

Puspa Shrestha

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Puspa Shrestha

Date: 20/08/03

EXPERIMENT NO. 1

NAME OF EXPERIMENT: TO STUDY DIFFERENT TYPES OF PLANT TISSUES.

COMMENTS

Permanent tissues are the group of simple or complex permanent tissue.

- i) Simple permanent tissue - contains only one type of cells and is of three types.
- ii) Parenchymatous tissue: A tissue composed of thin-walled spherical, polygonal or isodiametric living cells enclosing intercellular spaces. It is generally found in epidermal, cortical, pith and mesophyll cells. It becomes:
 - Chlorenchymatous tissue: They are composed of green chloroplast pigments.
 - Aerenchymatous tissue: They are loosely arranged cells enclosing large air-cavities.
- ii) Collenchymatous tissue: They are elongated living cells with slightly oblique or rounded ends. T.S of this tissue shows circular or polygonal cells with thickened intercellular spaces formed by the deposition of cellulose and pectin. The cells may

TO STUDY DIFFERENT TYPES OF PLANT TISSUES

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Date: 08-03

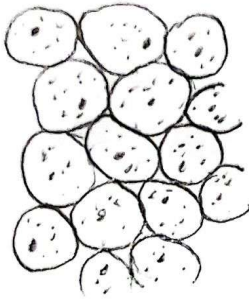


fig. Parenchyma

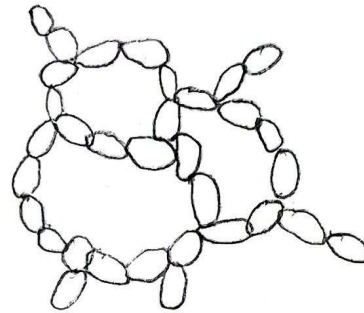


fig. Aerenchyma

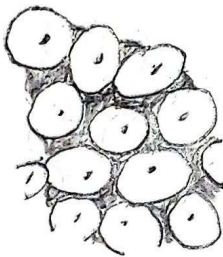


fig. Collenchyma

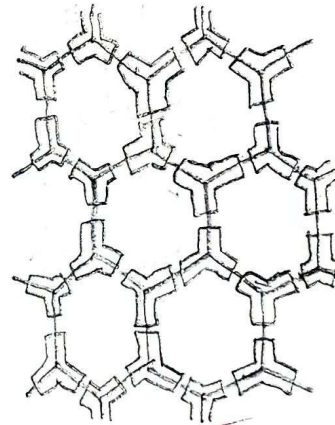


fig. Sclerenchyma

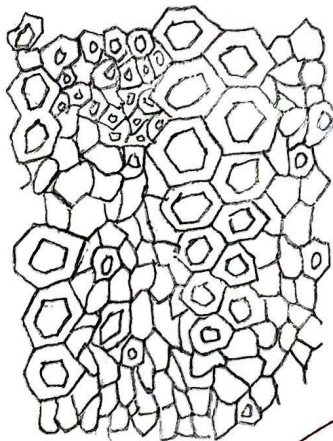


fig. Xylem

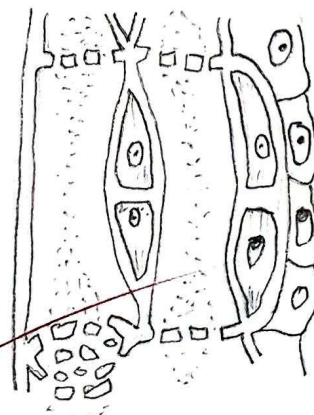


fig. Phloem

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may contain chloroplast. It is normally found below the epidermis.

iii. Sclerenchymatous tissue: They are compactly arranged dead cells without intercellular space. Each cell called fibre, is long and spindle shaped. The cell is empty with thick lignified walls. They are found in patches or in layers in hypodermis, pericycle and xylem. They are special kind of sclerenchyma tissue called Sclereids or the stone cells occurring in the hard parts of plant. They have reduced lumen due to the very thickened walls.

2) Complex permanent tissue: It contains more than two types of tissues. Its two types :-

i) Xylem: It is the hard tissue composed of four elements:

- Tracheids: elongated dead cells with tapering ends and the walls thickened in different patterns such as annular, spiral, reticulate, scalariform and pitted.
- Vessels: elongated tube-like dead cells with thickened walls. They are found in bigger size as metaxylem or smaller size as protoxylem.
- Wood parenchyma: parenchymatous cells

- associated with other xylem elements.
- Wood Fibres: sclerenchymatous cells in woody plants.

ii) Phloem: It is soft tissue composed of four elements.

