

The Fundamental Tissue System

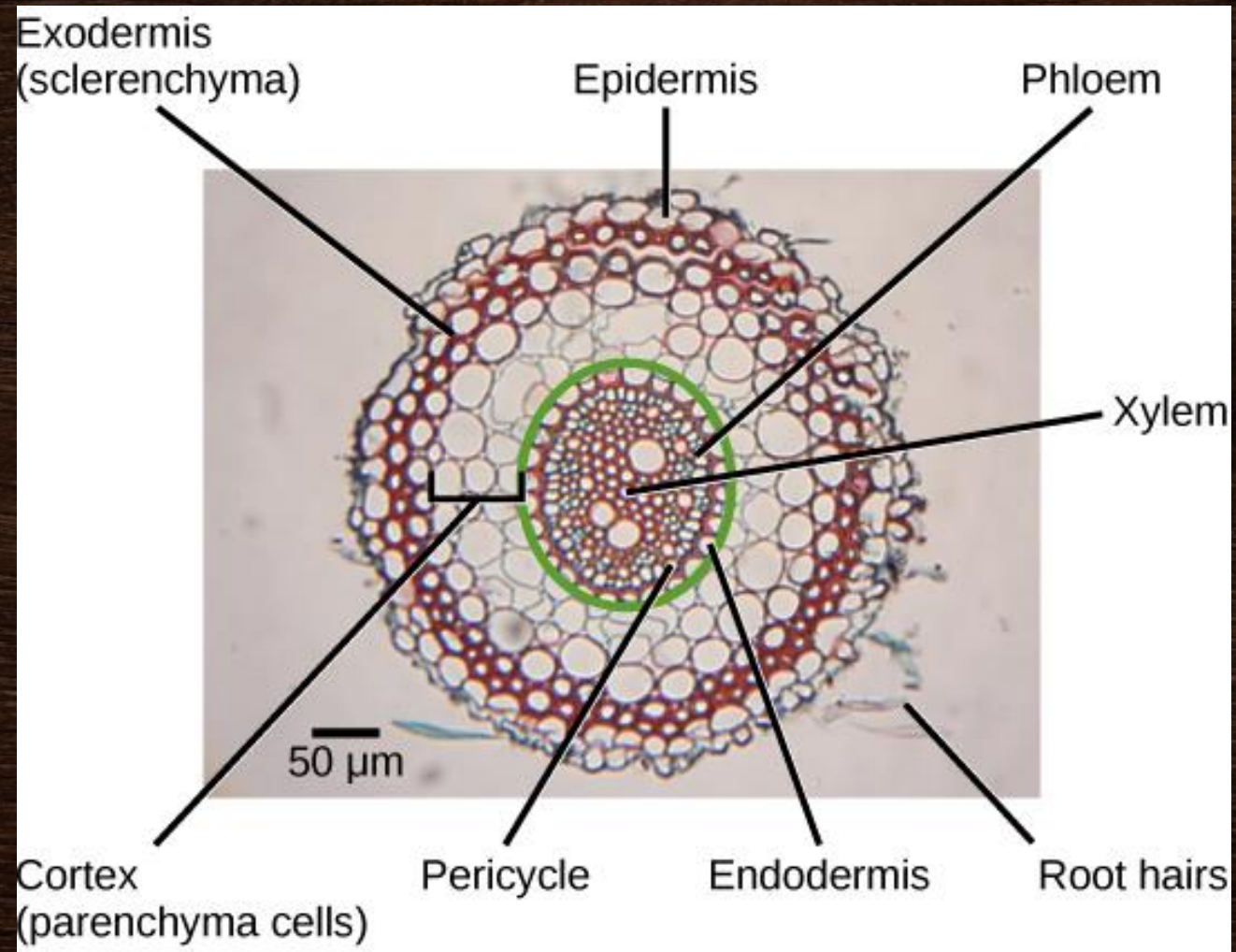
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Fundamental tissue system

- Also known as **Ground tissue system**.
- The components of fundamental tissue system includes cortex, Endodermis, pericycle and pith.

