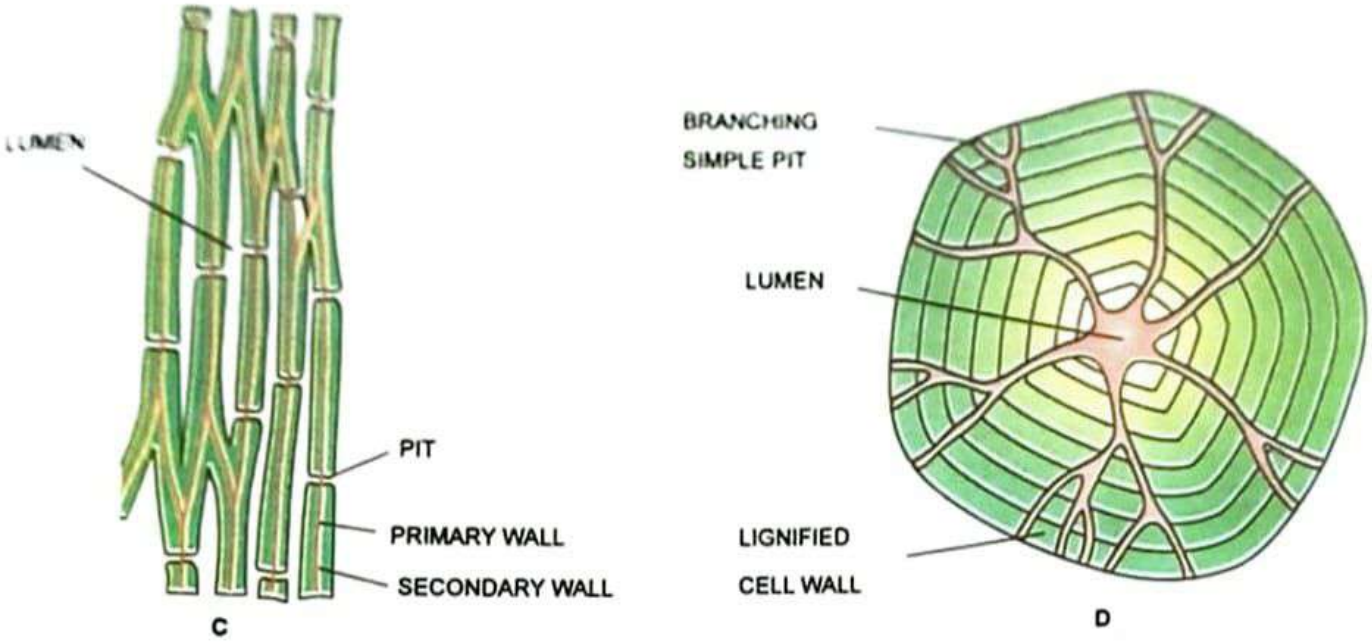

Fig. 5B. Simple permanent tissue. C. Sclerenchyma (Fibres); D. Sclereid.

Table 5. Differences between xylem and phloem.

Characters	Xylem (Wood)	Phloem (Bast)
1. Components	Tracheids, tracheae (vessels), xylem parenchyma and xylem sclerenchyma (fibres).	Sieve tube cells, companion cells, phloem parenchyma and phloem fibres.
2. Function	Upward conduction **(unidirectional)** of water and minerals.	Upward and downward **(bidirectional)** conduction of organic food.

