

# CONCEPT MAP

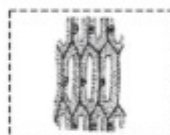
## SIMPLE PERMANENT TISSUES

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.

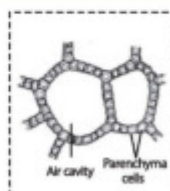


#### Prosenchyma

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

#### Idioblasts

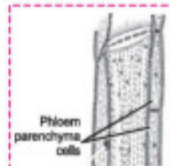
The non-green, large sized parenchyma cells possessing inclusions or metabolic waste products like resins, tannins, crystals of calcium carbonate, calcium oxalate, etc.



#### 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.



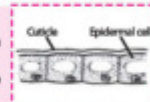
#### Phloem parenchyma

Thin walled, elongated parenchymatous cells having abundant plasmodesmata.

**Function:** Stores food, resins, mucilage, latex, etc., as well as help in lateral conduction of food.

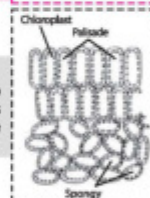
#### Cutinised parenchyma

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.



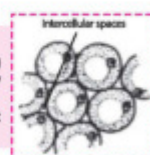
#### Chlorenchyma

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).



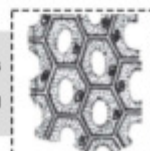
#### Storage parenchyma

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.



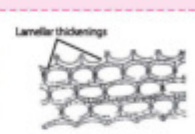
### COLLENCHYMA

- 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:

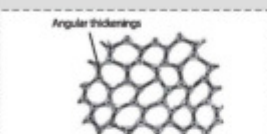
#### Lamellar collenchyma

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



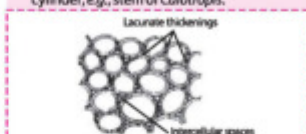
#### Angular collenchyma

- 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:

#### 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**.



#### 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*.



#### Wood fibres

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

#### 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.

Types of 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.