CONCEPT MAP

SIMPLE PERMANENT TISSUES

Tissues can be defined as a group of cells having a common origin that interact with one another to perform a similar function. Plants are formed of two types of tissues, on the basis of tissues and on the basis of ability of cells to divide, *i.e.*, **Meristematic** (divide indefinitely) and **Permanent.** Permanent tissues are those plant tissues that have lost the capacity to divide and attain a permanent shape, size and function due to morphological, biochemical and physiological differentiation. Based on the composition, permanent tissues can be **simple** or **complex**.
Simple permanent tissues are made up of structurally similar cells that carry out the common function.

There are three types of simple permanent tissues

PARENCHYMA

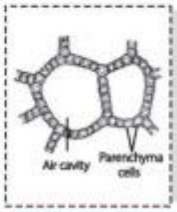
- Most abundant and common tissue of plants.
- Composed of thin walled, isodiametric cells that may be oval, rounded or polygonal in outline.
- Cell wall is cellulosic and encloses a large central vacuole and a peripheral cytoplasm containing nucleus.
- Cells may be closely packed or have small intercellular spaces between them.
- Cells form symplasm or living continuum as they connect with the adjacent parenchyma cells by plasmodesmata.
- It is usually used for storage of food and provides turgidity to softer parts of plants.
- It may be variously modified to perform special functions.

Prosenchyma

Fibre like elongated parenchyma with slightly thick walls.
Function: Provides rigidity and strength.

Idioblasts

The non-green, large sized parenchyma cells possessing inclusions or metabolic waste products like resins, tannins, crystals of calcium carbonate, calcium oxalate, etc.



Aerenchyma

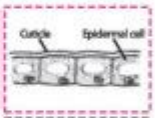
The parenchyma in hydrophytes and some land plants get specialised to form network of parenchyma cells, enclosing large intercellular spaces filled with air *i.e.*, air cavities called as aerenchyma.
Function: Stores air or gases that helps in making aquatic plants light and buoyant.

Phloem parenchyma

Thin walled, elongated parenchymatous cells having abundant plasmodesmata.
Function: Stores food, resins, mucilage, latex, etc., as well as help in lateral conduction of food.

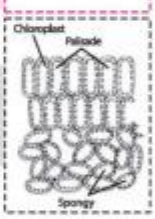
Cutinised parenchyma

The parenchymatous cells become cutinised to form a distinct protective covering or layer called **epidermis**.
Function: Checks excessive loss of water due to transpiration and protects inner soft parts.



Chlorenchyma

Chloroplast containing parenchymatous cells. It is also called assimilatory parenchyma since it performs photosynthesis. It is differentiated into two types: palisade (columnar in shape) and spongy (round in shape).

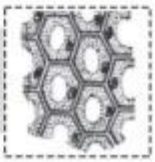


Storage parenchyma

Parenchyma sometimes get specialised by becoming enlarged and enclosing large vacuole. They are usually colourless.
Function: Stores food, water, mucilage or ergastic substances.

Xylem parenchyma

These are small and thick walled parenchymatous cells having simple pits.
Function: Helps in lateral conduction of water or sap and storage of food.



COLLENCHYMA

- Simple, living mechanical tissue, usually present in hypodermal regions of plant part or organs.
- Cells are conspicuous, elongated and are circular, oval or angular in transverse section.
- Each cell encloses a large central vacuole and a peripheral cytoplasm with chloroplasts often present.
- The cell wall have uneven pectocellulosic thickenings, a characteristic feature of collenchyma.

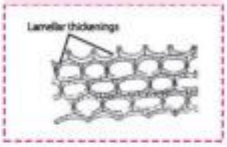
Functions:

- Provides both mechanical strength and elasticity to young dicot stem, petioles and leaves.
- Provides flexibility to organs and allow bending, e.g., in *Cucurbita* stem and prevents tearing of leaves.
- Permits growth and elongation of organs.
- Stores food and performs photosynthesis when chloroplasts are present.

Depending upon thickening, the collenchyma is of three types:

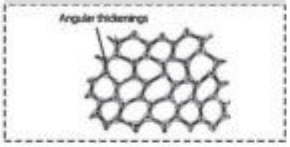
Lamellar collenchyma

- Cells are compactly arranged in rows.
- The cells have thickenings on tangential walls, e.g., stem of sunflower.



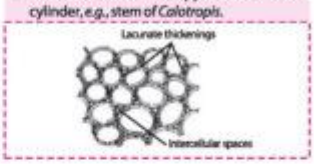
Angular collenchyma

- Most common type of collenchyma.
- Cells are irregularly arranged.
- Cell wall have thickening in the corners or angles and therefore intercellular spaces are absent, e.g., stem of *Datura*, tomato.



Lacunar collenchyma

- Cells are irregularly arranged, hence intercellular spaces are present.
- Thickenings are present on cell wall around intercellular spaces, such thickenings are called lacunate thickenings.
- The thickened cell wall appears as a hollow cylinder, e.g., stem of *Calotropis*.



SCLERENCHYMA

- Widely distributed, simple mechanical tissue.
- Comprises of dead and empty cells with highly thickened cell walls having little or no protoplasm.
- The lumen or cell cavity is narrow or highly reduced and sometimes obliterated (closed).
- The wall thickenings are made up of cellulose and lignin and may have few to numerous pits.

Sclerenchyma fibres

- Highly elongated, narrow, spindle shaped, thick walled cells with pointed or oblique end walls.
- Fibres occur in longitudinal bundles with the ends of adjacent fibres being interlocked to form a strengthening tissue.
- These are dead and empty at maturity with the exception in *Tamarix aphylla*, where fibres are living.

On the basis of length of cells, they may be of two types:

Types of Fibres

Wood fibres
Fibres associated with secondary xylem tissues and are derived from vascular cambium. Also called xylary or intraxylary fibres.

- **Libriform fibres** — Long and narrow fibres with slightly lignified secondary walls, having simple pits.
- **Fibre tracheids** — Comparatively shorter fibres with moderate secondary thickenings in the cell walls, having bordered pits.

Bast fibres or extraxylary fibres
Long fibres with lignified walls having simple or bordered pits. Found in cortex, pericycle and phloem.

Surface fibres
Arise from the surface of plant organs, e.g., cotton fibres from testa of seeds, mesocarp fibres of coconut.

Sclereids

- Broader and shorter than fibres, ranging from isodiametric, polyhedral, spherical, oval, short or cylindrical cells.
- Highly thickened dead cells with very narrow cavities and may have branched or unbranched simple pits.
- Occur either singly or in groups and impart stiffness to regions, where they are present.

Types of Sclereids

Brachysclereids
Isodiametric, short and unbranched cells with ramiform pits. Abundantly present in soft parts like cortex, phloem, flesh of fruits, e.g., guava, pear, apple, etc. Also called **stone cells**.

Osteosclereids
Bone shaped sclereids with rod like enlarged or lobed ends. Found in leaves and sub-epidermal covering of leguminous seeds, e.g., *Phaseolus*

Macrosclereids
Slightly elongated and columnar rod shaped cells. Form epidermal covering of leguminous seeds such as pea and bean.

Filiform sclereids
Fibre like, sparingly branched sclereids. Found in leaves of *Olea*.

Astrosclereids
Star like, stellate sclereids having lobes. Found in leaves and petioles of aquatic plants, e.g., *Nymphaea*.