

PUC I YEAR SEMESTER-II

UNIT-IV. INTERNAL ORGANIZATION IN PLANTS

Module 23 : ANATOMY OF DICOTYLEDONOUS AND MONOCOTYLEDONOUS LEAF

ANATOMY OF DICOT (DORSIVENTRAL) LEAF

A transverse section through the midrib region of a typical dorsi-ventral leaf (**Sunflower**) reveals the following structures.

Epidermis : is in two layers, one on each surface of the leaf. Both the layers are composed of compactly arranged, barrel-shaped cells. Intercellular spaces are absent. A cuticle covers both the layers. Multicellular hairs called trichomes are present on both the layers. Stomata occur mostly on the lower epidermis. This condition is described as hypostomatic. The epidermis is meant for protection, transpiration and gaseous exchange.

Mesophyll: is the ground tissue that occurs between the two epidermal layers. It is exclusively composed of chlorenchyma cells. The mesophyll is characteristically differentiated into two regions namely, an upper palisade parenchyma and a lower spongy parenchyma. It is mainly involved in photosynthetic activity.

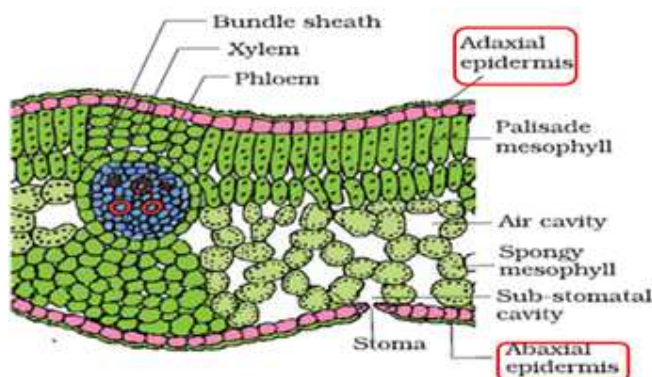
a) **Palisade parenchyma** is composed of two or three layers of elongated, compactly arranged chlorenchyma cells. Intercellular spaces are absent. The cells contain large number of chloroplasts.

b) **Spongy parenchyma** is composed of a few layers of loosely arranged spherical or oval chlorenchyma cells with prominent intercellular spaces. These cells contain very few chloroplasts.

Veins represent the **vascular bundles**. They are found irregularly scattered in the mesophyll due to reticulate venation. The largest and the

oldest vein is found in the centre. It is known as midrib vein and is involved in conduction.

Each vein has a bundle sheath composed of single layer of compactly arranged barrel shaped parenchyma cells. The bundle sheath encloses both xylem and phloem. Xylem is found towards upper epidermis and phloem towards lower epidermis. The cambium is absent. Hence, the vascular bundle is described as conjoint and collateral with endarch xylem. The bundle sheath of the midrib vein is connected to the upper and the lower epidermal layers by many layers of parenchyma cells, representing bundle sheath extensions or hypodermal parenchyma.



ANATOMY OF MONOCOT (isobilateral)LEAF

A transverse section passing through the midrib region of an iso-bilateral leaf (**Maize**) reveals the following structure.

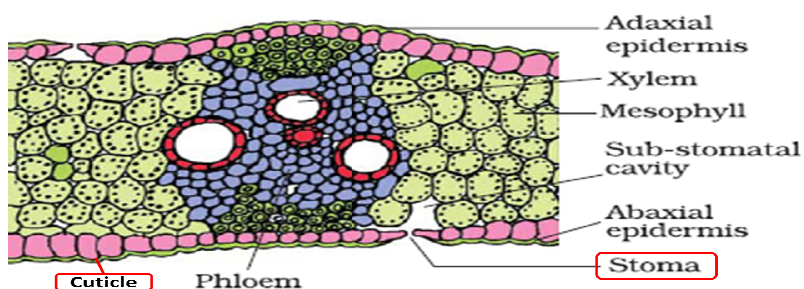
Epidermis: is in two layers, one on each surface of the leaf. Both the epidermal layers are composed of compactly arranged, barrel shaped cells. Cuticle and trichomes are present in both the layers. Stomata are found in both the epidermal layers. This condition is described as **amphistomatic**. A few cells in the upper epidermis are enlarged to form motor cells or

bulliform cells. These cells help the leaves to roll during desiccation to avoid excess water loss.

Mesophyll: is ground tissue that occurs between the two epidermal layers. It is composed of many layers of loosely arranged, spherical or oval chlorenchyma cells. Intercellular spaces are prominent.

Veins are found in parallel arrangement in the mesophyll (parallel venation). Each vascular bundle is surrounded by a bundle sheath composed of a single layer of compactly arranged barrel-shaped cells. The bundle sheath encloses both phloem and xylem. Phloem is found towards lower epidermis and xylem towards upper epidermis. In the xylem, only two protoxylem and two metaxylem vessels are present. The cambium is absent. The vascular bundle is described as conjoint, collateral and closed.

The oldest and the largest vascular bundle are found in the centre. It is known as midrib vein. The bundle sheath of the midrib vein is connected to the upper and lower epidermal layers by sclerenchyma cells representing bundle sheath extensions or hypodermal sclerenchyma.



CHECK POINTS

1. The leaves of dicot and monocot have epidermis on either side and covered with cuticle.
2. Stomata are more on lower side in dicot leaf and evenly distributed in monocot leaf.

3. The Mesophyll is present between two epidermal layers. Motor cells are present in the upper epidermis of monocot leaves.
4. In dicot leaf, the mesophyll is differentiated into upper palisade tissue and lower spongy tissue. The vascular bundles (veins) are irregularly scattered in the mesophyll.
5. The vascular bundles are conjoint, collateral with endarch xylem and surrounded by parenchymatous bundle sheath cells.
6. In monocot leaf, the mesophyll is undifferentiated; vascular bundles are parallelly arranged and other vascular characters are similar to dicot leaf.

Short answer Questions:

1. What are the anatomical characters of conducting tissue of sunflower stem?
2. Differentiate between dorsiventral and Iso-bilateral leaves.
3. Give an account of characteristic features of mesophyll tissue of dicot leaf.
4. Give the distinguishing features of vascular tissue of a monocot leaf.
5. What are bulliform cells? What is their role?
6. What is hypostomatic and amphistomatic condition?

Long answer Questions:

1. Explain the internal structure of a dicot leaf with labeled diagram.
2. Give an account on anatomy of monocot leaf with labeled diagram.

MCQS

1. The conjoint bundles are characteristic feature of
 - A. Both leaf and stem**
 - B. Leaf but not stem
 - C. Stem but not leaf

D. Root

2. Pores on the leaf surface that function in gas exchange are called

A. Hairs

B. Xylem cells

C. Phloem cells

D. Stomata

E. Sclereids

3. One important difference between the anatomy of roots and the anatomy of leaves is that

A. Only leaves have phloem and roots only have xylem.

B. The cells of roots have cell walls that are lacking in leaf cells.

C. A waxy cuticle covers leaves but is absent in roots.

D. Vascular tissue is found in roots but it is absent in leaves.

E. Leaves have epidermis, while such tissue is absent from roots.

4. Which of the following cell types are found in ground tissue?

A. Vessel elements, tracheids

B. Parenchyma, collenchyma

C. Vascular cambium

D. Primary xylem

5. When the two sides of mesophyll of a leaf are similar in structure, the leaf is said to be

A. Hypostomatic

B. Isobilateral

C. Dorsiventral

D. Unifacial