



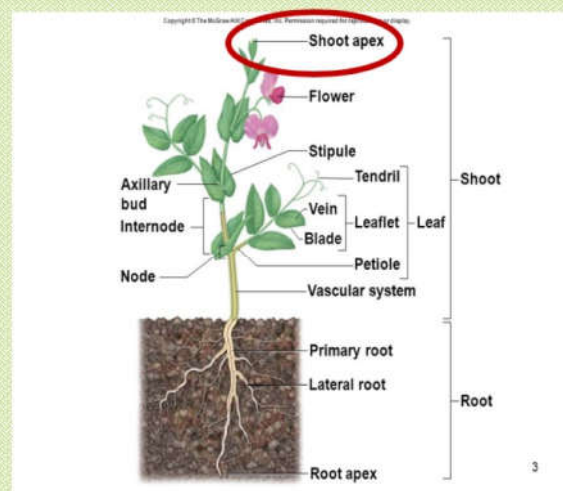
Primary Stem Anatomy

DİCOT and MONOCOT Stem

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Aydan ACAR
Ergin ŞAHİN

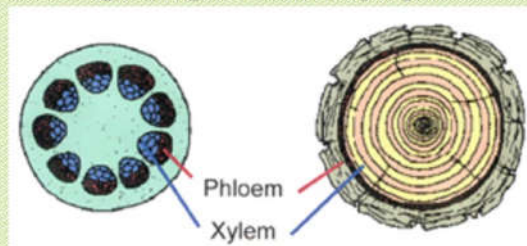
Primary stem structure

- ❖ Stem is the plant axis that bears buds and shoots with leaves and, at its basal end, roots. The stem is the stalk of a plant or the main trunk of a tree.
- ❖ This organ is responsible for the forming the aboveground structure of the plant, and is involved in both structural support and vascular transport.
- ❖ Inferior plants such as «Algae, lichens and fungi» in fact, do not possess true roots, **stems**, leaves and other specialised organs that characterise the “superior” plants
- ❖ The shoot apical meristem and the primary meristems lie at the **apex of the shoot** and give rise to the primary tissues of the stem. The shoot apical meristem produces leaves and axillary buds exogenously; as a result, the epidermis of stems and leaves is continuous.



❖ There are two types for aboveground stems:

- **Herbaceous plants** : **with very flexible stems. Their leaves and stems die down to soil level at the end of every growing season. Herbaceous plants can be annual, biennial or perennial.** Annual herbaceous completely die every year then grow back again from the seed. With biennial and perennial herbaceous only the stems and leaves die at the end of growing season but parts of the plant survives and grows back from those parts the next year.
- **Woody plants**: **with very strong and not easily bendable stems such as trees. Woody plants produce wood as a structural tissue.** The stems branches and roots are usually covered with a layer of bark. The wood that woody plants produce is a structural cellular adaptation that allows them to survive harsh winters and continue growing instead of dying.



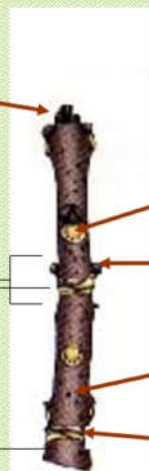
What Are Some of the Structures on the Outside of a Stem?

contains apical meristem; found at the tip of a stem; it increases the length of a stem

Terminal bud

Node – where leaf & bud attach

Internode – distance between 2 nodes



is the remains of the leaf after it has fallen off of the tree; it is just below the lateral bud

Leaf scar with vascular bundle scars

also called the axillary bud; develops into a leaf or flower

Lateral bud

are small spots on the stem that allow a stem to exchange gases (oxygen & carbon dioxide) with the environment

Lenticel

Bud scale scar

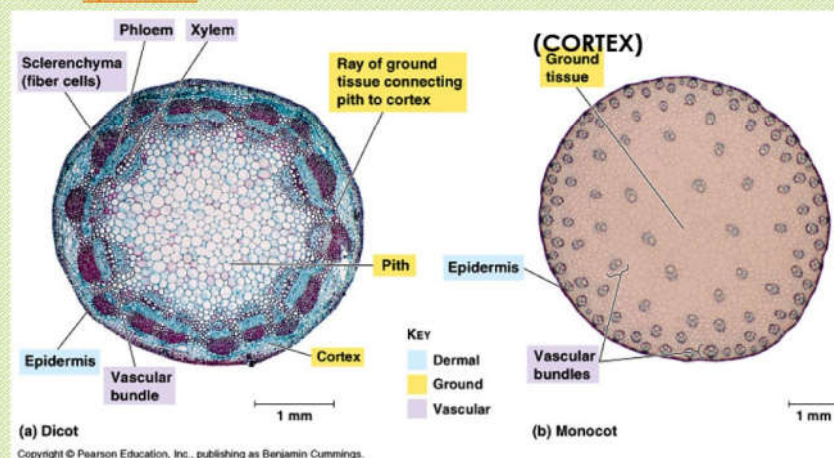
Bud scale-helps the bud survive harsh climate changes; when the bud opens in the spring, the scales fall off leaving a bud scale scar