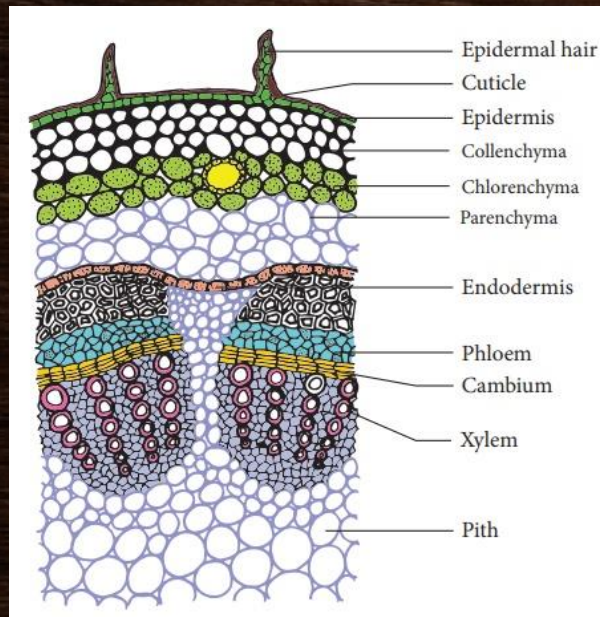
Cortex

- Ground tissue found beneath the epidermis which surrounds the central cylinder is called cortex.
- It is delimited from the vascular cylinder by endodermis.
- Usually the cortex of stems consists of thin walled parenchyma cells with intercellular space.
- Usually some of the cells or all of them are chlorophyllated in the case of young stem.



- The cortical cells also contain starch, tannins, crystals and other common secretions.
- The cortex may contain collenchyma, sclerenchyma and sclerids in addition to parenchyma.
- Collenchyma – Could be arranged as a cylinder or in the form of strands near or beneath epidermis.
- In dicots, collenchyma is often seen in ridges, in corners and in other portions to give temporary support to plant body.

- Sometimes a few layers of fibres of collenchyma develop just below the epidermis forming an outer protective layer – **Hypodermis**
- The innermost layer of cortex – Endodermis
- Cortex of roots is more homogeneous than that of stem. Cortical region of roots usually consist of parenchyma only



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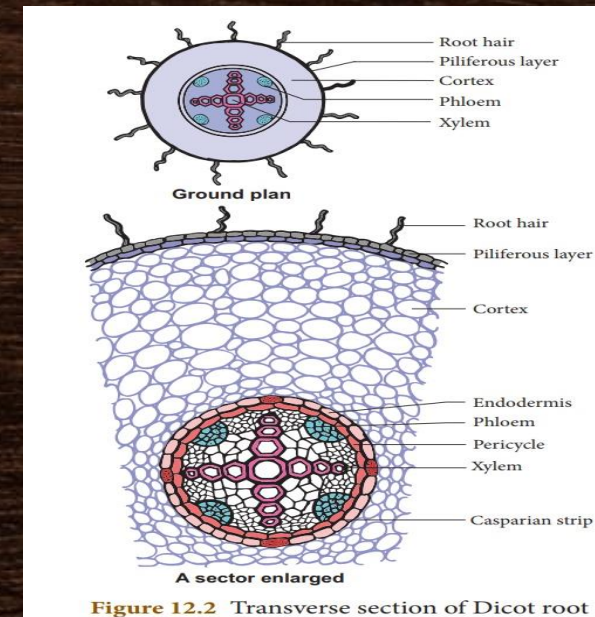


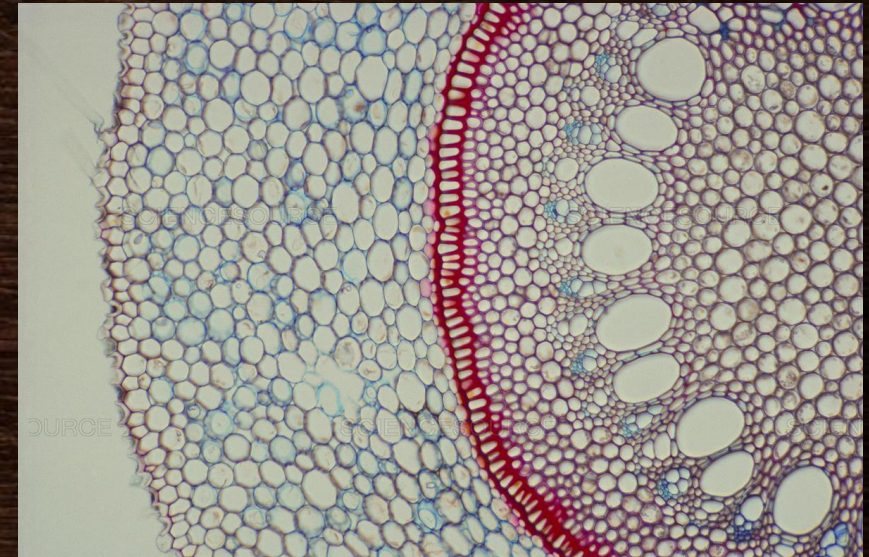
Figure 12.2 Transverse section of Dicot root

