is multicellular and is made up of parenchymatous cells.
- (ii) **Region of meristematic activity** : This layer is few millimetre above the root cap. The cells of this layer are thin-walled, small, with dense protoplasm. They divide repeatedly to produce new cells.
- (iii) **Region of elongation** : The cells proximal to the meristematic region undergo rapid elongation and enlargement and are responsible for the growth of roots in length.
- (iv) **Region of maturation** : The cells elongation zone gradually differentiate and mature. Hence, this zone proximal to region of elongation, is called the region of maturation.

04. Modifications of Root

- (i) **Storage roots** : In some plants the primary tap root is modified to store food and assumes various shapes. e.g., tap root of carrot, turnip, radish, beet and adventitious roots of sweet potato get swollen and store food.
- (ii) **Respiratory roots** : In some plants such as *Rhizophora* growing in swampy areas, many roots come out of the ground vertically upwards to get oxygen for respiration. Such roots are called pneumatophores.
- (iii) **Prop roots** : They arise from the branches of stem for providing mechanical support to heavy branches, as pillars e.g., banyan tree.
- (iv) **Stilt roots** : They arise from lower nodes of stem to support main axis and enter the soil obliquely e.g., sugarcane, maize.

Adventitious root with special functions :

- (i) **Floating roots** : In aquatic plants (e.g., *Jussiaea*) white spongy roots arise branches and help in floating and respiration.
- (ii) **Assimilatory roots** : The aerial roots of *Tinospora* and submerged roots of *Trapa* (Water chestnut) become green and synthesize food. *Podostemon* also has green assimilatory roots.
- (iii) **Sucking or haustorial roots** : These roots suck food and water from host and are found in parasitic plants e.g., *Cuscuta*, *Orobancha*, *Viscum*.
- (iv) **Hygroscopic roots** : These are found in epiphytes, specifically orchids and help in absorption of moisture from the atmosphere using special tissue called velamen.
- (v) **Epiphyllous roots** : These roots arise from the margins of leaf lamina for vegetative reproduction e.g., *Bryophyllum*

05. The Stem

The ascending part of the plant axis which bears branches, leaves, flowers and fruits is called stem. It generally grows above the ground and hence is considered as the aerial part of the plant. The plumula of the embryo, present in the germinating seed gives rise to the stem. The region bearing leaves, present at regular intervals on the stem and its branches are called nodes and the part of stem present between the two nodes is called internode. A bud is defined as the young, immature, under developed, compact shoot. The buds present on the stem are of two types namely.

- (i) **Terminal bud** : The bud present at the tip of the stem is called terminal bud. The growth of the stem and its branches is accomplished through the terminal bud. The terminal bud is also called apical bud.
- (ii) **Axillary bud** : The leaf makes an angle with the upper part of the stem. The angle made between the leaves and the upper part of the stem is called the axil. The bud which is present at the axil is called axillary bud.

Functions of the Stem

- (i) Stem bears and supports leaves, flowers and fruits.
- (ii) It conducts water and minerals salts from roots to leaves and fruits.

- (iii) The food manufactured in the leaves is transported to the roots, fruits and organs of storage through the stem.

Modification of Stem

(I) Underground stem

- (a) **Rhizoma** : It grows parallel or horizontal to soil surface. It bears nodes, internodes, buds and scaly leaves e.g., Ginger, Banana, Turmeric, Ferns. It is of two types.
- Rootstocks** : It is upright or oblique with the tip almost reaching the soil surface e.g., Dryopteris.
 - Straggling** : It is horizontal and branched. Branching may be :
Racemose – Axis is monopodial, e.g., Saccharum, Lotus.
Uniparous cymose – Axis is sympodial, e.g., Zingiber officinale (ginger), Curcuma domestica (turmeric) and Canna.
- (b) **Tuber** : It is terminal portion of underground stem branch which is swollen on account of accumulation of food, e.g., Potato, Helianthus tuberosus (Jerusalem artichoke)
- (c) **Corm** : It grows vertically beneath soil surface. It is usually unbranched. It bears nodes, internodes, buds and scale leaves, e.g., Colocasia, Gladiolus, Colchicum, Crocus, Amorphophallus (Zaminkand).
- (d) **Bulb** : Stem is reduced and disc shaped. The bud is surrounded by many concentric scale leaves. Leaf bases of inner ones are fleshy and edible and of outer ones are dry, e.g., onion, lily, garlic.
 It is of two types – tunicated and scaly. Tunicated bulb is covered by a sheath of membranous scales called tunic. It may be simple tunicated bulb – covered by a sheath, e.g., onion and Narcissus or compound tunicated bulb – concentric rings of bulblets surrounded by a white membranous sheath or tunic e.g. garlic. Scaly or naked bulbs do not have tunic, e.g., lily.
- (II) **Stem tendrils** : In some plants the axillary buds present on the stem modify to form tendrils. Tendrils are long, thin, thread-like spirally coiled, sensitive structures. They are the climbing organs of the plant which coil around the nearby support. e.g., tendrils are present in grape vine, gourds (pumpkins, watermelon, cucumber).
- (III) **Thorn** : The axillary buds of plants like Citrus and Bougainvillea lose their ability to grow and form hard, woody and pointed structures called thorns. These thorns protect the plants from browsing animals. Thus, these thorns are protective in function.

(IV) Sub-aerial Weak Stem

- (a) **Offsets** : Aquatic plants such as Pistia and Eichhornia contain a lateral branch which bear short internodes. In these lateral branches the distance between the two nodes decreases and each node bears a rosette of leaves above and a cluster (tuft) of roots below.
- (b) **Suckers** : In plants like banana, pineapple, Chrysanthemum, the lateral branches originate from the distance and then emerges out obliquely to form the aerial shoot.
- (c) **Runners** : It is elongated, prostrate branch with long internodes and roots at nodes. e.g., grasses.