Complex Tissues

The complex tissues are heterogeneous in nature, being composed of different types of cell elements. The latter remain contiguous and form a structural part of the plant, adapted to carry on a specialised function.

Xylem and phloem are the complex tissues which constitute the component parts of the vascular bundle. They are also called vascular tissues.

- **xylem**: a vascular tissue in land plants primarily responsible for the distribution of water and minerals taken up by the roots; also the primary component of wood
- **phloem**: a vascular tissue in land plants primarily responsible for the distribution of sugars and nutrients manufactured in the shoot

Xylem:

Xylem is a complex tissue forming a part of the vascular bundle. It is primarily instrumental for conduction of water and solutes, and also for mechanical support. Primary xylem originates from the procambium of apical meristem, and secondary xylem from the vascular cambium. As a complex tissue it consists of different types of cells and elements, living and non-living.

Tracheid:

Tracheid, in botany, primitive element of xylem (fluid-conducting tissues), consisting of a single elongated cell with pointed ends and a secondary, cellulosic wall thickened with lignin (a chemical binding substance) containing numerous pits but having no perforations in the primary cell wall. At functional maturity, the cell is dead and empty; its former protoplast is represented, if at all, by a warty layer on the wall. Tracheids serve for support and for upward conduction of water and dissolved minerals in all vascular plants and are the only such elements in conifers and ferns.

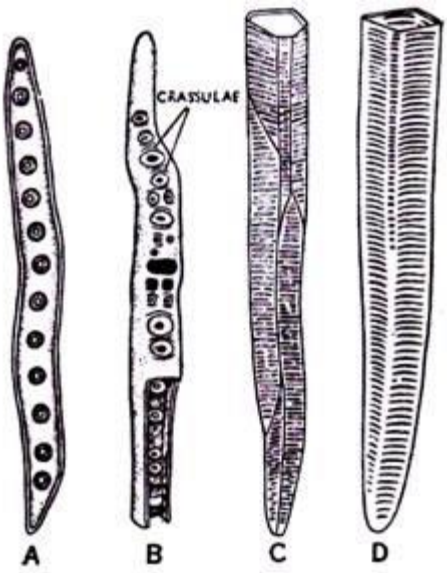

Fig. 538. Tracheids. A. A tracheid with bordered pits. B. A part showing bordered pits with crassulae. C & D. Parts with scalariform thickening.

Vessel: **Vessel**, also called **trachea**, in botany, the most specialized and efficient conducting structure of xylem (fluid-conducting tissues). Characteristic of most flowering plants and absent from most gymnosperms and ferns, vessels are thought to have evolved from tracheids (a primitive form of water-conducting cell) by loss of the end walls.

Xylem Fibres:

Some fibres remain associated with other elements in the complex tissue, xylem, and they mainly give mechanical support. As previously stated, fibres are very much elongated, usually dead cells with lignified walls. Xylem fibres or wood fibres are mainly of two types: fibre-traeheids and libiriform fibres which usually intergrade, so much so that it is difficult to draw a line of de-marcation between them. Fibre-tracheids, as already reported, are intermediate forms between typical fibres and tracheids; they possess bordered pits, though the borders are not well-developed. Libiriform fibres ate narrow ones with highly thickened secondary wall.The central lumen is almost obliterated and pits are simple. They resemble the phloem fibres, and hence the name. They occur abundantly in many woody dicotyledons.

Xylem Parenchyma:

Living parenchyma is a constituent of xylem of most plants. In primary xylem they remain associated with other elements and derive their origin from the same meristem. In secondary xylem parenchyma occurs in two forms: xylem parenchyma is somewhat elongate cells and lie in vertical series attached end on end; ray parenchyma cells occur in radial transverse series in

many woody plants. Parenchyma is abundant in the secondary xylem of most of the plants, excepting a few conifers like Pinus, Taxus and Araucaria. These are the only living cells in xylem. The cells may be thin-walled or thick-walled. If lignified secondary wall is present, the pit-pairs between the cells and the adjacent xylem element may be bordered, half-bordered or simple. Between two parenchyma cells the pit is obviously simple. These cells are particularly meant for storage of starch and fatty food; other matters like tannins, crystals, etc., may also be present. As a constituent part of xylem they are possibly involved in conduction of water and solutes and mechanical support.

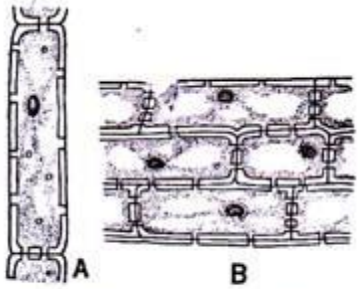

Fig. 541. Xylem Parenchyma.
A. Parenchyma. B. Ray cells.