- Sieve tubes: thin walled elongated tube-like cells with perforated end walls called sieve plates.
- Companion cells: elongated thin-walled cells containing dense cytoplasm and a nucleus. They lie with sieve tube as company. In T.S., phloem shows rectangular cells adjoining with sieve tubes.
- Phloem parenchyma: parenchyma cells lying with sieve tube and companion cells.
- Bast: phloem sclerenchymatous tissue laying with sieve tubes and companion cells in secondary phloem.

Date - 20/08/09/09

EXPERIMENT NO. 2

NAME OF EXPERIMENT: TO STUDY INTERNAL STRUCTURE OF DICOT ROOT

COMMENTS

The T.S of the dicot root shows the following anatomical structures.

1. Epiblema: It is the outermost layer of the root which is composed of a single layer of thin-walled, barrel-shaped, compactly arranged parenchymatous cells. It does not cover with cuticle but some of the cells give rise to unicellular root hairs which help in the absorption of water and minerals from the soil.
2. Cortex: It lies immediately below the epiblema. It is multilayered constituted by thin-walled, oval loosely arranged parenchymatous cells with many intercellular spaces. It helps in the storage and lateral conduction of water.
3. Endodermis: It is the innermost layer of the cortex. It is a single layer of compactly arranged, barrel-shaped cells. The radial wall of cells possesses a band of thickenings called Casparian strips. It controls the

TO STUDY INTERNAL STRUCTURE OF DICOT ROOT

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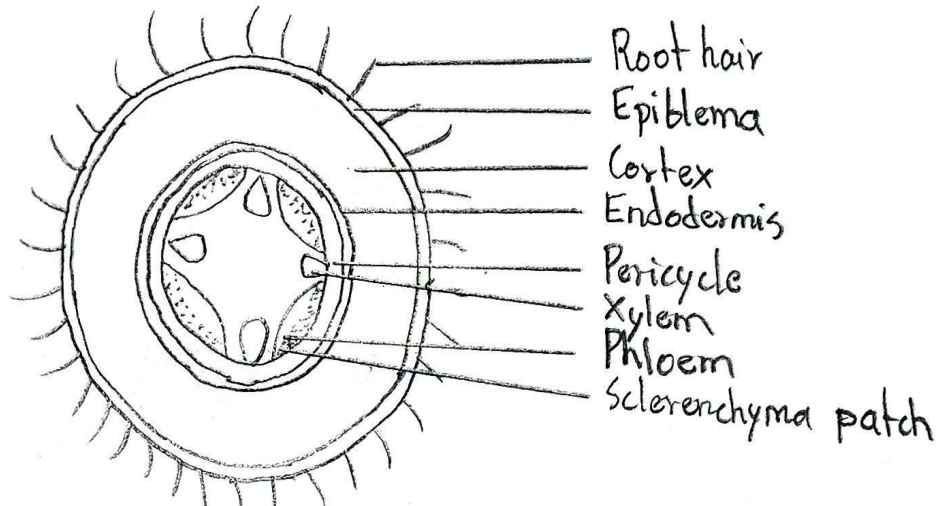


Fig. T.S of Dicot Root (Diagrammatic sketch)

