ROOT

- The Prolongation of the radicle of the embryo is **Root.**
- It is the underground main axis of the plant body.

Chrarateristics of root system:

- Roots grows underground - positively geotropic or negatively phototropic (except in pneumatophores)
- It is not differentiated into nodes and inter nodes
- Leaves and normal buds are absent.
- Root - non chlorophyllous (Brown coloured)
- Lateral roots are formed endogenously in acropetal succession
- Root apex protected by root cap and root pockets (aquatic plants)
- Root hairs-unicellular formed exogenously and are short lived

Types of Root System In Angiosperms:

Two types of root systems present

Tap Root System :

The main root develops from the radicle of the embryonal axis of the germinating seed.

i. Grows vertically
ii. Commonly found in found in dicots.
iii. lateral roots develop endogenously, obliquely in acropetal manner.

Adventitious root system

- The growth of radicle is arrested
- A bunch of uniform roots arises from the base of the stem, not from radicle
- As they do not develop from the radicle these are called adventitious roots.
- All the roots are slender and equally developed .
- All the roots look like fibres. So these are called fibrous roots
- It is found in monocots

Functions of the root

- Provides anchorage
- Absorbs water and minerals from the soil
- Conducts the absorbed water and minerals to shoot system.

Modifications of the root:

- when a permanent change occurs in the • structure of a root to perform new function suitable for the environment, it is called root modification
- some important root modifications are

A. Storage or Tuberous roots.

Autotrophic plants store food for future needs in the roots.

- These roots become tuberous and bulged.
- These roots are called **storage** or **tuberous roots.**
- Storage root may be a tap root or an adventitious root.
- In *Raphamts, Daucus and Beta* the tap root is **tuberous,**
- Depending on their shapes different names are given
  Raphamis- Spindle shaped
  Daucus - Conical
  Beta - Napiform
- These roots are common in biennials and stores food materials in the first season and utilise them in the second season.
- These are called **"root crops"**
- In some plants adventitious roots store food materials and become tuberous such roots are called **fasciculated roots.**
- In Ipomoea batatus, the single adventitious root becomes tuberous.
- In Dahlia, Ruelliaand Asparagus(Monocot) the adventititous roots are swollen appear like a bunch - called fasciculated roots
- Normally food is stored In most of the plants as starch.
- In *Beta vulgaris* the food material stored as sugars.

- In *Dahlia*-Inulin

B. Velamen roots or Epiphytic roots

- These roots are found in Epiphytes
  - Epiphytes - take shelter on the branches of other trees to obtain more sunlight
  - They show two types of roots.

1. **Clinging roots 2. Velamen roots**

1 . **Clinging roots**: Grow in to the crevices ofthe branches of trees and fixes the epiphytes.

2. **Velamen roots** : These are long, brown , branched and hang freely in the air, root hairs are absent.

- They have a special, dead hygroscopic epidermal tissue called **Velamen.**
- It absorbs moisture from the atmosphere.
- Epiphytes show xerophytic adaptations.
- Velamen roots are found in the members of *Orchidaceae.*

Eg:-*Vanda*

C. Photo synthetic or Assimilatory roots :

- In some plants the roots are green, flattened, and ribbon like
- As these are green they perform photosynthesis - photosynthetic roots.
- This type of roots are seen *Taeniophyllum* (shoot less epiphyte).
- *Tinospora* - aerial roots
- *Trapa* - Hydrophyte is with submerged green roots.

D. Respiratory roots or pneumatophores. ,

- These are special aerial roots of Mangroves living in **marshy soils.**
- The roots of such plants cannot get Oxygen because of water logged condition of soil
- Some aerial branches are produced from the roots.
- These roots show small pores which help in gaseous exchange called **Pneumathodes**
- These roots are called Pneumatophores or respiratory roots.
  Ex:- RhizophOra, Avicennia
- Spongy breathing roots are found in Jussiaea - a free floating hydrophyte.

E. Parasitic roots or Haustoria

- The plants which depend on other plants either ' completely or incompletely for their food called **parasitic plants.**
- These plants produce special adventitious roots into the vascular bundles of the host to absorb food and nutrients called **Haustoria.**
- Based on haustorial penetration into stem and root, parasites are divided into stem and root parasites.
- When the parasites depend on the host for water, it is called **partial parasite or Incomplete parasite.**
- When the parasite absorbs both water and food from host - called **complete parasite.**

F. Nodular roots

- Roots of legume plants show small nodule like structures hence called nodular roots
- Nodules contain rod shaped N_2 fixing bacteria (Rhizobium)
- It lives in Symbiotic association with host plant
- Nodular roots also contain pink colour pigment called Leg haemoglobin eg: arachis, dolichos