TISSUES

CLASSIFICATION OF PLANT TISSUE



1. MERISTEMATIC TISSUE

• Meristematic cells shows following characteristics.

- (i) Spherical or polygonal.
- (ii) less inter-cellular spaces are present or they are absent.
- (iii) Protoplasm is dense, with large, prominent nucleus and small vacuoles (vesicles).
- (iv) Cell wall is made up of thin cellulose.
- (v) Metabolically active.
- (vi) Divide throughout plant life. (vii) On the basis of origin meristem are of two types
- On the basis of location meristem are of three types:



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2. PERMANENT TISSUE:

• The permanent tissues are composed of those cells which have lost their capability to divide.

- May be living or dead at maturity.
- On the basis of composition these are of two types.



A. Simple permanent tissues:

Homogenous masses of cells. Made up of only one type of cells. These are of three types -

(i) Parenchyma -

- Living tissue.
- Cells are iso-diametric, oval or polygonal in shape with small nuclei. Loosely packed cells with inter cellular spaces.
- Cell wall is made up of thin cellulose.
- Cells are metabolically active having small nuclei.
- Provides support to plants and store food.
- In stems and roots, these cells stores nutrients and water.
- Found in cortex of roots, ground tissue of stem, mesophyll of leaves, pith, medullary rays, packing tissue in xylem and phloem

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(ii) Collenchyma:

- Living elongated cells, cell wall has deposition of cellulose, pectin & hemi-cellulose.
- At the corner of cells irregular thickenings are present. So, inter-cellular spaces are absent or narrow.
- Allows easy bending of various parts of a plant like leaf, stem without breaking thus provide tensile strength to plant parts.
- Also provide mechanical support to plant.
- Found in leaf stalks below the epidermis, in hypodermis region of cortex, in mid rib of leaves, petioles of dicot plant.
- Absent in roots and monocot plants.

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(iii) Sclerenchyma:

• Dead, long and narrow cells, with greatly thickened walls due to the deposition of lignin and cellulose.

- Make plant hard and stiff.
- Due to thick cell wall, there is no intercellular spaces between the cells.
- Pits are present over the cell wall.
- Provides strength and mechanical support to the plant parts.
- They are found in stem, root, veins of leaves, hard covering of seeds and nuts.
- Husk of a coconut is made up of sclerenchyma.
- Cells have lumen inside.
- These are of two types:



B. Complex permanent tissue:

• Made up of more than one types of cells. All these cells co-ordinate to perform a common function.

• Heterogeneous mass of the cells.

These are of two types:

(i) Xylem or wood

- Consist of four types of cells, which are:
- (a) Xylem tracheid
- (b)Xylem vessel
- (c) Xylem Parenchyma
- (d)Xylem Fiber

(a) Xylem tracheid –



- Elongated, dead cells with tapering ends with narrow lumen.
- Cell wall with lignin deposition and pits.
- About 1 mm in length and made of up single cell.
- Main water conduction element in Pteridophytes and Gymnosperms.

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(b) Xylem vessel -



• Made up of row of cells placed one above the other with out intervening walls absent due to dissolution.

- Long, dead, tube-like structures with broad ends and wider lumen.
- Cell wall with lignin deposition and pits.
- Mainly found in Angiosperm.

(c) Xylem Parenchyma –



- Living, parenchymatous cells with cellulose cell wall.
- Store food and helps in the sideways conduction of water and minerals.

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(d) Xylem Fibres -

- Provide support.
- Elongated, dead sclerenchymatous with higly lignified cell wall & bear narrow lumen.
- Provide mechanical support.

(ii) Phloem -

• Also known as bast because phloem fibres of some plants like Jute, Flax and Hemp are used for binding purposes.

• Made up of four types of elements.

(a) Sieve tubes :

- Elongated, thin walled tube like cells with sieve plates at the ends.
- Living cells but nuclei absent
- Placed one above the other.
- Responsible for conduction of food from leaves to other parts of plants.

(b) Companion cells -

- Living, parenchymatous cells, associated with sieve tubes.
- Cell with thin cell wall, dense cytoplasm and prominent nucleus.
- Found only in Angiosperms.
- Its nucleus control metabolic functioning of sieve tubes

(c) Phloem Parenchyma -

- Living, Parenchymatous cells.
- Helps in storage of food.
- Absent in most of monocot and herbaceous dicots.

(d) Phloem Fibers -

- Dead, elongated, sclerenchyma cells.
- Provide mechanical strength.
- Is the only dead phloem element

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• Phloem helps in translocation of food in both direction i.e. upward and downward. It transports foods from leaves to various parts of the plant

PLANT TISSUE SYSTEM

- Various tissues in plants forms tissue system, which are of three types -
- (1) Epidermal tissue system
- (2) Ground or fundamental tissue system
- (3) Vascular or conductive tissue system

1. Epidermal Tissue System:

- Outermost layer of cells.
- Epidermis makes outer covering of plant body.
- In xerophytes, epidermis remain covered by thick cuticle.

• In aerial parts of plant, epidermal cells secrete a waxy, water resistant layer on outer surface, which provide protection against loss of water, mechanical injury and invasion by parasitic fungi.

• In epidermis of leaf, small pores or stomata are present, enclosed by two kidney shaped guard cells in dicot plants, which regulate opening and closing of stomata. Epidermal cells surrounding guard cells are called subsidiary cell

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- Stomatal pore, guard cells and subsidiary cells together form stomatal complex.
- Stomata help in gaseous exchange and transpiration.

Cork or Phellem:

- In old plants, the epidermis of the stem is replaced by a strip of secondary meristem, and forms the several-layer thick cork or the bark of the tree.
- The cells of cork are dead and compactly arranged without intercellular spaces.
- Their cell wall contain suberin that makes cork cells impervious to gases and water.
- Cork is protective in function.

2. Ground or Fundamental tissue system -

- Forms major part of plant body, made up of mostly parenchyma cells.
- Forms cortex, endodermis, pith, medullary rays of plant body.

3. Vascular tissue system -

- Made up of xylem and phloem.
- Group of xylem and phloem is called vascular bundle.
- Helps in conduction of water and minerals and in translocation of food.
- If cambium is present between xylem and phloem, such then the vascular bundles are called open, found in dicot plants and responsible for secondary growth.

• If cambium is absent between xylem and phloem, then the vascular bundles are called closed type, found in monocot plants.