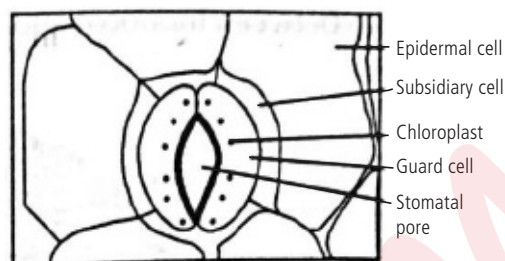


Anatomy of Flowering Plants

Topic 1

1. Stomata are structures present in the epidermis of leaves. Each stoma is composed of two bean-shaped cells known as guard cells which enclose stomatal pore. The outer walls of guard cells (away from the stomatal pore) are thin and the inner walls (towards the stomatal pore) are highly thickened. The guard cells possess chloroplasts and regulate the opening and closing of stomata. Sometimes, a few epidermal cells, in the vicinity of the guard cells become specialised in their shape and size and are known as subsidiary cells. The stomatal aperture, guard cells and the surrounding subsidiary cells are together called stomatal apparatus. Diagrammatic representation of stomatal apparatus is as follows:



2. The three basic tissue systems in flowering plants are epidermal tissue system, ground tissue system and vascular tissue system.

Epidermal tissue system comprises of epidermal cells, stomata, trichomes and hairs.

Ground tissue system consists of cortex, endodermis, pericycle, pith and medullary rays, in the primary roots and stems. In leaves, the ground tissue consists of thin

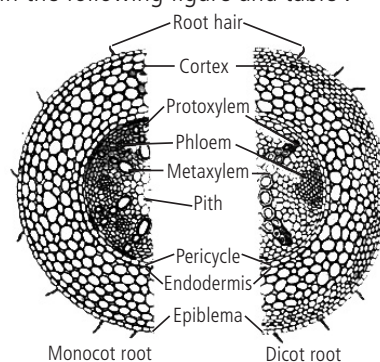
walled chloroplast containing cell and is called mesophyll. The vascular tissue system consists of complex tissues, the phloem and the xylem.

3. Study of internal structures of plants is called plant anatomy. Study of plant anatomy is useful:

- for solving taxonomic problems.
- for knowing homology and analogy of various plant groups.
- to differentiate the superior and inferior, standard and sub-standard or specified and unspecified woods.
- in establishing purity and correct identity of plant parts in pharmacognosy (science connected with sources, characteristics and possible medicinal uses).
- in knowing the structural peculiarities of different groups of plants.

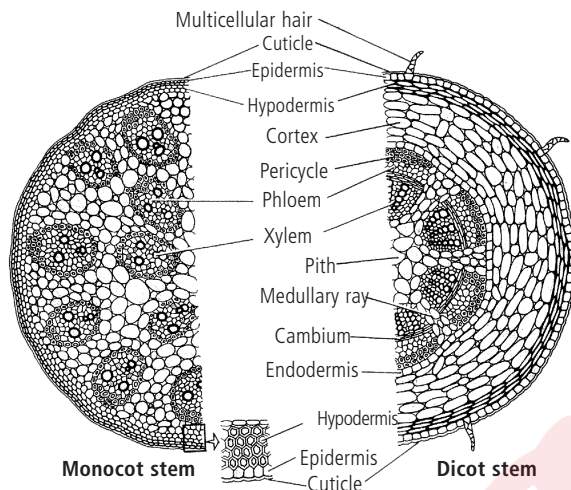
Topic 2

1. (a) Differences between monocot root and dicot root are illustrated in the following figure and table :



| S.No. | Features | Dicot root | Monocot root |
|-------|------------------|---|---|
| (i) | Cortex | Comparatively narrow | Very wide |
| (ii) | Endodermis | Less thickened and Casparian strips are more prominent | Later become highly thickened. Casparian strips are visible only in young root. |
| (iii) | Passage cells | Generally absent | Generally occur opposite the protoxylem point |
| (iv) | Pericycle | Produces lateral roots, cork cambium and part of the vascular cambium | Produces lateral roots only |
| (v) | Vascular bundles | 2 to 5 or sometimes 8 | 8 or more in number |
| (vi) | Pith | Either absent or very small | Well-developed |

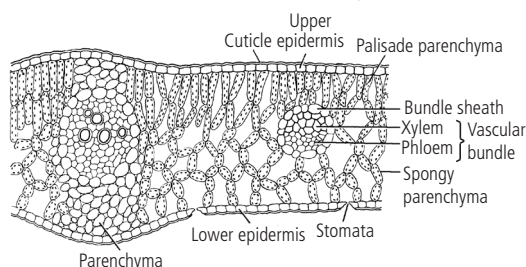
(b) Differences between monocot and dicot stems are illustrated in the following figure and table.



| S.No. | Features | Monocotyledonous stem | Dicotyledonous stem |
|-------|------------------|---|--|
| (i) | Vascular bundles | (a) Scattered (b) Conjoint, collateral, closed (c) Bundle sheath usually present (d) Phloem parenchyma absent (e) Xylem vessels arranged either in Y or V shaped manner | (a) Vascular bundles in ring (b) Conjoint, collateral or bicollateral and open (c) Bundle sheath absent (d) Phloem parenchyma present (e) Not so |
| (ii) | Pith (Medulla) | Absent | Made up of parenchymatous cells situated in the centre of stem |
| (iii) | Ground tissue | Ground tissue is not differentiated into the cortex and pith | Differentiated into the cortex and pith |
| (iv) | Hypodermis | Usually sclerenchymatous | Collenchymatous |
| (v) | Endodermis | Absent | One layered, starchy sheath which is usually not well differentiated |
| (vi) | Pericycle | Absent | Made up of one or more layers of parenchymatous and/or sclerenchymatous cells |
| (vii) | Medullary ray | Absent | Found in between vascular bundles |

2. Vascular bundles in dicot stem are arranged in a ring whereas in monocot stem, vascular bundles are scattered throughout the ground tissue. On the basis of arrangement of vascular bundles it can be ascertained whether the young stem is dicot or monocot. Besides undifferentiated ground tissues sclerenchymatous hypodermis, oval or circular vascular bundles with Y shaped xylem are other differentiating features of monocot stem.

3. T.S. of a dorsiventral leaf i.e., *Mangifera* is as follows:



Dorsiventral leaves are found in dicots. The important anatomical features of dorsiventral leaves are discussed below:

(a) Upper epidermis : This is generally outermost single layer made of parenchymatous cells. The epidermal cells have sometimes outgrowths called papillae, e.g., in *Gladiolus*. The epidermal cells are devoid of chloroplast and stomata are absent on upper epidermis.

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

(c) Mesophyll : In between upper and lower epidermis, mesophyll tissue is present which can be divided into two regions:

(i) Palisade parenchyma : These are elongated columnar

cells without intercellular spaces. These have chloroplast in them and are generally arranged in two layers.

(ii) Spongy parenchyma : It is found below palisade parenchyma and are spherical or oval with intercellular spaces. They also have chloroplasts but number of chloroplasts is more in palisade parenchyma than spongy parenchyma.

(d) Vascular bundles : Vascular bundles are generally found

at the boundary between the palisade and the spongy regions. The vascular bundle in midrib region is largest. Vascular bundles are conjoint, collateral and closed. Each vascular bundle is surrounded by a bundle sheath of parenchymatous cells. In the vascular bundle, xylem is present towards upper epidermis and phloem towards lower epidermis. Further in xylem, protoxylem is towards upper epidermis.

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