Stems are responsible for the following functions:

1. Stems support the leaves
 - Able to stretch the leaves into the best positions for catching sunlight
2. Move water, minerals and food through the whole plant
3. Can also produce food through photosynthesis
 - Not its main job, but will occur in plants with small or no leaves
4. Store food that has been manufactured by the plant

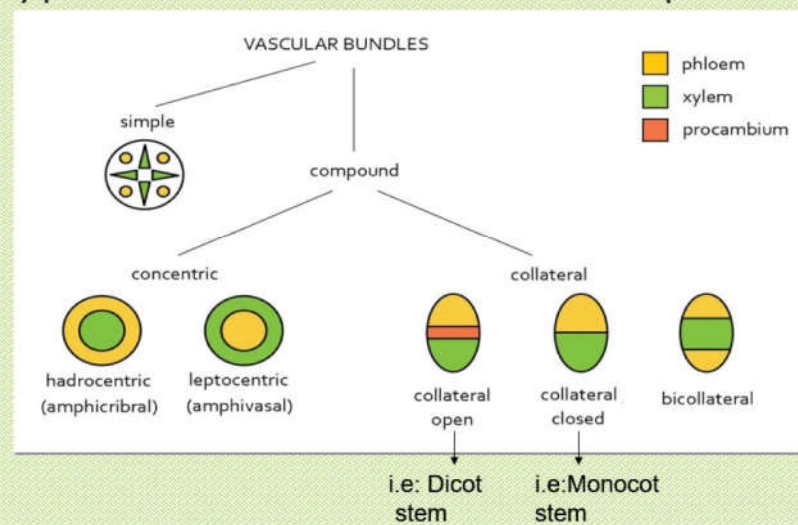
Stem anatomy

In the stems of young **dicotyledons** and **gymnosperms**, the vascular bundles (xylem and phloem) are arranged in a **circle** around a central core of spongy ground **tissue** called the pith. Surrounding the vascular bundles is a layer that varies in thickness in different species and is called the **cortex**. Surrounding this and **comprising** the exterior surface of the stem is a layer called the **epidermis**.



- There are three important tissues found inside the stem:
 - A) **Xylem** – conducts the water and minerals upward throughout the plant
 - Made of tube-like cells which grow together to conduct liquids
 - Tends to be found closer to the center of the stem
 - B) **Phloem** – conducts the food that is produced in the leaf downward to the rest of the plant
 - These cells also form tubes
 - Tends to be found towards the outside of the stem
- C) **Cambium** – the tissue responsible for the production of new xylem & phloem
 - ❖ Also increases the girth (width) of a stem
 - ❖ Generally found between the xylem and phloem

Types of vascular bundles of plants

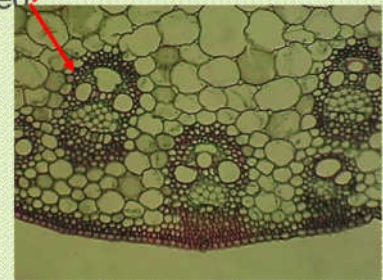


What Are Some of the Internal Structures of a Stem?

- Inside of the stem, there are tissues that are used for transport of materials through the plants
- Stem tissues are organized in one of the following ways:
 - They are found in small bundles scattered throughout the stem
 - They look like smiley faces
 - Characteristic of **monocots**

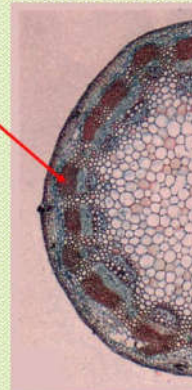


Monocot bundle

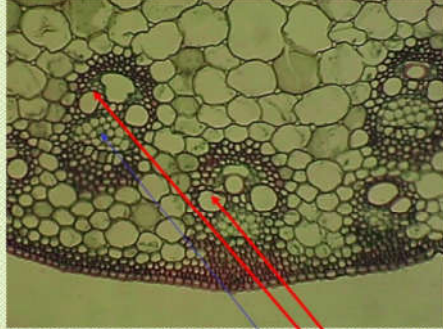


- They are also found in rings around the stem
 - They look like candy-corns
 - Characteristics of **dicots**
 - This is what gives the plant annual rings
 - Determines the age of a plant

