

INTRODUCTION TO PLANTS & PLANT ROOTS



ES 20

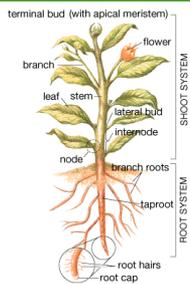
What is a Plant?

- Multicellular
- Eukaryotic (has a membrane-bound nucleus)
- Photosynthetic
- Lacks mobility



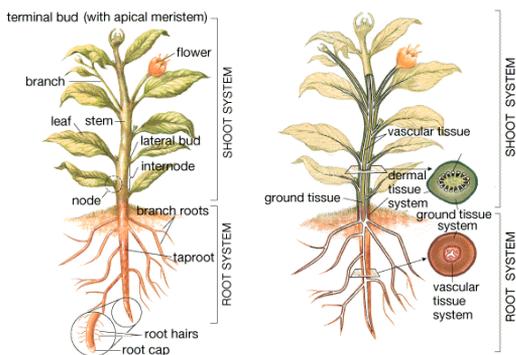
What is a Plant?

- Consists of: a root system (the roots) and a shoot system (the stems and leaves).
- Flowers, seeds, and fruits are reproductive structures.



What is a Plant?

- Plants are composed of cells.
- Groups of cells that perform a common function make up a tissue.
 - Dermal Tissue (epidermis - forms the outside covering)
 - Vascular Tissue (xylem and phloem - transport)
 - Meristematic Tissue (growing regions where cells divide)
 - Ground Tissue (photosynthesis, storage, support)



What is a Plant?

- These tissues are then organized into and found in all of the 3 plant organs:
 - Roots
 - Stems
 - Leaves
-we will look at the root first....

Roots

- First structure to grow out of the seed when it sprouts
- Part of the plant that develops underground
- The roots are the beginning of pipeline that moves water and minerals from the soil up to the rest of the plant.

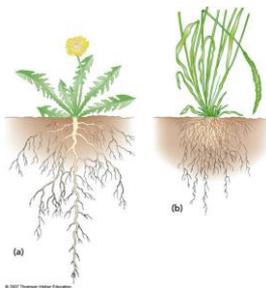


Roots

In addition to absorbing water and minerals, plant roots also function to:

- > Anchor the plant
- > Support the plant against the effects of gravity, wind, and water
- > Storage of food made by leaves

Types of Roots



(a) Tap Roots – one long, thick root growing downwards supported by several smaller roots (e.g. carrots, beets)

(b) Fibrous Roots – many thin roots spread throughout the soil (e.g. beans, peas)

Figure 21.1C Taproot system (*left*) versus fibrous root system (*right*)

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Taproot

Fibrous root system

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Types of Roots

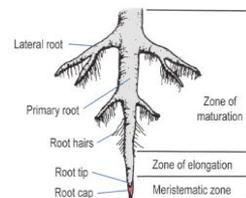
(c) Modified Roots – other root types have adapted to grow in diverse environments



(e.g. mangrove and other trees that live in water develop pneumatophores - roots that help supply oxygen)

External Root Structure

- The end of the root that absorbs water and minerals is the root tip, which is covered by the root cap.
- The cap is composed of thick-walled cells which serve as a "hard hat" to protect the root as it pushes through soil.



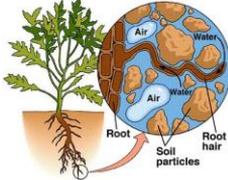
An outer layer of cells, called the epidermis, covers the root.

Some cells in the epidermis develop tiny, hair-like projections called root hairs.

Root hairs increase the surface area of the root system and maximize absorption of water and minerals from the soil.

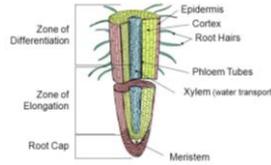


Root Hairs Absorb Water and Nutrients from the Soil



Internal Root Structure

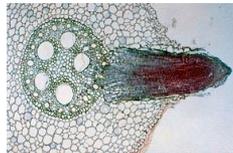
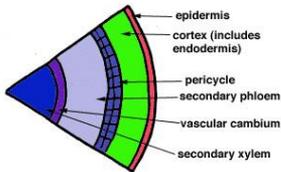
Root Structure



- The layer below the epidermis is the cortex.
- It is composed of ground tissues involved in transport and storage of plant substances.

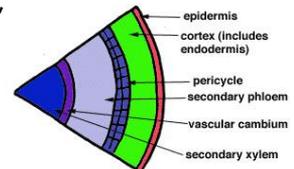
Internal Root Structure

- The layer of cells next to the cortex is called the pericycle and it is the tissue that produces lateral (horizontal) roots.

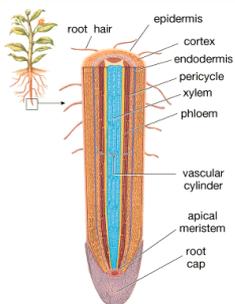


Internal Root Structure

- Next is the vascular tissue, often called the vascular cylinder.
- This is comprised of the xylem and phloem separated by the cambium.

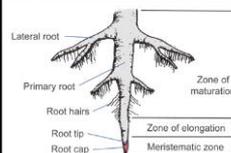


Internal Root Structure



- Xylem transports water and minerals up from the roots.
- Phloem carries food from photosynthesis throughout the plant.

Overall Root Structure



- Zone of Maturation/Differentiation: Older section of root tip where the root begins adding cells to increase the width, and where root hairs form.
- Zone of Elongation: Region of root tip where cells get longer, thus lengthening the root. This is the only place where the root grows longer.
- Meristematic Zone: Region where cells divide rapidly.