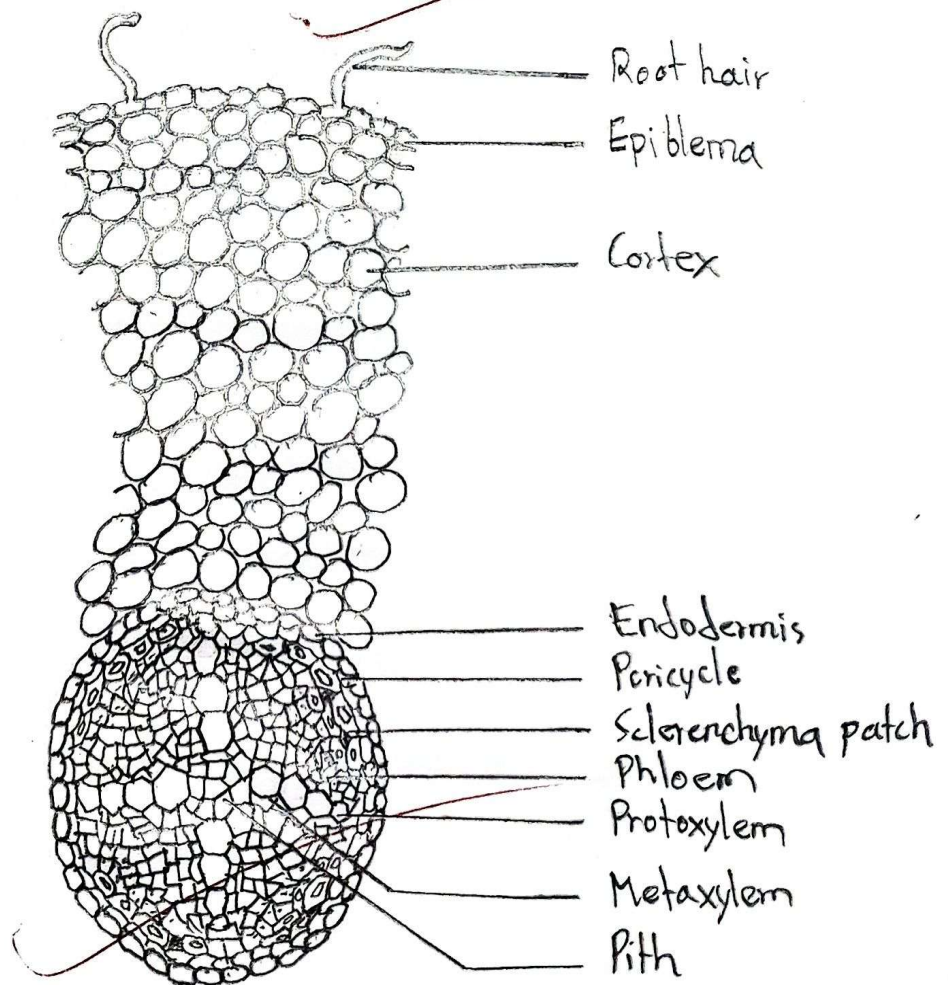


Fig. T.S. of a Portion of Dicot Root (Enlarged)

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movement of water and minerals from outside to the inner part or vice-versa. The thin-walled endodermal cells lying opposite to the protoxylem are called passage cells. These cells allow the passage of water into the xylem.

4. Pericycle: It is a single layer, thin-walled parenchymatous cells lying below the endodermis. It is very important layer, as a portion of vascular cambium, cork cambium and lateral roots develop from this region.

5. Vascular bundles

- The vascular bundles are radial types:

Xylem - It is exarch with the protoxylem towards the periphery and ~~metaxylem~~ metaxylem towards the centre.

Phloem - It is semi-circular cluster of cell consisting of sieve tubes companion cells and phloem parenchyma.

6. Conjunctive tissue: They are thin-walled parenchymatous tissue which separate xylem and phloem patches from each other.

7. Pith

It is the central mass of parenchymatous cells with intercellular spaces. It may disappear due to the growth of metaxylem tissue.

EXPERIMENT NO. 3

NAME OF EXPERIMENT: TO STUDY THE INTERNAL STRUCTURE OF DICOT STEM

COMMENTS

The T.S. of the dicot stem shows the following anatomical structures.

1. **Epidermis:** It is the outermost, single-celled layer that consists of compactly arranged parenchymatous cells, covered by cuticle externally. Many multicellular hairs called epidermal hairs are present which are protective in function. The function of this layer is protection.
2. **Hypodermis:** Just below the epidermis, lies hypodermis which is made up of multi-layered collenchymatous cells having pectin and cellulose depositions at the corners. The functions of this layer are storage as well as providing elasticity and mechanical strength to the stem.
3. **Cortex:** Below the hypodermis, lies cortex which consists of loosely arranged thin-walled and spherical parenchymatous cells. The main functions of the cortex are storage as well as help in exchange of gases.

