

**Department of biology**

**BOTANY (PLANT BIOLOGY)**

**First stage**

**(7)**

**Types of permanent tissues**

**By**

**Prof. Dr. Dhurgham Ali Al-Sultany**

**A. Simple tissues**

These are homogenous in nature and are composed of structurally and functionally similar cells these are of three topes:

(i) Parenchyma

(ii) Collenchyma

(iii) Sclerenchyma

**(i) Parenchyma**

1. Parenchyma is considered as the precursor of all other living tissues.
2. It is also the most primitive tissue from phylogenetic point of view.
3. Parenchymatous cells are living thin-walled containing distinct nuclei.
4. The cell walls are made up of cellulose hemicellulosic and pectic materials.
5. Cells have small or large intercellular spaces. Cells are generally isodiametric (but may also be elongated lobed, columnar, stelate and folded).
6. All meristems made up of parenchyma.

**Functions:**

1. Parenctyma cells are the centre of respiration, photosynthesis, storage, secretion etc..
2. These cells may have the power of division.
3. These cells help in wound-healing and in formation of adventitious buds and roots.
4. Parenchymatous cells store water in succulent plants.
5. In aquatic plants parenchyma cells store air.
6. Parenctyma cells of xylem and phloem help in conduction of water and food materials.



**(ii) Collenchyma**

1. These are living elongated cells with thick walls. The cell wall is made up of cellulose, hemicellulose and pectic materials. The wall thickening is not uniform.
2. The walls are often provided with simple pits. Sometimes chloroplasts are present in Collenchyma cells.
3. Collenchyma is found in many herbaceous dicot stems, petioles and younger aerial regions of woody stems.
4. Collenchyma is absent in roots and monocot stems.

**Types of collenchyma:**

According to thickening on cell wall, Collenchyma may divide into three types:

1. Angular:

The deposition is maximum at the angles (where the two cell walls come in contact). It is the most common type.

1. Lacunar:

Large intercellular spaces occur between the cells. The deposition occurs on the walls towards the spaces.

1. Lamellar:

The deposition occurs on tangential walls. The cells appear plate like or lamellar. It is also called plate collenchyma. Functions It performs both mechanical as well as vital types of functions. Collenchyma provides tensile strength which gives elasticity and support to the growing organs chloroplast containing collenchyma performs photosynthetic function.



**(iii) Sclerenchyma**

1. They are dead cells, and act as purely mechanical.
2. The cells are long, narrow and pointed at both ends.
3. The cell walls are lignified and have simple pits.
4. The cell walls are very thick with the result that the cell cavity becomes narrow.

**Sclerenchyma cells can occur in two forms:**

1. Sclereids are sclerenchyma cells that are randomly distributed throughout other tissues. Sometimes they are grouped within other tissues in specific zones or regions. They are generally as long as they are wide. Sclereids are sometimes called stone cells.
2. Fibers are sometimes found in association with a wide variety of tissues in roots, stems, leaves and fruits. Usually, fiber cells are much longer than they are wide and have a very tiny cavity in the center of the cell.

**Complex tissues**

This tissue is made of many cells of different kinds. Their structure is different individually they collect together to perform similar functions in the plant. These tissues are also called conducting tissues because they transport water and dissolved minerals from root hairs to the different parts of the plant and prepared food from the leaves to the different parts of the plant. Thus these tissues were divided into two types

1. Xylem

2. Phloem

**Xylem is made of four types of cells**

1. Tracheids: these cells are long pointed at both ends. Their walls have lignin deposits.
2. Xylem vessel: Cells have thick walls. The thickenings could be annular, spiral, scalariform, reticular or pitted. These are dead cells they can be three meters in long.
3. Wood fibers: long tapering cells. They are dead cells and the walls have pit.
4. Wood parenchyma: these cells are isodiametric. Their walls are thinner. They store food.

**Phloem this conducting tissue is made of four kinds of cells.**

1. Sieve tube: these are thin walled long cells joined end to end. The walls between two adjacent cells have pores in them making them look like sieves. These cells transport carbohydrates and proteins from leaves to the storage parts and growing parts in a longitudinal manner.
2. Campanian cells: These are parenchymatous cells associated with phloem. These are living cells. Many monocots do not have this tissue.
3. Phloem parenchyma
4. Phloem fibers



**Special Tissues**

Some cells of certain tissues get modified to secrete some substances. Thus, these tissues are called special tissues or secretory tissues. They include glandular tissue and lactiferous tissue.

**First \\ Glandular Tissue:**

This tissue has different types of glands have secretory or excretory products. They can be external or internal.

1-External glands Some external glands found in plants are:

* + 1. Water recreating glands called hydathodes found *Pistia*
    2. Glandular hairs which secrete substances like gum ex. Tobacco .
    3. Glandular tissue secreting poisonous substances like nottles
    4. Necter glands of flowers.
    5. Glands secreting enzymes such as found in insectivorous plants.

2-Internal glands Some important examples of internal glands are as follows:

* + 1. Oil glands which secrete aromatic oils or volatile oils such as found in orange and lemon fruits and leaves
    2. Mucous secreting glands as found in the leaves of betel (pan)
    3. Glands secreting resins, tannins etc. as found in babool, pine, catechu etc.
    4. Digestive glands secreting enzymes
    5. Water secreting glands

**Second \\ Lactiferous tissues**

in these tissues, long thin walled, branched cells are present. They produce white milk like secretion called **Latex**. When the plant or any part of it is injured, the latex flows out. Latex is an emulsion of protein, carbohydrate, enzyme, rubber etc. The milk of papaya and opium are examples of latex. There are two types of laticiferous tissue.

* + 1. Latex vessels these are formed by the joining of many cells. This is found in the plants of sunflower family.
    2. Latex cells these are isolated cells. They are branched. These type of cells found in *Nerium* and *Vinca*
    3. 