Functions of cortex

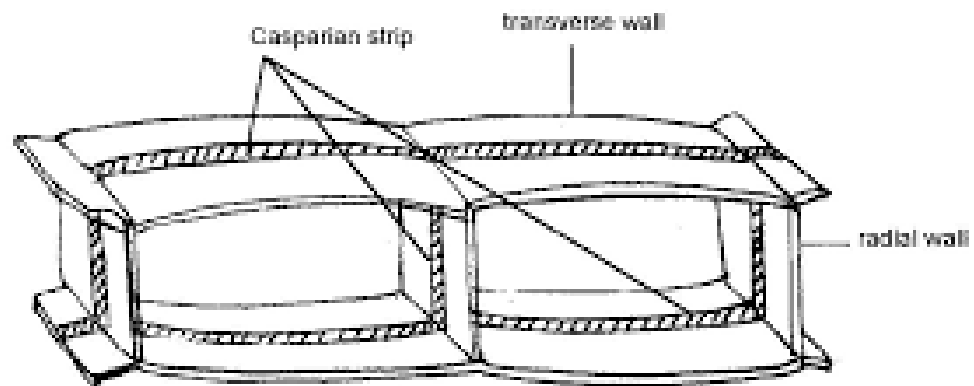
- Protective tissue
- Carbon assimilation
- Storage of water
- Storage of food
- Collenchyma in cortex helps in temporary mechanical support of plant body.
- In roots – It is a storage tissue and helps in pumping of water from root hairs to the xylem.

Endodermis

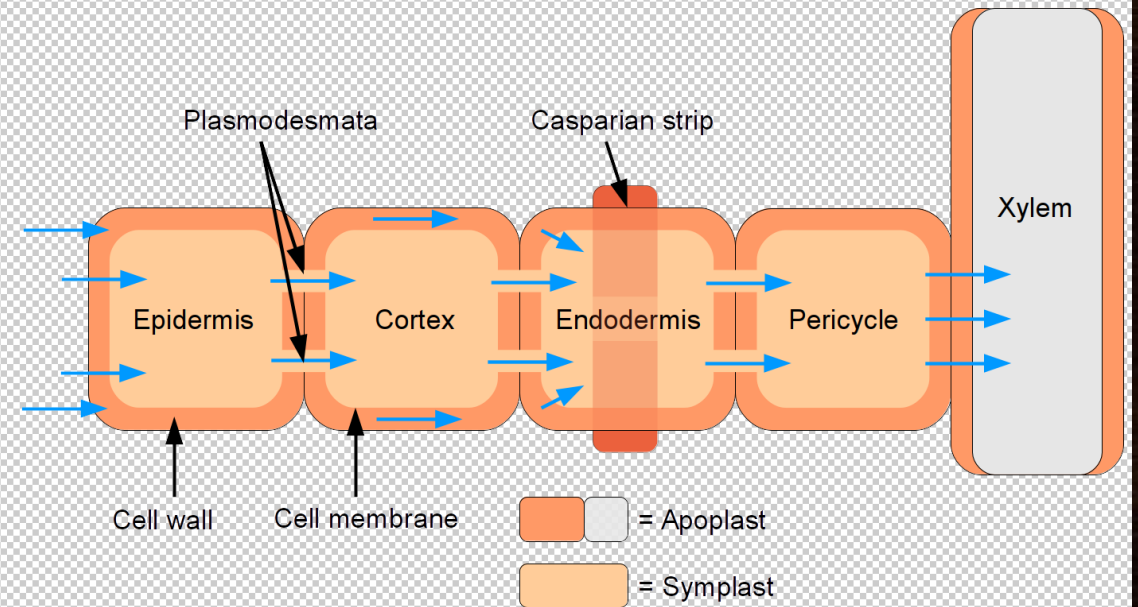
- Also known as starch sheath – Due to the presence of starch.
- Uniseriate layer of cells delimiting the cortex from stele.
- Consist of barrel – shaped cells without intercellular space.
- The cells of endodermis are living.
- In stem – It is inconspicuous and wavy.
- In roots – Well defined and circular.