TO STUDY THE INTERNAL STRUCTURE OF DICOT STEM

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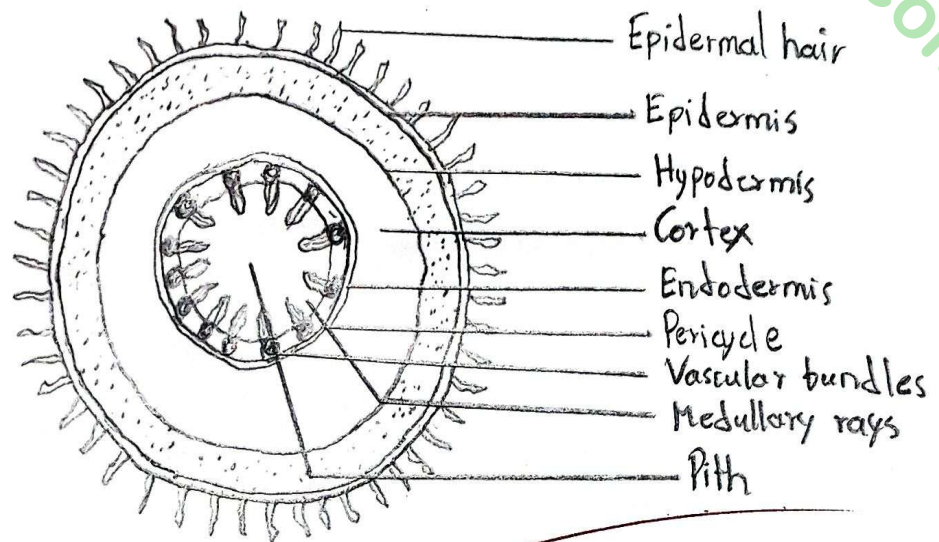
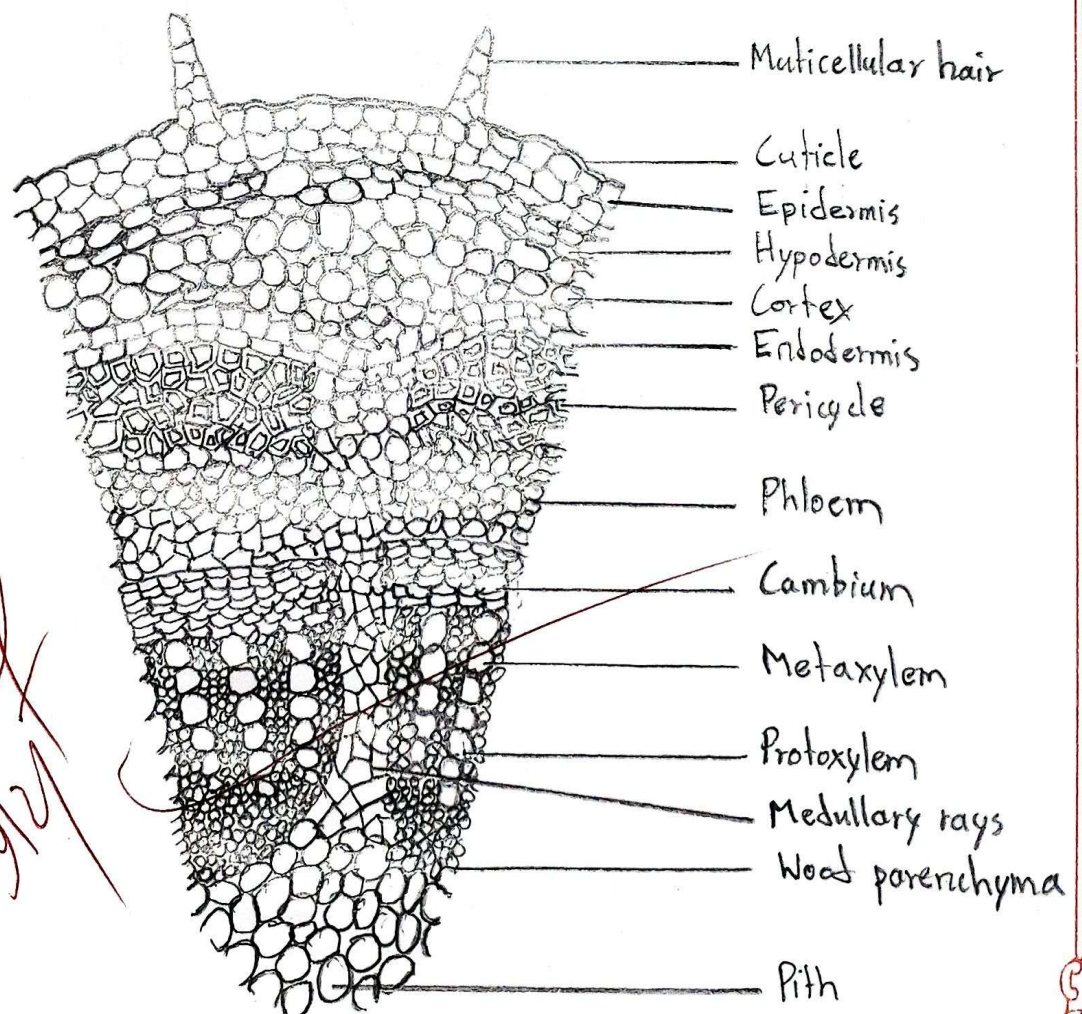


Fig. T.S. of Dicot



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Fig. T.S. of Dicot stem

4. Endodermis : It is the innermost layer of the cortex. It is composed of a single layer of barrel-shaped, compactly arranged parenchymatous cells. The endodermal cells contain starch grains, hence endodermis is also called as a starch sheath.
5. Pericycle : It is a multilayered region lying just below the endodermis. It consists of two types of the tissues - parenchymatous tissues above the medullary rays and patches of sclerenchymatous tissue above the vascular bundles. The functions of this region are to provide mechanical support and storage.
6. Vascular bundles: The vascular bundles are arranged in a ring. The vascular bundles are wedge-shaped. They are conjoint, collateral and open type. The xylem consists of vessels, tracheids and xylem parenchyma. It is endarch (i.e. protoxylem towards the centre and metaxylem towards the outer side). Phloem consists of sieve tubes, companion cells and phloem parenchyma.
7. Medullary rays: These are radially elongated, thin-walled, parenchymatous cells present between the vascular bundles.