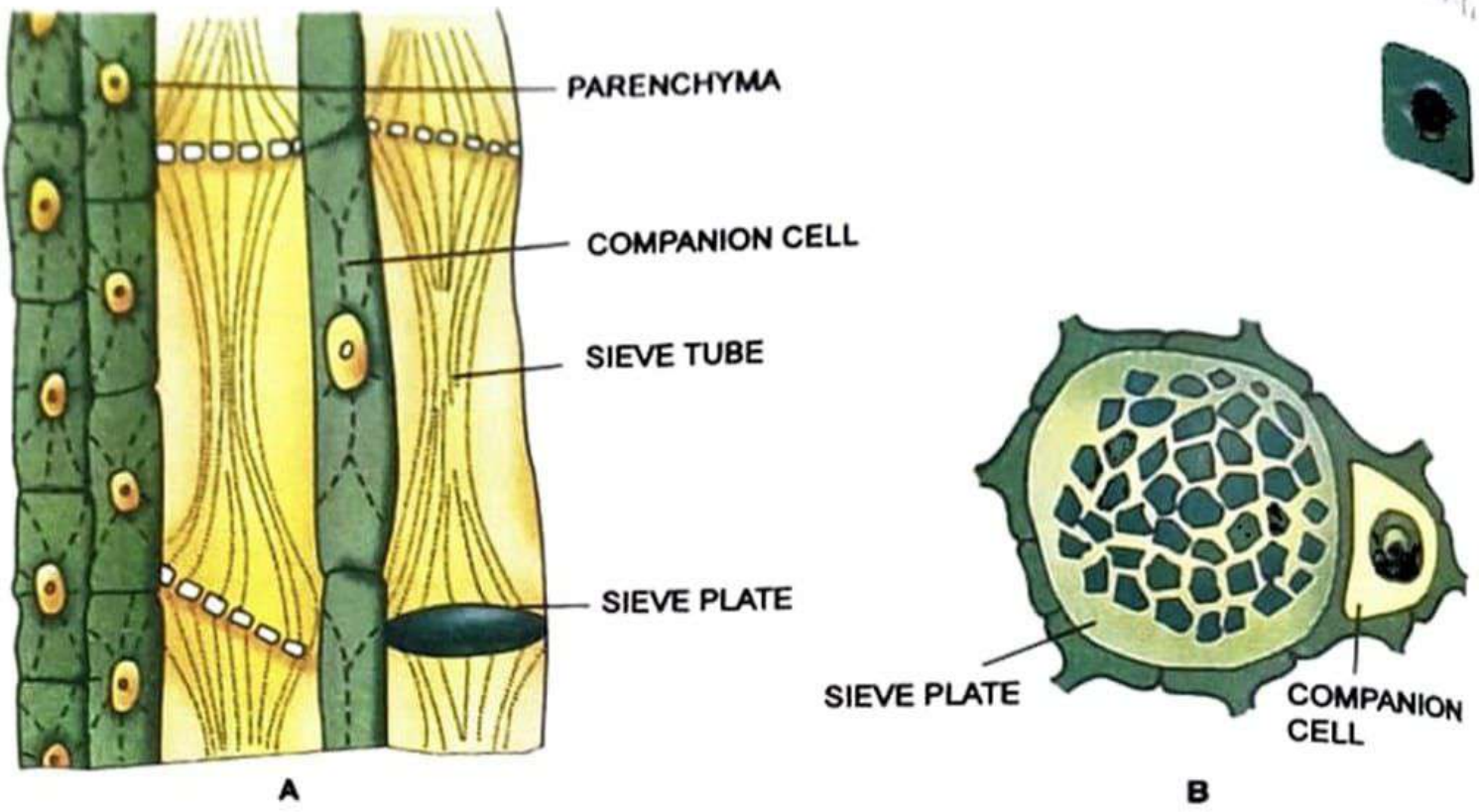

Fig. 10. Phloem tissue. **A.** Longitudinal section; **B.** Transverse section.

