

## Internal Structure of Dicot Stem

Transverse section of internal structure of Dicotyledonous stem of sunflower shows the following structure. It consists of Epidermis, cortex and stele. In the stele there are numerous vascular bundles in a ring and also large pith.

### I. Epidermis

This forms outer most layers and consists of single row of cells and fit along their radial walls with a well defined cuticle over it. It bears some multicellular hairs and few stomata but no chloroplasts except in the guard cells.

### II. Cortex

It lies in between epidermis and pericycle and consists of hypodermis externally, general cortex centrally and endodermis internally.

**(a) Hypodermis (collenchyma):** This lies immediately below the epidermis and consists of 4 to 4 layers of collenchymatous cells.

These cells are thick at the corners against the intercellular spaces owing to deposit of cellulose and pectin. The cells are living and contain number of chloroplasts.

**(b) General Cortex:** This lies internal to hypodermis and consists of few layers of thin walled large rounded or oval parenchymatous cells. There are clear intercellular spaces in it.

**(c) Endodermis or Starch Sheath:** This is innermost layer of the cortex consisting of barrel shaped cells and surrounding the stele. Endodermis is conspicuous outside the hard bast but often loses its identity on either side. It contains many starch grains and is also known as starch sheath.

### III. The Central Cylinder or Stele

It encloses many vascular bundles arranged in form of a distinct ring and the intra-stelar ground tissues.

#### (a) Vascular Bundles

These are placed more towards the epidermis than towards the centre. Bundles are collateral and open. Xylem with its component parts, vessels, tracheids, wood-fibres and wood parenchyma, lies towards the centre.

Protoxylem vessels with smaller cavities and annular or spiral thickenings are always placed towards centre, and metaxylem vessels, with wider cavities and reticulate, scalariform or pitted thickening, towards, the epidermis.

This arrangement, typical of stems, is called endarch. Phloem with sieve tubes, companion cells and phloem parenchyma lies outside or towards the circumference. A strip of lateral meristem, called cambium, is present between xylem and phloem.

### **(b) Intra-Stelar Ground Tissues**

**These are differentiated into three zones**

#### **i. Pericycle**

Next to endodermis there is a many-layered region, called pericycle, lying outside the bundles. This is region lying in between the endodermis and the vascular bundles and is represented by semi-lunar patches of sclerenchyma and mass of parenchyma. Each patch associated with phloem of vascular bundle is called hard bast. Pericycle in the sunflower stem is made up of two types of cells. Against every vascular bundle there is a patch of sclerenchyma forming something like a cap on the bundle. These patches are called bundle caps or hard bast. In between the two bundles, pericycle is parenchymatous. Thus the pericycle is heterogeneous.

#### **ii. Medullary Rays**

A few layers of big polygonal or radially elongated parenchymatous cells lying in between two vascular bundles constitute a medullary ray.

#### **iii. Pith**

This is large in sunflower stem and occupies the major portion of it. It extends from below the vascular bundles to the centre and is composed of rounded or polygonal thin-walled living cells with intercellular spaces in between them.

### **Vascular Bundles**

These are collateral and open and are arranged in a ring. Each bundle is formed of (a) Phloem or bast (b) cambium (c) xylem or wood.

**(a) Phloem:** It is external and has (i) sieve tubes which are large elements (ii) companion cells which are smaller cells associated with sieve tubes and (iii) Phloem parenchyma which is remaining mass of small cells. They are all thin and living. Phloem is meant to conduct prepared food material from leaves to storage organs.

**(b) Cambium:** It is band of thin-walled tissue lying between phloem and xylem. Its cells are in radial rows and are rectangular in shape, very small in size and very thin-walled. Cambium is responsible for secondary growth,

**(c) Xylem or wood:** It is internal and bears (i) wood vessels which are large thick-walled and lie in a few radial rows. Smaller vessels towards centre form protoxylem and bigger ones lying

away from centre form metaxylem. Tracheids and wood fibres are smaller thick walled and lignified cells lying around metaxylem vessels. Wood parenchyma is the patch of thin walled parenchyma lying on the inner side of the bundle around protoxylem. Its cells are living.

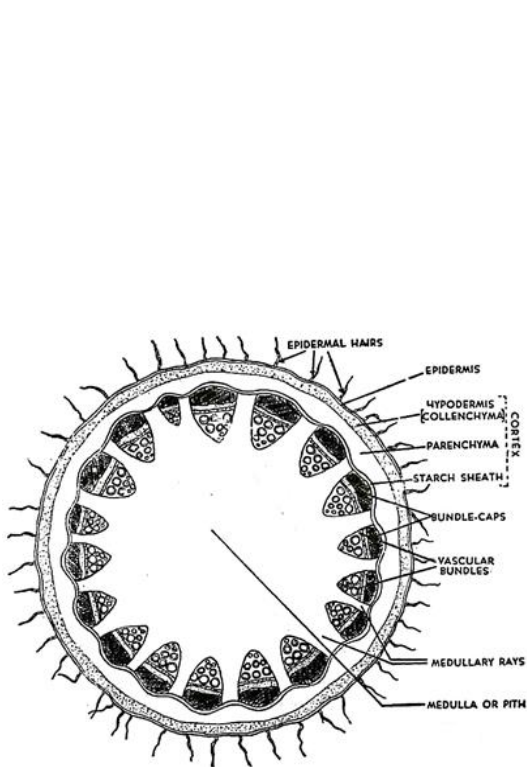


Fig. 146. Transverse section of young sunflower stem showing the plan of arrangement of tissues (diagrammatic).

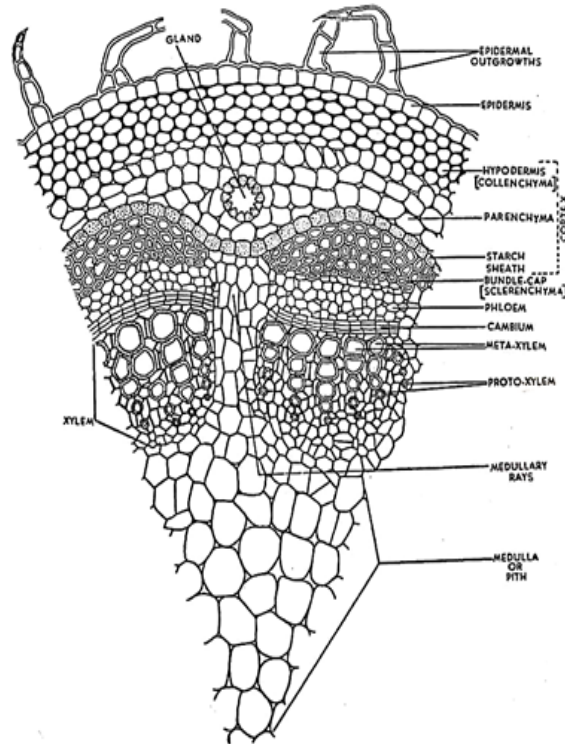


Fig. 147. Portion of transverse section of a young sunflower stem showing the plan of arrangement of tissues.

*Prepared by: Dr. Sagarika Parida*

*Sourced from:* <https://www.biologydiscussion.com/stems-2/dicot-stem/structure-of-dicot-stem-botany/48793>