8. Pith : It is the central region that consists of thin-walled, loosely arranged, parenchymatous cells with intercellular spaces. The main function of pith is storage.

EXPERIMENT NO. 4

NAME OF EXPERIMENT: TO STUDY THE INTERNAL STRUCTURE OF MONOCOT ROOT

COMMENTS

The T.S. of the monocot root shows the following anatomical structures.

1. **Epiblema:** It is the outermost layer of root which is single-cell layered thick. It is composed of thin-walled, barrel-shaped, compactly arranged parenchymatous cells. It lacks cuticle. Some epiblema cells give rise to unicellular root hairs which help in the absorption of water and minerals from the soil.
2. **Cortex:** It lies immediately below the epiblema. It is multilayered and composed of thin-walled, oval, loosely arranged parenchymatous cells with many intercellular spaces. It helps in the storage and lateral conduction of water.
3. **Endodermis:** It is the innermost layer of the cortex. It is composed of a single layer of compactly arranged, barrel-shaped cells. The radial wall of these cells possesses a band of thickenings called Casparian

TO STUDY THE INTERNAL STRUCTURE OF MONOCOT ROOT

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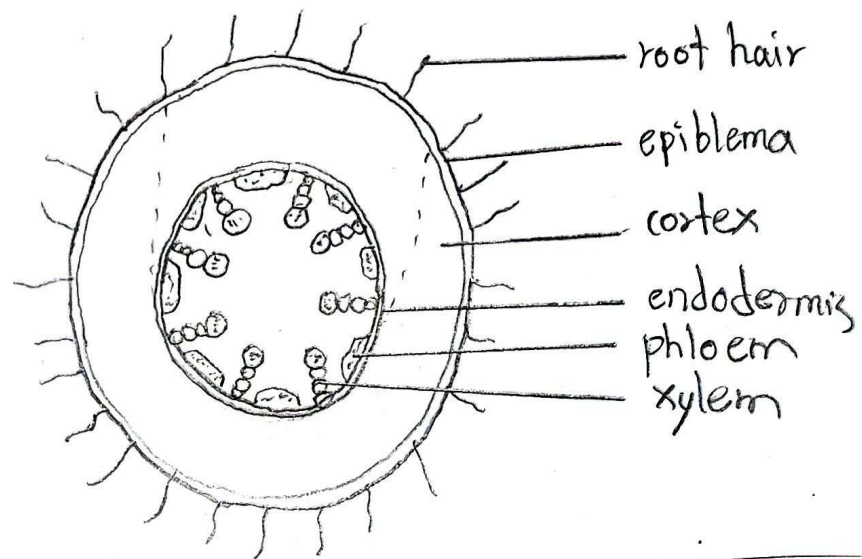


