UNIT 18

ORGANIZATION OF TISSUES

INTRODUCTION:

- Unicellular organisms like bacteria and protozoans are made of single cells.
- Multicellular organisms, like higher plants and animals, are composed of millions of different types of cells that are grouped into different levels of organization.
- Multicellular organisms have specialized cells, tissues, organs and organ systems that perform specific functions.
- Group of cells positioned and designed to perform a particular function is called a **tissue.**
- An organ is a structure made up of a collection of tissues that carry out specialized functions.
- For example, in plants the root, stem and leaves are organs, whereas xylem andphloem are tissues**.**
- In animals, stomach is an organ that consists of tissues made of epithelial cells, glandcells and muscle cells. .

PLANT TISSUES

- Plants are made up of vegetative and reproductive tissues.
- Plant tissues are classified into two types namely

I. MERISTEMS OR MERISTEMATIC TISSUE

II. PERMANENT TISSUES

MERISTEMATIC TISSUES (MERISTEMS)

- The term '**meristem'**is derived from the **greek** word **Meristos'** which means divisible or having cell division activity'
- Meristematic tissues are group of immature cells that are capable of undergoing cell division.
- In plants, meristem is found in zones where growth can take place**.**

Example: apex of stem,root, leaf primordia, vascular cambium, cork cambium, etc.,

CHARACTERISTIC FEATURES OF MERISTEMATIC TISSUE:

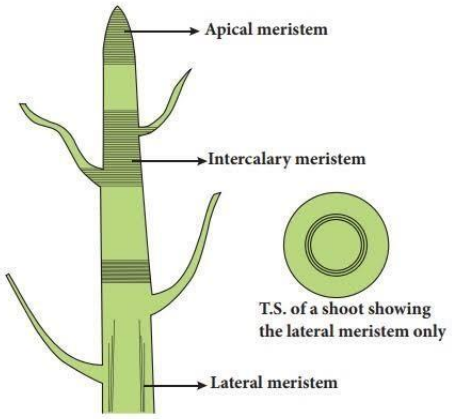
a) They are living cells.

b) Cells are small, oval, polygonal or round in shape.

c) They are thin walled with dense cytoplasm, large nuclei and small vacuoles. They undergo mitotic cell division.

d) They do not store food materials.

Longitudinal section of shoot apex showing location of meristems and young leaves



TYPES OF MERISTEMS BASED ON POSITION

On the basis of their position in the plant, meristems are of three types:

- **Apical meristem**
- **Intercalary meristem**
- **Lateral meristem.**

Apical meristem:

These are found at the apices or growing points of root and shoot and bring about increase in length.

Intercalary meristem:

It lies between the region of permanent tissues and is part of primary meristem. It is found either at the base of leaf (e.g. pinus) or at the base of internodes (e.g. grasses).

Lateral Meristem:

These are arranged parallel and causes the thickness of the plant part.

B. FUNCTIONS

Meristems are actively dividing tissues of the plant, that are responsible for **primary** (elongation)and **secondary** (thickness) growth of the plant.

PERMANENT TISSUES

Permanent tissues are those in which, growth has stopped either completely or for the time being**.**

At times, they become meristematic partially or wholly.Permanent tissues are of two types

- **Simple tissue**
- **Complex tissue**.

A. Simple Tissues

Simple tissues are homogeneous tissues composed of structurally and functionally similar cells.

Example

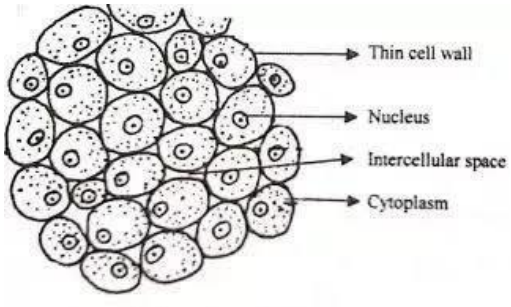
- **Parenchyma,**

- **Collenchyma**
- **Sclerenchyma.**

PARENCHYMA

- Parenchyma are simple permanent tissues composed of living cells.
- Parenchyma cells are thin walled, oval, rounded or polygonal in shape with welldeveloped spaces among them.

A typical parenchyma tissue



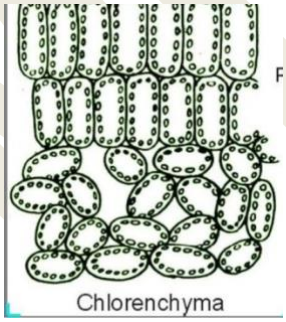
In aquatic plants, parenchyma possesses intercellular air spaces, and is named as **Aerenchyma.**

When exposed to light, parenchyma cells may develop chloroplasts and are known as **Chlorenchyma.**

FUNCTIONS OF PARENCHYMA

Parenchyma may store water in many succulent and xerophytic plants. It also servesthe functions of storage of food reserves, absorption, buoyancy, secretion etc.,

COLLENCHYMA

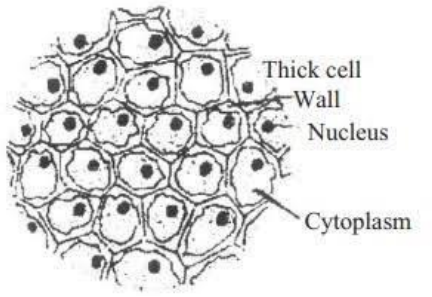


- Collenchyma is a living tissue found beneath the epidermis. Cells are elongated withunevenly

thickened non-lignified walls

- Cells have rectangular oblique or tapering ends and persistent protoplast. Theypossess thick primary non-lignified walls.
- They provide mechanical support for growing organs

Collenchyma tissue



SCLERENCHYMA:

- Sclerenchyma consists of thick walled cells which are often lignified.
- Sclerenchyma cells are dead and do not possess living protoplasts at maturity.
- Sclerenchyma cells are grouped into **fibres and sclereids.**

FIBRES

- Fibres are elongated sclerenchymatous cells, usually with pointed ends.
- Their walls are lignified.
- Fibres are abundantly found in many plants.

The average length of fibres is **1 to 3mm**, however in plants like *Linumusitatissimum*(flax) *Cannabis sativa* (hemp) and *Corchoruscapsularis*(jute), fibres are extensively longer,ranging from **20 mm to 550mm.**

SCLEREIDS.

- **Sclereids** are widely distributed in plant body
- They are usually broad, may occur in single or in groups.
- Sclereids are isodiametric, with liginified walls.
- Pits are prominent and seen along the walls.
- Lumen is filled with wall materials.
- Sclereids are also common in fruits and seeds