

Primary structure of dicotyledonous stem (Sunflower stem)

Internal structure of dicotyledonous stem reveals epidermis, cortex and stele.

1. Epidermis

a. Structure

- It is a single layer of parenchymatous rectangular cells.
- The cells are compactly arranged without intercellular spaces.
- The outer walls of the epidermal cells have a layer called cuticle. The cuticle is made up of a waxy substance known as cutin.
- Stomata may be present here and there.
- A large number of multicellular hairs occur on the epidermis.

b. Function

- It is protective in function and forms the outermost layer of the stem.
- cuticle which checks the transpiration.

2. Cortex

a. Structure

- Cortex lies below the epidermis and is differentiated into three zones.
- Just below the epidermis, there are a few layers of collenchyma cells- called hypodermis. These cells are living and thickened at the corners.
- Inner to the hypodermis, a few layers of chlorenchyma cells are present with conspicuous intercellular spaces. Some resin ducts also occur here.
- The third zone is made up of parenchyma cells. The innermost layer of the cortex is called endodermis. The cells of this layer are barrel shaped and arranged compactly without intercellular spaces. Since starch grains are abundant in these cells, this layer is also known as starch sheath. This layer is morphologically homologous to the endodermis found in the root. In most of the dicot stems, endodermis with casparian strips is not developed.

b. Function

- Hypodermis. It gives mechanical strength to the stem.
- This region performs photosynthesis and the parenchyma cells store food materials.

3. Stele

- The central part of the stem inner to the endodermis is known as stele consisting of pericycle, vascular bundles and pith.
- In dicot stem, vascular bundles are arranged in a ring around the pith. This type of stele is called eustele.

a. Pericycle

- Pericycle occurs between the endodermis and vascular bundles.

- In the stem of sunflower (*Helianthus*), a few layers of sclerenchyma cells occur in patches outside the phloem in each vascular bundle- called bundle cap or hard bast.

b. Vascular bundles

- The vascular bundles consist of xylem, phloem and cambium.
- These vascular bundles are wedge shaped and they are arranged in the form of a ring.
- Each vascular bundle is conjoint, collateral, open and endarch.

c. Phloem

- Primary phloem lies towards the periphery and consists of protophloem and metaphloem.
- Phloem consists of sieve tubes, companion cells and phloem parenchyma.
- Phloem fibres are absent in the primary phloem.
- Phloem conducts organic food materials from the leaves to other parts of the plant body.

d. Cambium

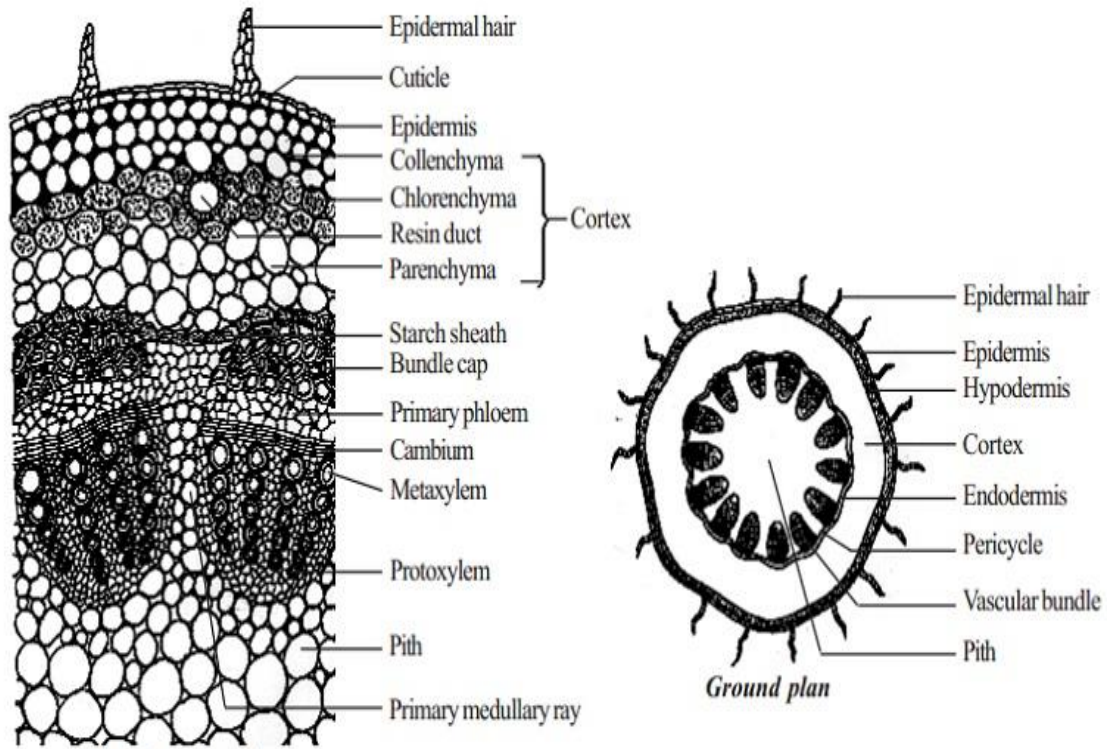
- Cambium consists of brick shaped and thin walled meristematic cells.
- It is two to three layers in thickness and are capable of forming new cells during secondary growth.

e. Xylem

- Xylem consists of xylem fibres, xylem parenchyma, vessels and tracheids.
- Vessels are thick walled and arranged in a few rows.
- Xylem conducts water and minerals from the root to the other parts of the plant body.

4. Pith

- The large central portion of the stem is called pith and is composed of parenchyma cells with intercellular spaces.
- The pith is also known as medulla.
- The pith extends between the vascular bundles.
- These extensions of the pith between the vascular bundles are called primary pith rays or primary medullary rays.
- Function of the pith is storage of food.



A sector enlarged

Fig. T.S. of Sunflower stem