



1. What is meant by modification of root? What type of modification of root is found in the:

- (a) Banyan tree
- (b) Turnip
- (c) Mangrove trees

Solution:

Roots of some plants change their shape and structure and become modified to perform certain functions other than absorption and conduction of water and minerals. It is called modification of roots. Roots are modified for support, storage of food and respiration, etc.

(a) Root modification in banyan tree: In banyan tree, the root modifies to form prop roots. Prop roots arise from branches and enter the soil. Thus, they provide mechanical support to densely branched, huge trees.

(b) Root modification in turnip: The modification of root found in turnip is napiform for food storage. The upper portion of these fleshy roots is inflated or swollen which tapers towards the lower end.

(c) Root modification in mangrove trees: In mangrove plants, i.e., plants growing in saline marshes, the branches of tap root come out of the ground and grow vertically upwards showing negative geotropism. These roots are called pneumatophores. They help to get oxygen for respiration.

2. Justify the following statements on the basis of external features:

- Underground parts of a plant are not always roots.
- Flower is a modified shoot.

Solution:

- Underground parts of plant are not always roots because sometimes the stem also becomes underground and gets modified into various forms to perform different functions of storage, vegetative propagation, perennation, etc. Underground modifications of stems are tuber, rhizome, corm and bulb. The underground stems can be distinguished from roots externally by the presence of nodes and internodes, axillary buds, scale leaves etc. and by absence of root cap and root hairs.
- Flower is the reproductive part of the angiospermic plant and it is defined as the modified shoot because

1. Like shoot, flower develops from an axillary or rarely terminal bud.
2. Flowers may get modified into fleshy buds or bulbils,
3. A transition from foliage leaves to floral leaves is found in Paeonia.
4. Nymphaea shows transition from sepals to petals and petals to stamens,
5. In Passiflora and Cleome long internodes occur below gynoecium and stamens.

3. How is a pinnately compound leaf different from a palmately compound leaf?

Solution: The compound leaves may be of two types, pinnately compound leaf and palmately compound leaf. In pinnately compound leaf, a number of leaflets are present on a common axis, the rachis, which represents the midrib of the leaf as in neem. Pinnately compound leaf may be of different types as unipinnate, bipinnate, tripinnate and decompose. In palmately compound leaf, the leaflets are attached at a common point, i.e., at the tip of petiole, as in silk cotton. Palmately compound leaf may be of different types as unifoliate, bifoliate, trifoliate, quadrifoliate and multifoliate.

4. Explain with suitable examples the different types of phyllotaxy.

Solution: Phyllotaxy is the pattern of arrangement of leaves on the stem or branch. It is usually of three types - alternate, opposite and whorled. In alternate type of phyllotaxy, a single leaf arises at each node in alternate manner, as in china rose, mustard and sunflower plants. In opposite type, a pair of leaves arises at each node and lie opposite to each other as in Calotropis and guava plants. If more than two leaves arise at a node and form a whorl it is called whorled phyllotaxy as in Alstonia.

5. Define the following terms:

- (a) aestivation
- (b) placentation
- (c) actinomorphic
- (d) zygomorphic
- (e) superior ovary
- (f) perigynous flower
- (g) epipetalous stamen.

Solution:

(a) Aestivation: The mode of arrangement of accessory floral organs (sepals and petals) in relation to one another in floral bud is known as aestivation. The main type of aestivation are valvate, twisted, imbricate, and vexillary.

(b) Placentation: The arrangement of ovules within the ovary is known as placentation. The placentation are of different types namely, marginal, axile, parietal, basal, and free central.

(c) Actinomorphic: When flower can be divided into equal radial halves in any radial plane passing through the centre, it is said to be actinomorphic, e.g., mustard, Datura etc.

(d) Zygomorphic: When a flower can be divided into two similar halves only in one particular vertical plane, it is said to be zygomorphic, e.g., pea, gulmohar, bean, Cassia.

(e) Superior ovary: In hypogynous flower, the gynoecium occupies the highest position while the other parts are situated below it. The ovary in such flowers is said to be superior, e.g., mustard, brinjal.

(f) Perigynous flower: If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous. Here ovary is half superior, e.g., peach, plum.

(g) Epipetalous stamen: When stamens are attached to the petals, they are called epipetalous stamens e.g., brinjal.

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