Anatomy of Flowering Plants

6 Chapter

1. Draw illustrations to bring out the anatomical difference between

(a) Monocot root and dicot root

Ans: Variations between monocot root and dicot root are shown in the following picture and table.

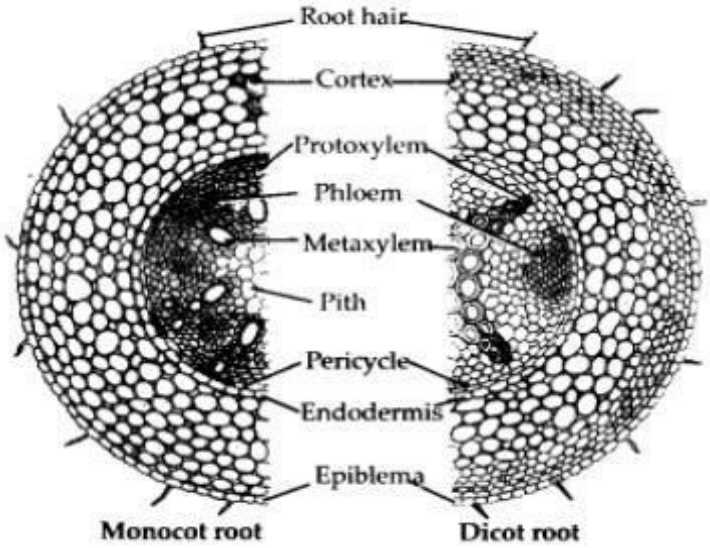

Fig: Comparative pictures of dicot root and monocot root T.S.

Features	**Monocot root**	**Dicot root**
Cortex	Comparatively	Very wide
Endodermis	Less thickened and Casparian strips are more important.	Later turn highly thickened. Casparian strips are noticeable only in young root

Passage cells	Generally absent.	Usually occur opposite the protoxylem point
Pericycle	Generates lateral roots, cork cambium, and part of the vascular cambium.	Creates lateral roots only.
Vascular bundles	2 to 5 or sometimes 8.	8 or more numbers.
Pith	Either absent or extremely small.	Well-developed.

(b) Monocot stem and dicot stem

Ans: Variations between monocot and dicot stems are shown in the following illustration.

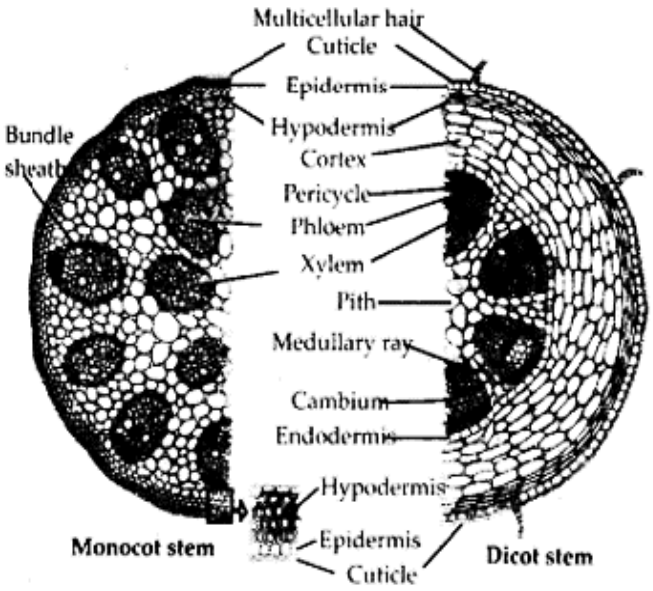

Fig:- Comparative pictures of dicot root and monocot stem T.S.

Features	**Monocotyledonous stem**	**Dicotyledonous stem**
Vascular bundles	(a) Scattered (b) Conjoint, collateral. (c) Bundle sheath is usually present. (d) Phloem parenchyma	(a) Vascular bundles in the ring (b) Conjoint, collateral, or bicollateral and open. (c) Bundle sheath absent. (d) Phloem parenchyma present.

	absent. (e) Xylem vessels are arranged either in a Y or V-shaped manner.	(e) Not arranged in V or Y shaped manner.
Pith (Medulla)	Absent	Composed of parenchymatous cells found in the center of the stem.
Ground tissue	Ground tissue is not distinguished into the pith and cortex.	Distinguished into the pith and cortex.
Hypodermis.	Usually, sclerenchymatous	Collenchymatous
Endodermis	Absent	One layered, starchy sheath is generally not well distinguished.
Pericycle	Absent	Composed of one or several.

