

Exercise 7

Aim: To study modifications of root.

Principle: Roots of plants are generally meant for anchorage and absorption of water and nutrients from soil. However, in certain plants, roots perform additional functions, particularly as storage organs of photosynthates. Roots are also modified to provide additional support to weak stems or to trees which are massive. In some cases roots may help in gaseous exchange or for floating (aquatic plants). Consequently, the root morphology and structure undergoes certain modifications to perform these additional functions.

Requirement: Samples/charts of radish, carrot, beet, turnip, *Asparagus*, sweet potato, pneumatophores, stilt roots, climbing roots, leguminous plants showing root nodules.

Procedure

- Carefully observe the shape and external morphology of each specimen.
- Draw diagrams and observe the morphological differences between the samples.

Observation

Some modifications of roots are discussed below:

(i) For storage of food

Roots are modified in some plants for storing reserve food materials. These modified roots usually are swollen and assume different forms such as spindle shaped, e.g., radish; top shaped, e.g., beet, turnip; conelike, e.g., carrot; indefinite shape, e.g., sweet potatoes (Fig. 7.1). *Dahlia*, *Asparagus*, *Portulaca* are some other examples of plants with modified roots for food storage.

(ii) Nodulated roots

The roots of pea and other leguminous plants have numerous swollen nodules on fine branches of roots. These nodules are formed due to symbiotic association of *Rhizobium* (bacterium) that live inside the root cortical cells of the roots. They fix nitrogen. An active nodule is pink in colour (Fig. 7.2).

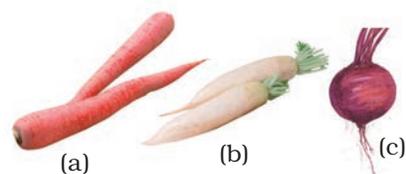


Fig. 7.1 Roots modified for storage of food (a) Carrot (b) Radish (c) Turnip

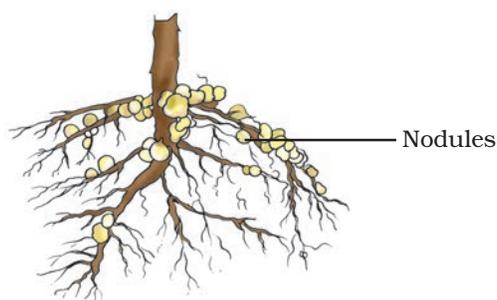


Fig. 7.2 Nodulated roots

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(iii) For mechanical support

Roots are modified to provide mechanical support as seen in banyan tree which has roots growing vertically/obliquely downwards (prop roots); sugarcane/maize in which roots arise from the nodes in cluster at the base of the stem (stilt roots) and betel/black pepper in which nodes and internodes bear roots which help in climbing (Fig. 7.3).



Fig. 7.3 Prop root of banyan tree

(iv) For gaseous exchange

Pneumatophores or breathing roots are found in plants growing in mangroves or swamps with saline water for exchange of gases. They are erect peg like structures with numerous pores through which air circulates e.g., *Rhizophora mangle* (Fig. 7.4).



Fig. 7.4 Pneumatophores of *Rhizophora*

Questions

1. Why are healthy root nodules pink in colour?
2. Mention characteristics by which we can identify the modified roots as roots?
3. Prop and stilt roots are aerial in origin yet they are called roots. Why?