

PUC I YEAR SEMESTER-II

UNIT-IV. INTERNAL ORGANIZATION IN PLANTS

Module 22: ANATOMY OF DICOTYLEDONOUS AND MONOCOTYLEDONOUS ROOT

INTERNAL ORGANIZATION OF DICOT ROOT

A transverse section passing through the root of Sunflower shows the following:

Epiblema: **Epiblema** is the outermost covering of the root formed by single layer of compactly arranged, barrel-shaped, parenchyma cells. **Cuticle** and **stomata** are absent. Some of the shorter epiblema cells or **trichoblasts** are produced into long unicellular projections called **root hairs**. Hence, the epiblema is also known as **piliferous layer** or **rhizodermis**.

Cortex: **Cortex** is a major component of the ground tissue of root. It is represented by several layers of loosely arranged parenchyma cells. Intercellular spaces are prominent. The cortex is mainly meant for storage of water. Generally in roots, the cortex is larger than the stele. It is differentiated into outer **exodermis** and **middle general cortex** and **inner endodermis**. The exodermis is composed of 2-3 rows of thick walled **suberized** cells. When the epidermal layer is removed; the exodermis acts as protective layer. It also prevents exit of water from cortical layers. General cortex consists of several layers of parenchyma cells and help in storage of food material. The general cortex helps in lateral conduction of water from epidermis to xylem vessels.

Endodermis: It is the innermost layer of cortex formed by compactly arranged barrel-shaped cells. Some of the cells in the endodermis are thin-walled and are

known as **passage cells**. The passage cells allow water to pass into the xylem vessels. The remaining cells in the endodermis are characterized by the presence of thickening on their radial walls. These thickenings are known as **casparian** thickenings. They are formed by the deposition of a waxy substance called **suberin** and **lignin**. The casparian thickenings play an important role in creating and maintaining a physical force called **root pressure**.

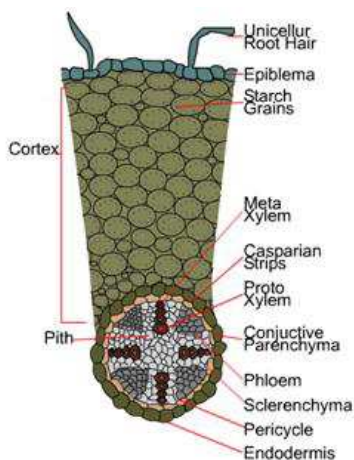
Stele: Stele consists of pericycle, **conjunctive tissue** and **vascular bundles**.

Pericycle: Pericycle is a region that lies immediately below the endodermis. It is represented by a single layer of parenchyma cells. Pericycle is the seat of origin of **lateral roots**. Some cells of pericycle dedifferentiate into **cambium** that takes part in secondary growth.

Conjunctive Tissue: **Conjunctive tissue** is represented by a group of radially arranged parenchyma cells found in between the vascular bundles. The cells are specialized for storage of water.

Vascular Bundles: Vascular bundles are described as **radial** and **tetrarch**. There are four bundles each of xylem and phloem occurring alternately. Xylem is described as **exarch**.

Pith: Pith is absent in the older root.



INTERNAL ORGANIZATION OF MONOCOT ROOT

Example: Maize

Epiblema: Epiblema is the outermost covering of the root and all the characters resemble the dicot root.

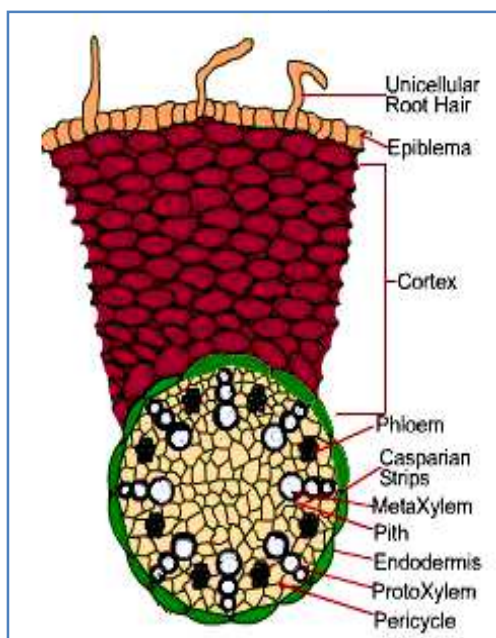
Cortex: The cortex is extensive and can be divided into outer exodermis, middle general cortex and inner endodermis. The structure and function of these regions is similar to that of dicot root.