fig. Diagrammatic sketch of T.S. of root

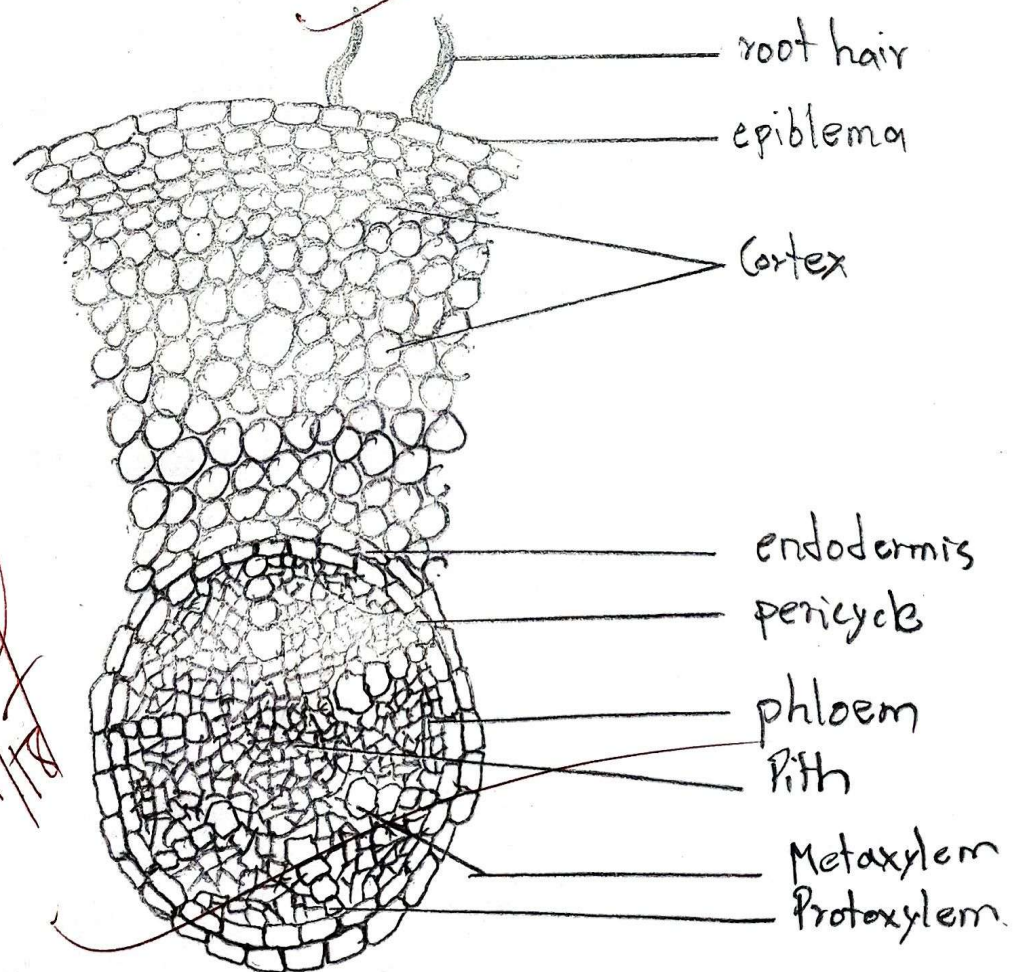


fig. A portion of root enlarged.

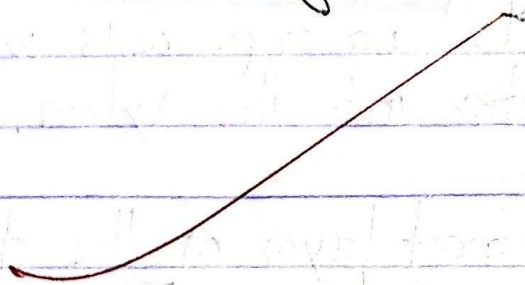
strips. It controls the movement of water and minerals from outside to inner part or vice-versa. The thin-walled endodermal cells lying opposite to the protoxylem are called passage cells which allow the passage of water into the xylem.

4. Percycle: It is the outermost layer of the stele lying just inner to the endoderms. It is composed of a single layer of thin-walled parenchymatous cells. It is very important layer as lateral roots develop from this region.

5. Vascular bundles:

- The vascular bundles are radial types i.e. the xylem and phloem bundles lie on different radii alternating with each other. The number of radial bundles are more than six.
- Xylem is exarch i.e. protoxylem lies towards periphery and metaxylem lies towards the centre. Xylem is made up of vessels, and few tracheids. They are oval or spherical in transverse section.
- Phloem consists of sieve tubes, companion cells and phloem parenchyma.
- Phloem and xylem bundles get separated by one or more layers of thin-walled parenchymatous cells called conjunctive tissue.

6. Pith : Pith is large and well developed. Its function is the storage of food materials.



EXPERIMENT NO. 5

NAME OF EXPERIMENT: TO STUDY INTERNAL STRUCTURE OF MONOCOT STEM.

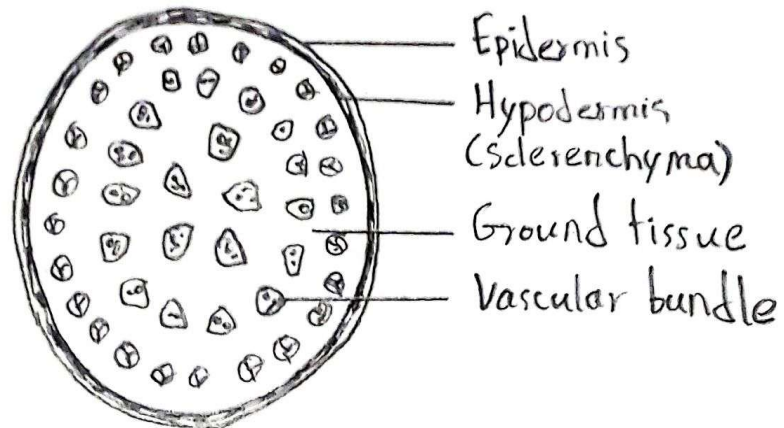
COMMENTS

The T.S. of the monocot stem shows the following anatomical structures.

