Chapter - 6
Anatomy of flowering Plants

★ Tissue system by Sachs

1) Epidermal tissue system
2) Ground / Fundamental tissue system
3) Vascular / conducting tissue System.

★ Epidermal tissue system

⇒ outermost covering of whole plant
⇒ comprises of epidermal cells, stomata, epidermal appendages - trichomes and hairs
⇒ Elongated, compactly arranged cells - from continuous layer
⇒ Single layered parenchymatous
⇒ with small cytoplasm, lining the cell wall, large Vacuole
⇒ Covered by a Waxy thick layer - Cuticle
⇒ It prevents water loss; hence absent in root
⇒ Stomata regulate the process of transpiration & gaseous exchange
⇒ In grasses the guard cells are dumb-bell shaped
⇒ The outer wall is thin, Inner walls is highly thickened

Subsidiary cells: Four epidermal cells, in the vicinity of guard cells become specialised in their shape and size

Stomatal apparatus - Stomatal aperture, guard cells, Subsidiary cells

⇒ Root hairs are unicellular elongation of epidermal cells - help absorb water and minerals from the soil

⇒ In stem these termed as trichomes are multicellular, branched or unbranched, soft / stiff, even secretory help in preventing water loss due to transpiration found in dicot stem

★ The Ground Tissue System

⇒ It consist of simple tissue parenchyma, collenchyma, sclerenchyma. All (Exp: Epidermis, vascular tissue)

⇒ Parenchymatous cells are usually present in Cortex, pericycle, pith and medullary rays in primary stem, roots

⇒ In leaves, mesophyll cells containing chloroplast is a form of ground tissue

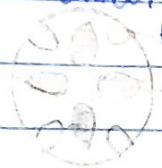
★ The Vascular Tissue System

⇒ Vascular system - complex tissues ; Xylem & phloem
⇒ In dicotyledonous stem, Cambium is present between Xyl & Phl

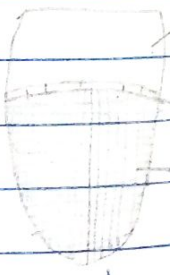
* Open Vascular bundles : Vascular bundles due to the presence of Cambium has an ability to form Secondary Xylem & Phloem tissues [Found in dicotyledonous stem]

* Closed Vascular bundles : Cambium is absent ; ∴ inability to form Secondary tissues [Found in Monocotyledonous stem]

* Radial : Xylem & Phloem arranged in a alternate manner within the vascular bundle along different radii



* Conjoint : Xylem & Phloem jointly situated along the same radius of vascular bundle. Commonly found in stem, leaf. Phloem located on the outer side of the Xylem



(a) - Conjoint closed
(b) - Conjoint open

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★ Dicotyledonous Root

⇒ The outer layer - **epiblema/Rhizodermis** many protude to form unicellular root hairs

⇒ The cortex consist of several layered of thin-walled parenchyma cells with intercellular spaces

Endodermis: Innermost layer of cortex
- Single layer of barrel shaped
- without intercellular spaces
- Tangential & radial walls
- deposition of water impermeable, waxy material called **Suberin** in the form of **Casparian strips**

Pericycle: Next to endodermis, thick walled parenchymatous cell
- Initiates lateral roots and Vascular cambium during secondary growth takes place

⇒ The **pith** is small or inconspicuous

⇒ The parenchymatous cells between the xylem & phloem are called **Conductive tissue**

⇒ There are usually 2 to 4 xylem & phloem packs, Later cambium ring develops between

⇒ All tissues on the inner side of the endodermis such as pith pericycle, vascular bundle constitute a **Stele**, **radially closed**

★ Monocotyledonous Root

⇒ xylem bundles usually more than 6 (polyarch)

⇒ Pith is large and well developed

⇒ do not undergo secondary growth, Remaining Anatomy Similar to dicot

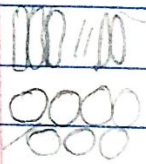
⇒

★ Dorsiventral (Dicotyledonous) Leaf

- 3 main parts → Epidermis
  - Mesophyll
  - Vascular system
- Epidermis cover upper (adaxial epidermis) and lower (abaxial epidermis)

① • The leaf has a conspicuous Cuticle → To limit Transpiration
• Abaxial epidermis has more stomata than

Mesophyll : tissue between upper & lower epidermis
⇒ posses chloroplast & carry out photosynthesis
⇒ made up of parenchyma
⇒ 2 types → Palisade Parenchyma → Upper Epidermis, Elongated cells Vertically // to each
Spongy Parenchyma



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*The oval or round, loosely arranged below palisade on the lower epidermis

② * Many air spaces & air cavity present

⇒ Vascular bundles seen in veins & mid rib
⇒ Size based on Veins → varies in thickness in the reticulate Venation of dicot leaves
⇒ Surrounded by thick walled Bundle sheath cells

⇒ Xylem → positioned towards abaxial (upper) side
⇒ Phloem → positioned towards adaxial (lower) side

Reason ① ⇒ As leaf is the part of major gaseous exchange, to limit the transpiration there is noticable cuticle

Reason ② ⇒ because of the stomata in lower epidermis, need space for

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Isobilateral (Monocotyledonous) Leaf

⇒ Stomata equally present on both sides
⇒ Mesophyll do not differentiate into Palisade, spongy parenchyma
⇒ Adaxial epidermal cells → Bulliform cells
⇒ Large, empty, colourless cells
⇒ If absorbed water, → turgid, surface exposed
⇒ flaccid due to water stress → curl inwards to ↓ water loss
⇒ If venation reflected in a near similar size of vascular bundle (ept: Main rib)

Dicotyledonous Stem

Epidermis: outermost protective layer. Covered by thin layer of cuticle. It may bear trichomes & few stomata

Cortex:
- → **Hypodermis**: consist of collenchymatous cell below Epidermis ∴ Mechanical strength for young stems
- → **Cortical layer**: rounded thin walled parenchymatous with intercellular spaces
- → **Endodermis**: Rich is starch grains, hence Starch sheath

Pericycle: present on the inner side of the endodermis & above the phloem in the form of semi-lunar patches of Sclerenchyma

⇒ Ring arrangement of vascular bundle characteristic features
⇒ vascular bundle - conjoint, open with endarch protoxylem

Pith: Large number of rounded, parenchymatous cells with large intercellular spaces which occupy central position i.e the center

★ Monocotyledonous Stem

⇒ Sclerenchymatous hypodermis
⇒ large no. of scattered vascular bundles
⇒ surrounded by a sclerenchymatous bundle sheath
⇒ Conspicuous parenchymatous cells of ground tissue
⇒ Vascular bundle are conjoint and closed
⇒ Peripherical vascular bundle generally smaller than those the located ones
⇒ The phloem parenchyma is absent
⇒ Water-containing cavities ~~are~~ are present with vascular bundle
⇒ Tricomes are absent
⇒ Vascular bundle is conjoint closed and Scattered arrangement
⇒ Pith is smaller and not well organised