2. Cut a transverse section of young stem of a plant from your school garden and observe it under the microscope. How would you ascertain whether it is a monocot stem or a dicot stem? Give reasons.

Ans: Looking through the microscope, I will check if the following features are observed.

- Vascular bundles in the dicot stem are arranged in a ring whereas in monocot stem vascular bundles are scattered throughout the ground tissue.
- Based on the arrangement of vascular bundles, it can be ascertained whether the young stem is dicot or monocot.
- In addition to the indistinguishable ground tissue, sclerenchymatous hypodermis, spherical or egg-shaped vascular bundles with Y-shaped xylem are other distinguishing characteristics of monocot stem.

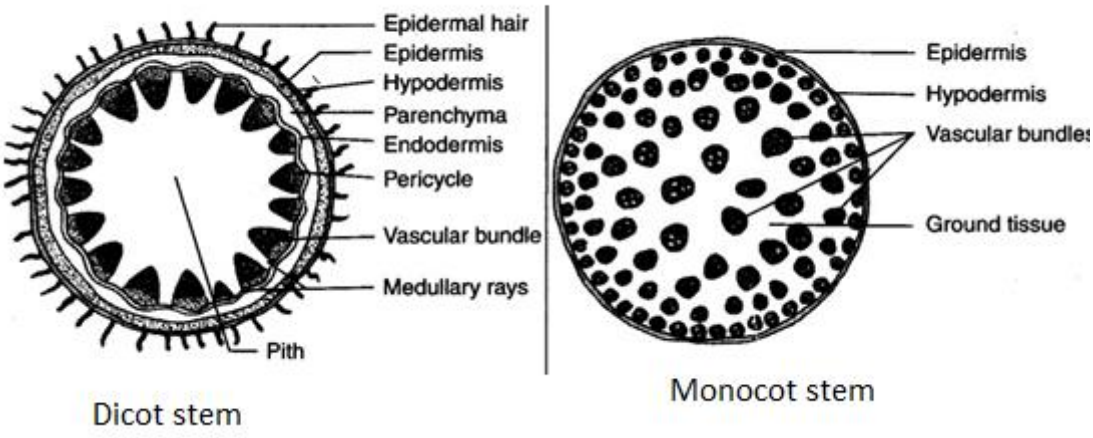

Fig: Arrangement of vascular bundles in dicot and monocot stems.

3. The transverse section of a plant material shows the following anatomical features - (a) the vascular bundles are conjoint, scattered and surrounded by a sclerenchymatous bundle sheaths. (b) phloem parenchyma is absent.
What will you identify it as?

Ans: The monocot stem is characterised by conjoint, collateral,
and closed vascular bundles, scattered in the ground tissue containing the parenchyma.
Each vascular bundle is surrounded by sclerenchymatous bundle-sheath cells.
Phloem parenchyma and medullary rays are absent in monocot stems.

4. What is stomatal apparatus? Explain the structure of stomata with a labelled diagram.

Ans: The stomatal apparatus comprises the following parts.

- A small aperture or opening present in the epidermal cells of the leaf called stoma. This is also called a stomatal aperture (singular- stoma, plural – stomata).
- Two bean-shaped guard cells surrounding the stomatal aperture. (It is to be noted that guard cells are dumbbell-shaped in monocots and bean-shaped in dicots.)
- Subsidiary cells – These are specific epidermal cells in the vicinity of guard cells.

Function:

- Change in the turgidity or flaccidity of the guard cells is associated with stomatal opening and closure.

- Stomata are essentially involved in gaseous exchange and transpiration.