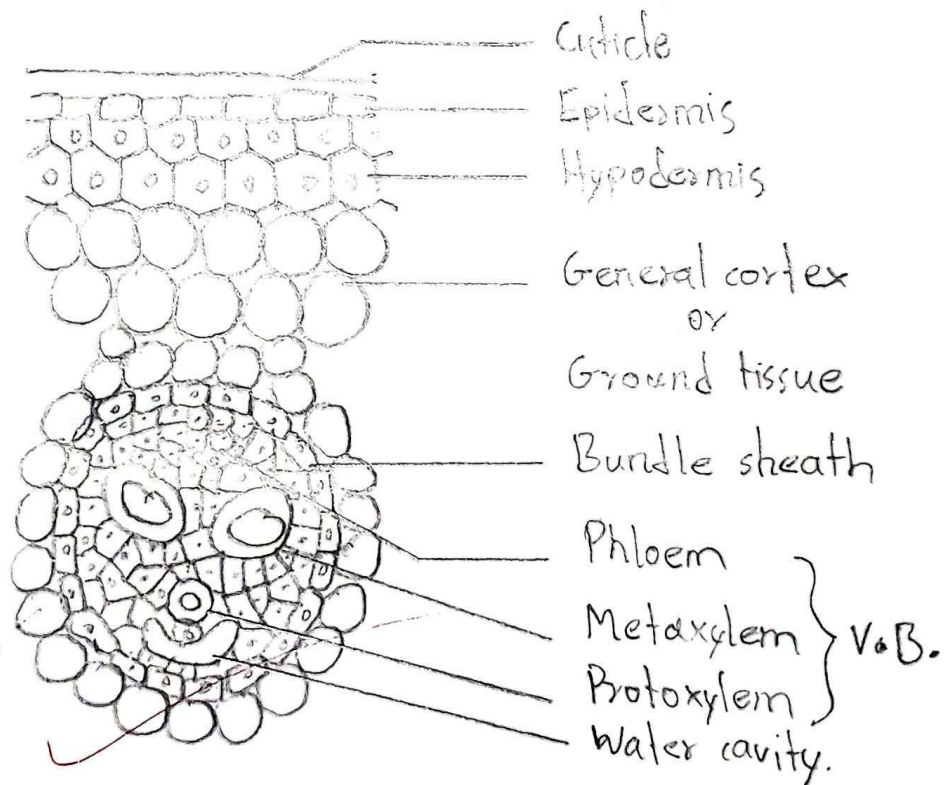
1. Epidermis : It is the outermost layer of the stem and consists of more or less barrel-shaped, thin-walled parenchymatous cells arranged compactly without any intercellular spaces. It is externally covered by a thin layer of cuticle. Epidermal hairs are usually absent but sometimes stomata may be present.
2. Hypodermis : The epidermis is followed by 2-3 layers of compactly arranged sclerenchymatous hypodermis. This region provides mechanical strength to the stem and also acts as a heat screen.
3. Ground tissue : It lies just below the hypodermis and consists of a uniform mass of thin-walled parenchymatous tissues. This region is not

TO STUDY THE INTERNAL STRUCTURE OF MONOCOT STEM

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T.S. of monocot stem (Diagrammatic sketch)



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T.S. of monocot stem (Detailed structure)

differentiated into cortex, endodermis, pericycle and pith. This region stores food materials.

4. Vascular bundles

- The vascular bundles are scattered throughout the ground tissues. They are smaller and numerous towards the periphery and fewer but larger towards the central region.
- Each vascular bundle is oval, conjoint, collateral and closed type.
- Each vascular bundle is surrounded by sclerenchymatous bundle sheath.
- Xylem vessels lie in the form of 'Y' shaped and endarch (Protoxylem towards the centre) and consists of vessels, tracheids xylem parenchyma and a few xylem fibre. A large water cavity (lysigenous cavity) is present below the protoxylem which stores water. This cavity is formed by the dissolution of xylem parenchyma and some protoxylem.
- Phloem occupies in a patch on the outside of the xylem. It consists of sieve tubes, companion cells, and a few phloem fibres but lacks phloem parenchyma. It is differentiated into outer protophloem and inner metaphloem.

EXPERIMENT NO. 6

NAME OF EXPERIMENT: TO STUDY THE INTERNAL STRUCTURE OF MONOCOT LEAF.