Stele:

Pericycle: Pericycle is the outermost covering of the stele represented by a single layer of parenchyma cells. The cells of pericycle do not undergo dedifferentiation. Hence, secondary growth does not take place. In old and mature roots the pericycle becomes sclerenchymatous and gives mechanical strength.

Pith: Pith is the innermost region of the root representing the central axis. It is relatively larger which is absent in older dicot root. It is composed of few loosely arranged parenchyma cells.

Vascular bundles: Vascular bundles are radial in arrangement. There are eight bundles each of xylem and phloem. Hence, the condition is described as **polyarch**. Xylem is described as **exarch**. Pith is present in the center.



Check points

1. Dicot Root is covered with epiblema, root hairs and without cuticle and stomata.
2. Hypodermis is absent. Stele is surrounded by endodermis with passage cells.
3. Cortex is differentiated into outer exodermis and parenchymatous middle general cortex and inner endodermis.
4. Outer cortical suberized cells help in checking the water loss and middle cortex in storage function.
5. Vascular bundles exhibit tetrarch condition and exarch xylem.
6. Vascular bundles are radial, closed and xylem is exarch.
7. The monocot root differs from dicot root in having polyarch condition and distinct pith.

Short answer questions

- 1) Explain briefly epiblema

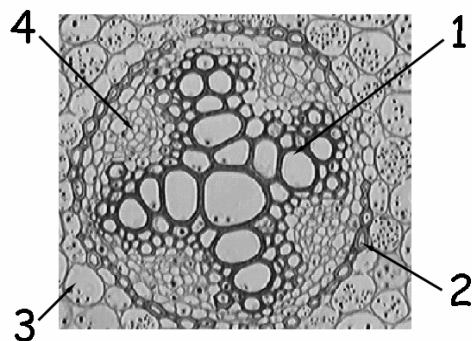
- 2) Differentiate the pericycle in dicot and monocot root.
- 3) Explain the structure of stele in monocot root.
- 4) Write about the function and structure of ground tissue of root.
- 5) What are casparian thickenings? What is their function?
- 6) Differentiate exarch and endarch Xylem?
- 7) Write about the endodermis of root.

Long answer questions

1. Give in detail the anatomy of dicot root as observed in T.S.
2. Describe the internal structure of monocot root?

MCQS

1. Identify the tissues indicated by numbers 1 through 4 in the photo.
 - A. 1: Endodermis; 2: Xylem; 3: Phloem; 4: Cortex
 - B. 1: Phloem; 2: Endodermis; 3: Cortex; 4: Xylem
 - C. 1: Xylem; 2: Cortex; 3: Endodermis; 4: Phloem
 - D. 1: Phloem; 2: Cortex; 3: Endodermis; 4: Xylem
 - E. **1: Xylem; 2: Endodermis; 3: Cortex; 4: Phloem**



2. Which of the following tissue is common in dicot stems but not in dicot roots?
- A. Endodermis
 - B. Cortex
 - C. Epidermis
 - D. Pith**
3. In a young root, the sequence of tissues from the outside to the center is:
- A. Epidermis, pericycle, cortex, endodermis, primary phloem, primary xylem
 - B. Epidermis, cortex, endodermis, pericycle, primary phloem, primary xylem**
 - C. Epidermis, primary phloem, cortex, primary xylem, endodermis, pericycle
 - D. Epidermis, cortex, primary phloem, primary xylem, endodermis, pericycle
 - E. Epidermis, cortex, pericycle, endodermis, primary phloem, primary xylem
4. Dicot roots do not possess:
- A. Cortex
 - B. Rhizodermis
 - C. pith**
 - D. Endodermis
 - E. Pericycle
5. Passage cells are found in which tissue?
- A. Metaxylem

- B. Rhizodermis
 - C. Endodermis**
 - D. Cortex
 - E. Pericycle
6. The tetrarch condition of stele is found in
- A. Monocot root
 - B. Dicot stem
 - C. Dicot root**
 - D. Monocot stem