Dicot bundle

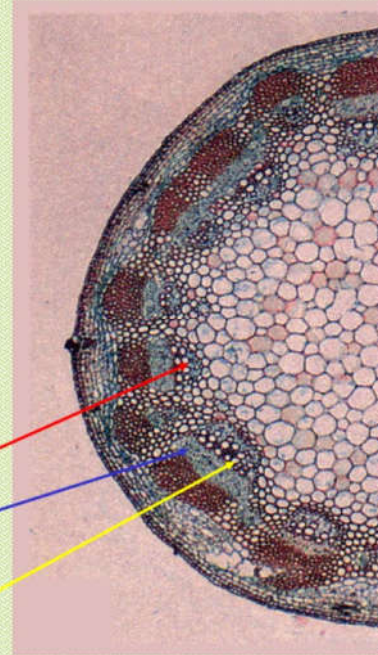


Location of Vascular Tissues



Notice that monocots do not have cambium

Xylem
Phloem
Vascular Cambium



- ❖ The other most important difference is their arrangement in the stem ground tissue.
- ❖ In dicots, the bundles form a ring around the central pith. In monocots, the bundles are scattered randomly throughout the ground tissue (sometimes called pith).

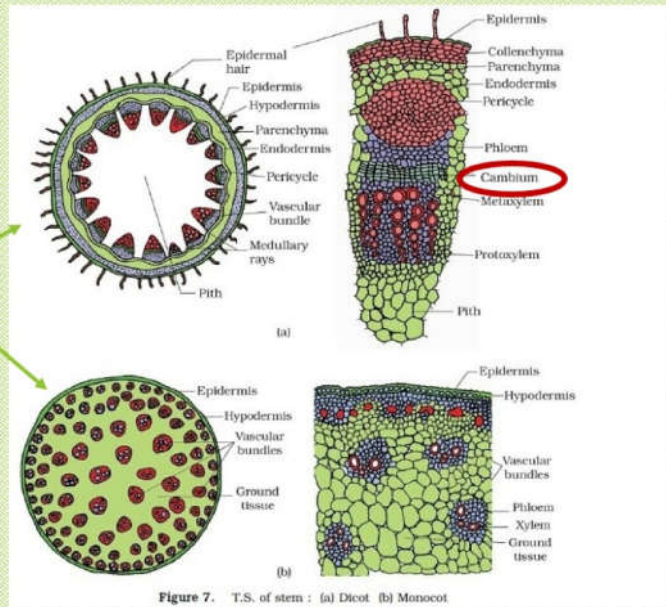
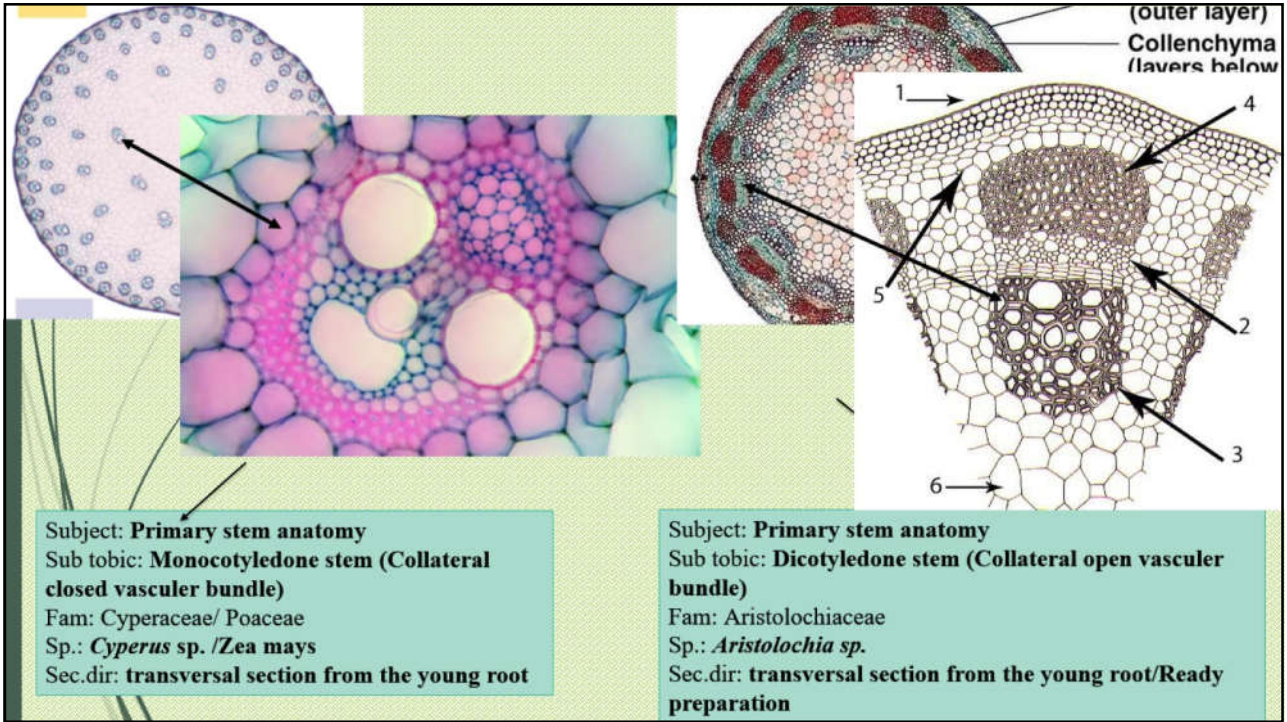
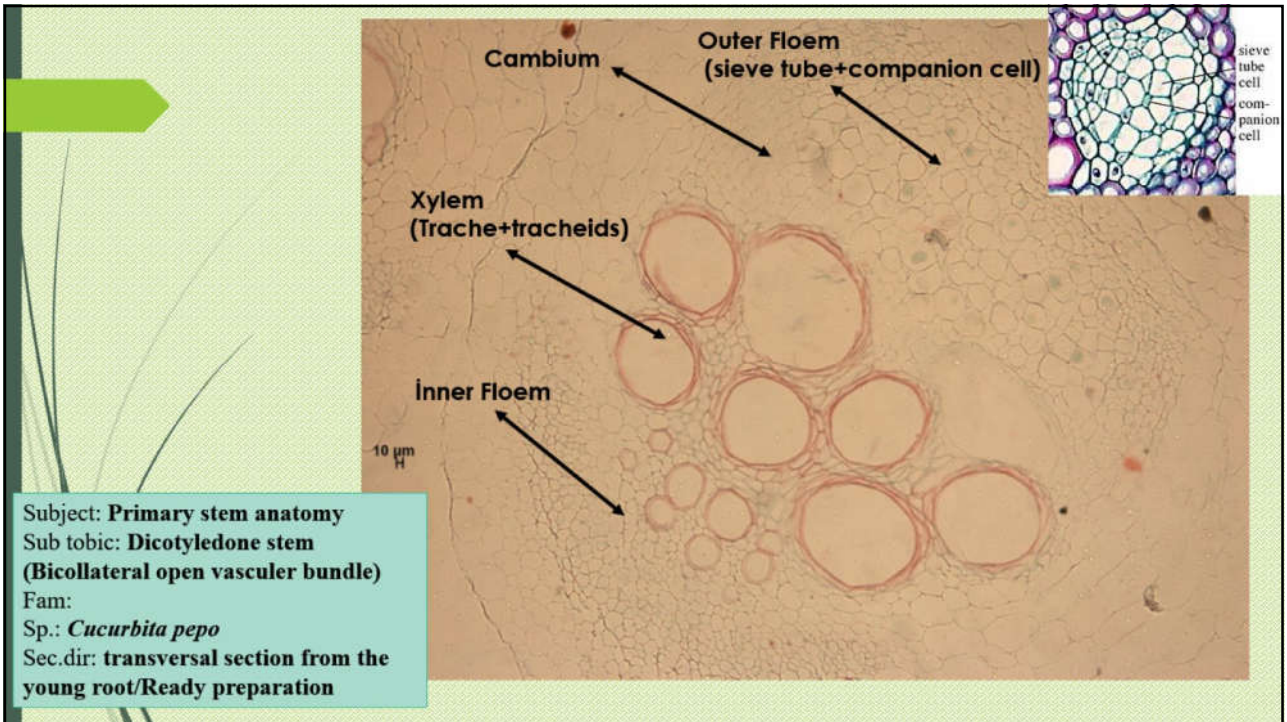


Figure 7. T.S. of stem : (a) Dicot (b) Monocot



Subject: **Primary stem anatomy**
 Sub topic: **Monocotyledon stem (Collateral closed vascular bundle)**
 Fam: Cyperaceae/ Poaceae
 Sp.: *Cyperus sp./Zea mays*
 Sec.dir: **transversal section from the young root**

Subject: **Primary stem anatomy**
 Sub topic: **Dicotyledon stem (Collateral open vascular bundle)**
 Fam: Aristolochiaceae
 Sp.: *Aristolochia sp.*
 Sec.dir: **transversal section from the young root/Ready preparation**



Subject: **Primary stem anatomy**
 Sub topic: **Dicotyledon stem (Bicollateral open vascular bundle)**
 Fam:
 Sp.: *Cucurbita pepo*
 Sec.dir: **transversal section from the young root/Ready preparation**