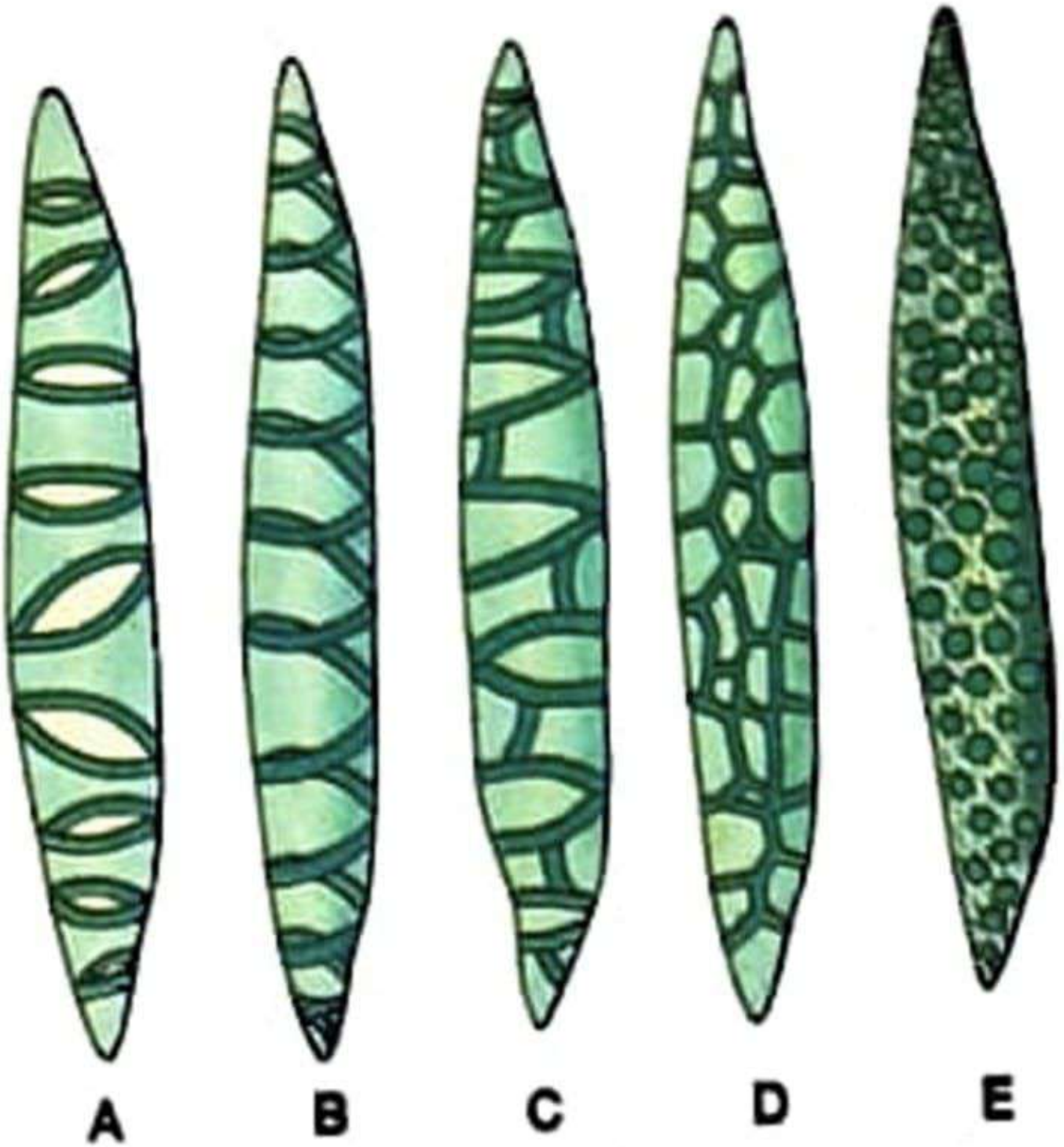

Fig. 9. Five types of lignifications on tracheids. A. Annular; B. Spiral; C. Reticulate; D. Scalariform; E. Pitted.

Table 4. Differences between tracheids and vessels.

Characters	Tracheids	Vessels
1. Cellular nature and size	Unicellular and small sized.	Multicellular and long sized
2. Occurrence	Found in pteridophytes (ferns), gymnosperms and a few angiosperms.	Found only in angiosperms.
3. End wall	Tapering ends and are intact.	Dissolved completely or is perforated.

Table 3. Three types of simple permanent tissues (Fig. 5).

Characters	Parenchyma (Gr. *para* = beside; *enchyma* = in filling)	Collenchyma (Gr. *kolla* = glue)	Sclerenchyma (Gr. *sclera* = hard)
1. Shape	Oval or rounded or polygonal and isodiametric. Usually loosely packed.	Prismatic or elongated with pointed ends.	Isodiametric or elongated fibre-like.
2. Nature of cells	Thin walled and living.	Thick walled and living.	Thick walled and dead.
3. Nature of cell wall	Only of cellulose and is not deposited with pectin or lignin so no pits are present. There are large intercellular spaces. Cells have large central vacuole.	Cell wall is thick as is **pectinised** at the corners. Pectin is unequally deposited so pits are present in the cell wall. There are very little intercellular spaces	Cell wall is thick as is **lignified**. Lignin is unequally deposited so pits are present in the cell wall. There are no intercellular spaces.
4. Occurrence	Most abundant type of permanent tissue of plants and is found in softer tissues *e.g.* epidermis, cortex, endodermis, pericycle and pith of root, stem, mesophyll of leaf, flower and fruit.	Forms **hypodermis** (below epidermis) **of dicot stem** (*e.g.* sunflower), and also found in midrib and leaf stalks of the leaves.	Forms **hypodermis of monocot** stem, husk of coconut, covering of seeds and nuts, in the veins of leaves, around vascular bundles, etc.
5. Functions	Primarily helps in storage of food (*e.g.* starch grains in the parenchymal cells of potato tuber). It also provides **support** to the stem of herbaceous plants. It acts as **packing tissue** between the specialized tissues.	Primarily for mechanical support (tensile strength) and elasticity (**flexibility**). So allow bending of leaves, stem, etc. without their breaking	Primarily for mechanical support (**chief mechanical tissue**), so enables the plant to resist various strains.