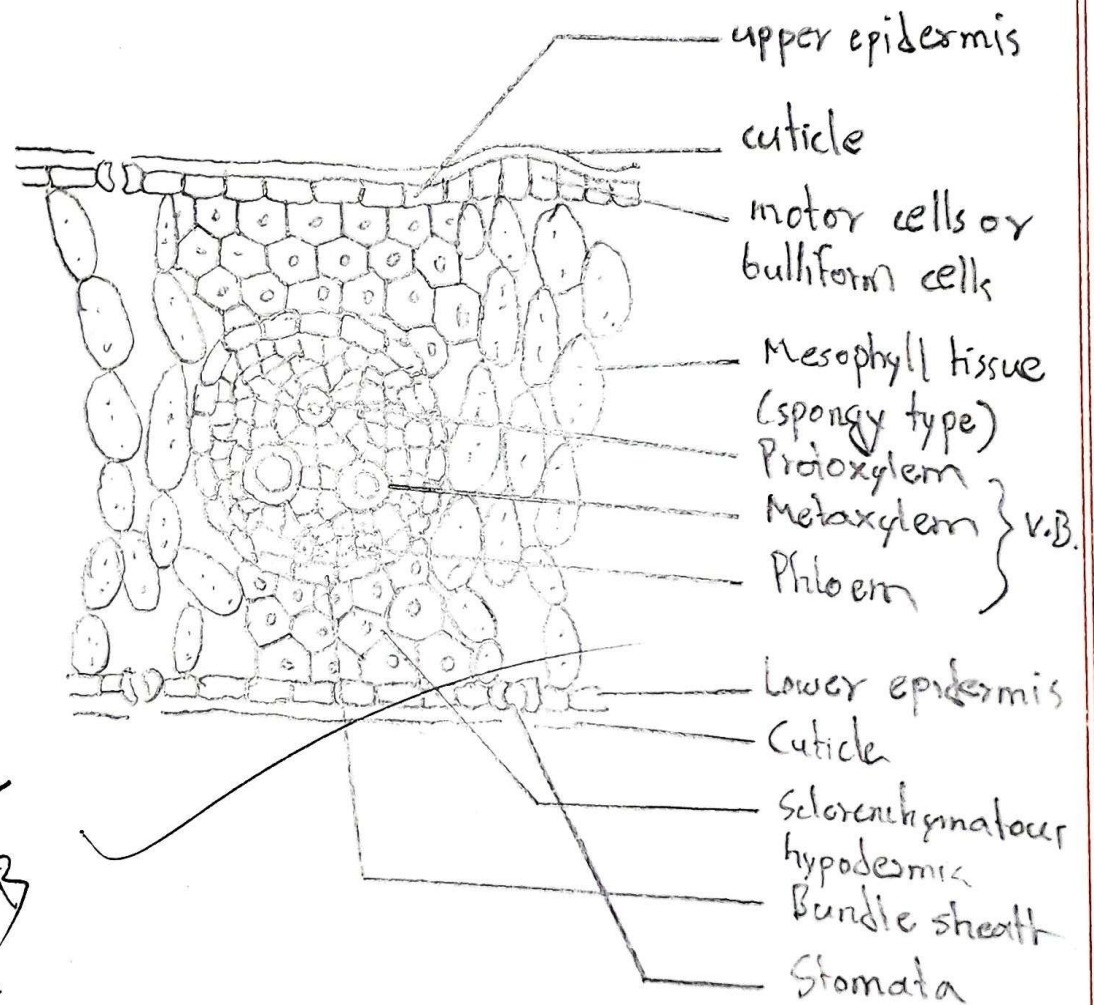
COMMENTS

The T.S. of monocot leaf shows the following anatomical structures.

1. Epidermis: It is a single-layered epidermis found in both sides of leaves which bears approximately equal number of stomata (amphistomatic). The stomata open inwards into the stomatal cavity. In maize, some upper epidermal cells become modified into a group of hygroscopic cells which are swollen to form bulliform cells or motor cells. Each stoma is surrounded by a pair of dumb-bell shaped guard cells.
2. Mesophyll tissue: It lies between the lower and upper epidermis. It consists of multi-layered large rounded parenchymatous cells with large cavities. The intercellular space is reduced. These cells are not differentiated into palaside and spongy parenchyma. Chloroplasts are found abundantly for photosynthesis.

TO STUDY THE INTERNAL STRUCTURE OF MONOCOT LEAF

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fig. T.S. of monocot stem.

3. Vascular bundles: Vascular bundles are present within the mesophyll tissue. They are arranged in a parallel series. The vascular bundles differ in their size. Each vascular bundle is conjoint, collateral and closed type. It is surrounded by a parenchymatous bundle sheath. The small bundles are surrounded by individual sheaths and contain less developed phloem and xylem. But the larger bundles have distinct phloem towards the lower epidermis and xylem toward the upper surface.

- The xylem consists of two pitted oval metaxylem; tracheids are also found in between them. The xylem parenchyma are less numerous. Protoxylem is represented by a lysigenous cavity. The xylem conducts water and mineral ions.

- The phloem has sieve tubes and companion cells. It conducts food materials.