The tissue that supports a plant and their growing organs against any deformation and provides mechanical strength is termed as mechanical tissue. Haberlandt (1914) called the mechanical tissue as stereome. Schwendener in 1874 termed the mechanical cells (e.g. collenchyma, bast fibres and libriform fibres) as stereids. Schwendener is of opinion that stereids collectively constitute the stereome or the mechanical tissue system of plants.

Plant organs are to withstand various strains like stretching due to presence of large fruits, bending due to natural calamities like high wind and passing animals and downpour, heavy snow etc. To withstand these strains the cell wall provides mechanical strength in all cells, un-thickened or thickened, lignified or non-lignified. The cell walls of parenchyma, collenchyma and sclerenchyma provide mechanical rigidity to the plant.

The large size and structural strength of a woody plant is achieved by the cell wall, which contribute 95% of the dry weight of the wood. The non lignified wall derives strength from the cellulose microfibrils. The mechanical strength of plant cell walls is due to the presence of skeletal framework formed by cellulosic microfibrils. The cellulosic wall of wood is further strengthened by lignifications. In some species where cellulose is absent, other polysaccharides assume the strengthening role and may form microfibril. In some higher plants, the hemicellulosic xylans form long strands, which lie parallel to microfibrils. The lignin contributes strength in lignified walls. The strength is greatest in the direction parallel to the microfibrils in both types of cell walls. There are several layers in a cell wall and the orientation of microfibrils is different in each layer, so that it is enough strong to resist forces from any direction.

In un-thickened cells, the wall gives limited support but the strength is greatly increased when the outward pressure of the turgid cytoplasm supplements it. The hydrophytes, some herbs and the growing seedlings gain the mechanical rigidity from turgid parenchyma cells.

The orientation of microfibrils in the wall is of great importance to withstand the major mechanical stresses imposed by environment. In the stem parenchyma, the microfibrils are oriented transversely on the vertical walls so that the cells bend without breaking. In roots the microfibrils have helical orientation to resist extension forces.

Maximum strength is obtained from collenchyma and sclerenchyma. The wall of collenchyma cells is thickened by pectin, hemicellulose, protein and cellulose. Lignin is completely absent. The thickening materials are deposited mainly at the corners or at the tangential walls. In growing cells also, deposition occurs and the microfibrils show transverse and longitudinal orientation at different alternate layers. Collenchyma is living cell and retains its protoplast even when mature. So, it can regulate the deposition and orientation of wall materials according to the need of developing organs. The collenchyma cells, in addition to mechanical strength, also provide elasticity to the cell due to the presence of hydrated pectin on the wall.

Collenchyma (Figs. 13.1, 13.6) is one of the important mechanical cells of the growing organs and the mature organs of herbaceous plants. In stems it usually occurs just beneath the epidermis or is separated from epidermis by one or tow layered parenchyma cells. It occurs as a continuous cylinder or as individual bundle. Collenchyma cells are very conspicuous below the ridges in the petioles and stems.It may form a sheath around the entire vascular bundle of many plants (Esau, 1965). In leaves collenchyma occurs in the petiole and blade. In the latter it may be present in one or two sides of the vascular bundles forming prominent caps. Collenchyma cells also occur along the margins of a leaf thus making it tough and resistant to tearing.

The other important mechanical cell is sclerenchyma. It may be non-­conducting sclerenchyma and conducting sclerenchyma. The former includes sclereids and fibres. Sclereids give strength, resistance and inflexible protection in the organs where they occur. In stems they may occur just below the epidermis, on the periphery of vascular region and in the pith. Sclereids are also present in the leaves towards the ends of veinlet and termed as terminal sclereids. Sclereids are also present in fruits either singly or in clusters and in the epidermis of seed coat of Phaseolus, Pisum, Glycine etc.

Fibres add mechanical rigidity to the organ where they occur. The fibres may be extraxylary and xylary. The former fibres may occur uninterrupted just beneath the epidermis (e.g. Zea mays stem) or may be present in the ground tissue (e.g. Asparagus stem). They may be present in groups as isolated patches in the cortex (e.g. Pandanus root).

Phloem fibres occur both in the primary and secondary phloem. Fibres are conspicuous in monocotyledonous leaves. They may form bundle sheath and connect the vascular bundles with the upper and lower epidermis.

The xylary fibres and the conducting sclerenchyma, i.e. tracheary elements also add mechanical rigidity to the organ where they are present. Some tracheary elements that are present in branches and stems show special adaptation to resist the force of gravity and known as reaction wood. This **“reaction wood”** differs in structure and location from ordinary wood. In conifers, this wood is located at the lower side of branches to resist compression while in dicots it is present on the upper side to resist tension. In conifer reaction wood, the innermost layer of the secondary wall is usually absent.