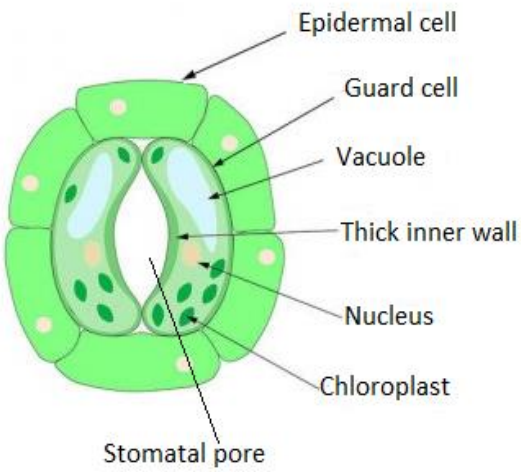

Fig: Stomatal apparatus

5. Name the three basic tissue systems in the flowering plants. Give the tissue names under each system.

Ans:

- The three basic tissue systems in flowering plants are the epidermal tissue system, ground tissue system, and vascular tissue system.
- The epidermal tissue system comprises epidermal cells, stomata, trichomes, and hairs.
- The ground tissue system is composed of the endodermis, cortex, pith, pericycle, and medullary rays, in the primary stems and roots.
- In leaves, the ground tissue is comprised of thin-walled chloroplast-which contains the cells and is known as mesophyll.
- The vascular tissue system is composed of complex tissues, the xylem, and the phloem.

6. How is the study of plant anatomy useful to us?

Ans:

- The study of plant anatomy helps to understand structural adaptations in plants with respect to their different environmental conditions.
- It also helps us in differentiating between monocots, dicots, and gymnosperms. This gives us an idea of the physiological state of the plants and so can be useful in crop improvement.

- Internal structures also help us to predict the strength of wood and hence its utility for commercial activities.
- Study of plant fibres such as jute, flax, and hemp, etc. may prove useful in their business-related exploitation.

7. Describe the internal structure of a dorsiventral leaf with the help of labelled diagrams.

Ans:

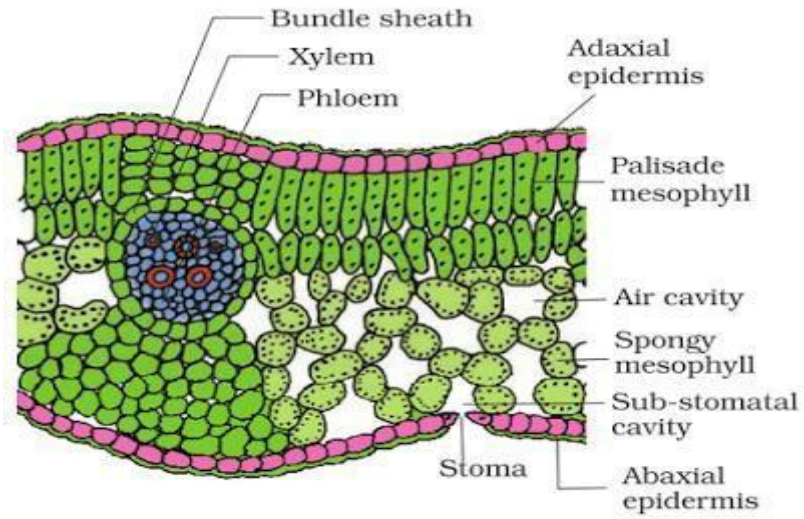

Fig: Internal Structure of a dorsiventral leaf.

Dorsiventral leaves are found in dicots. The significant anatomical characteristics of dorsiventral leaves are discussed below:

(a) Upper epidermis: This is usually the outermost single made of parenchymatous cells. The epidermal cells have sometimes outgrowths known as papillae, e.g., in Gladiolus. The epidermal cells are devoid of chloroplast and stomata are absent on the top epidermis.

(b) Lower epidermis: It is the same as the upper epidermis but here stomata are present. Chloroplasts are absent in the bottom epidermis also, except the guard cells of stomata.

(c) Mesophyll: In between the lower and upper epidermis mesophyll tissues is present which can be split into two regions:

i. Palisade parenchyma: These are lengthened columnar cells without intercellular spaces. These contain chloroplast in them and are usually arranged in two layers.

ii. **Spongy parenchyma:** It is found below palisade parenchyma and is oval or spherical with intercellular spaces. They also contain chloroplasts but several chloroplasts are more in palisade parenchyma than spongy parenchyma.

(d) Vascular bundles: Vascular bundles are usually found at the boundary between the spongy and the palisade regions. The vascular bundle in the midrib area is the largest. Vascular bundles are collateral, conjoint, and closed. Each vascular bundle is encircled by a bundle sheath of parenchymatous cells. In the vascular bundle, phloem is found towards the lower epidermis and the xylem is present towards the top epidermis. Additionally, in the xylem, the protoxylem is towards the uppermost epidermis.