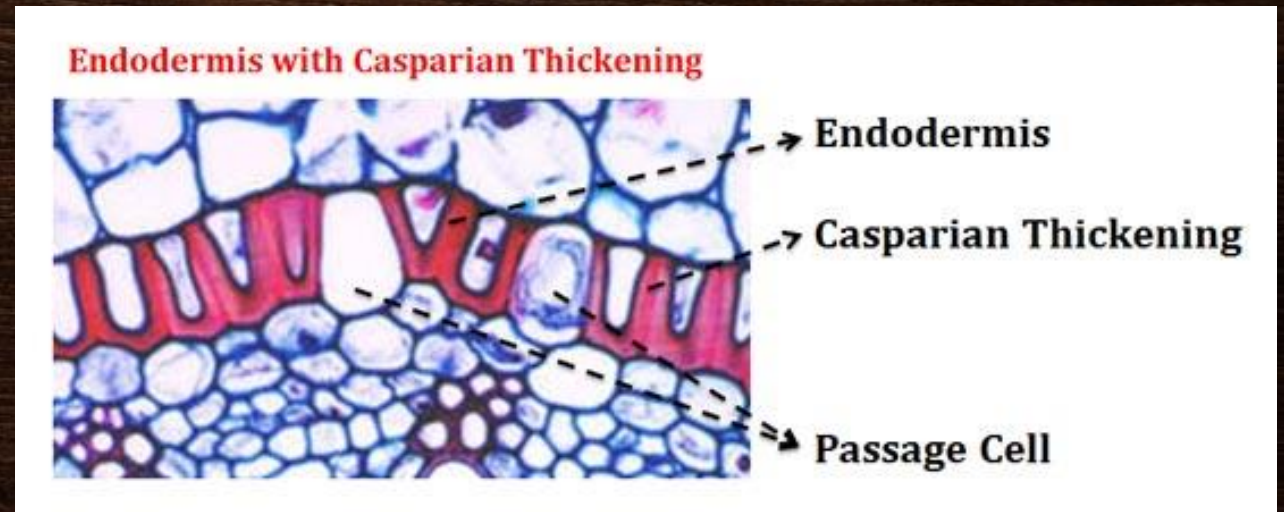
- Endodermal cells are of two types – Primary or thin walled and secondary or thick walled.
- In primary or thin walled cells certain thickening of suberin are developed in the form of a band or a strip which run completely around the cell the radial walls and end walls – Known as Casparian strips or Casparian bands.
- In secondary or thick-walled endodermal cells, all the walls are thickened by suberin.
- The casparian band was first recognized by Caspry.



Three dimensional view of two endodermal cells. the Casparian strip is along the radial and transverse walls



- Among the thick walled cells of endodermis, as in many roots, there occur occasionally thin walled cells usually opposite the protoxylem elements, which are known as passage or transfusion cells.
- Through these passage cells the sap absorbed by root hairs enter the xylary elements.



Functions of endodermis

- It is a protective covering or an accessory inner epidermis
- Maintenance of root pressure.
- Act as an air dam which prevents the diffusion of air into the vessels.
- It may serve as storage tissue having starch grains in many dicots.

Pericycle

- In dicots, pericycle is a multilayered zone found in between endodermis and the vascular bundles.
- It always occur as a thin cylinder of tissue completely encircling the vascular bundles and the pith.
- Towards inner side pericycle is limited by primary phloem, whereas towards the outer side it is limited by the endodermis.
- Typically the pericycle consists of parenchyma cells.
- It may be a complete sclerenchymatous zone or it consists of both sclerenchyma and parenchyma cells.
- When endodermis is altogether absent, the pericycle merges with the cortex.

- Lateral roots of angiosperms arise in this tissue.
- Roots of certain angiosperm parasites and aquatic plants lack pericycle.
- Functions of pericycle
 - In dicot roots the cells of pericycle become meristematic and form the cork cambium.
 - Pericycle gives rise to lateral roots
 - In stem, adventitious roots originate from pericycle
 - Storage
 - Laciferous cells, secretory cells and other specialized cells may occur in pericycle

Pith

- Also known as medulla
- Forms the central region of stem and root
- Usually the pith of dicot stems is largely parenchymatous
- It is devoid of chlorophyll, but leucoplast are present in it.
- Intercellular space is seen
- In monocot stem the vascular bundles are found scattered throughout the ground tissue and pith is not distinguishable.
- In dicots roots – Pith is scanty or lacking, but in monocot roots it is well developed
- In some monocots (e.g.- *Canna*) pith is sclerenchymatous.

- The extensions of pith in the form of narrow parenchymatous strips are called medullary or pith rays.
- The pith of certain plants is partially obliterated during the growth of stem and in such cases stem becomes hollow.
- However, in such cases the node retain their pith.
- Certain pith cells posses tannins and crystals.
- Pith may be treated as the inner portion of the ground or fundamental tissue system.

Functions of pith

- Storage
- Sclerenchymatous pith act as mechanical tissue and provide mechanical strength to the plant
- Medullary rays serve as channels for the transport of food materials and water from the central part (pith) to peripheral region (cortex) of the stem.
- In dicots, some of the parenchyma cells of the medullary rays become meristematic and give rise to interfascicular cambium.

Thank
you!!!