

Plant biochemistry

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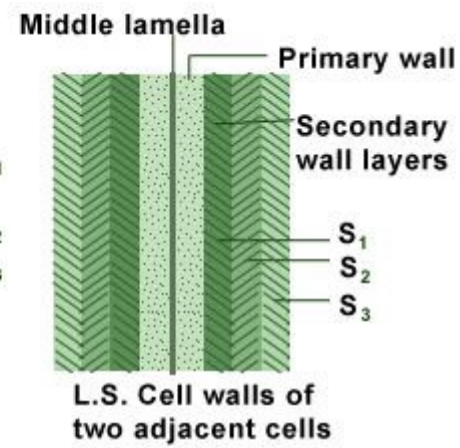
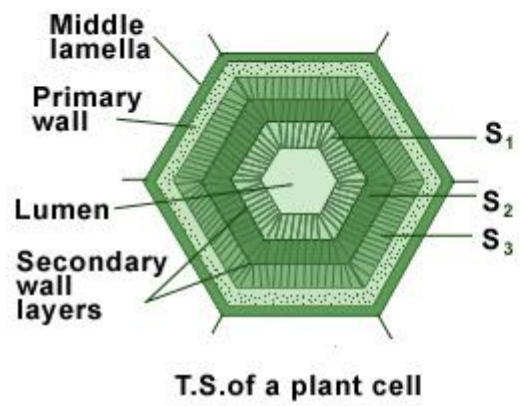
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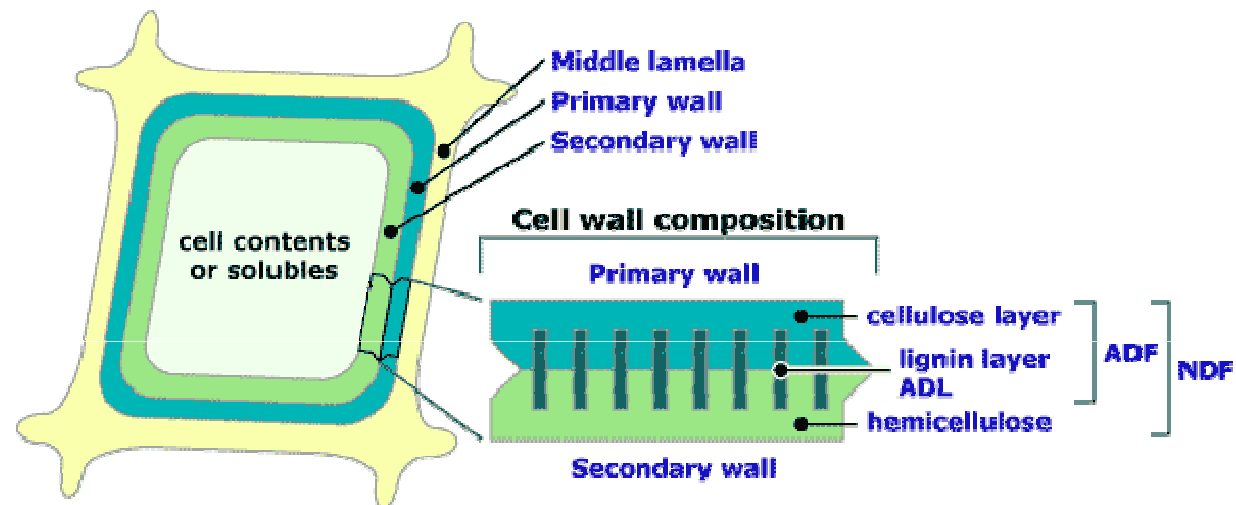
Department of Biochemistry



Cell wall

- Most plant cells possess a cell wall, and this feature distinguishes them from animal cells.
- The cell wall is a non-living structure which is formed by the living protoplast.
- It has supportive and protective functions.
- In a typical plant tissue, the cell wall consists of **three morphological layers** :
 - The middle lamella .
 - The primary cell wall .
 - The secondary cell wall .





- The secondary cell wall is usually deposited between the plasma and the primary cell wall .
- Three layers can be distinguished in the cell wall.
- Occasionally a tertiary cell wall may be present.

The middle lamella :

- is formed cell wall between adjacent cell walls during cell division .
- It is viscous and jelly –like substance .
- It acts as a cement material between the primary cell walls of adjacent cells .
- The middle lamella is composed of pectin, cellulose, calcium and polymers of various types.
- Pectin is hydrophilic colloidal substances .

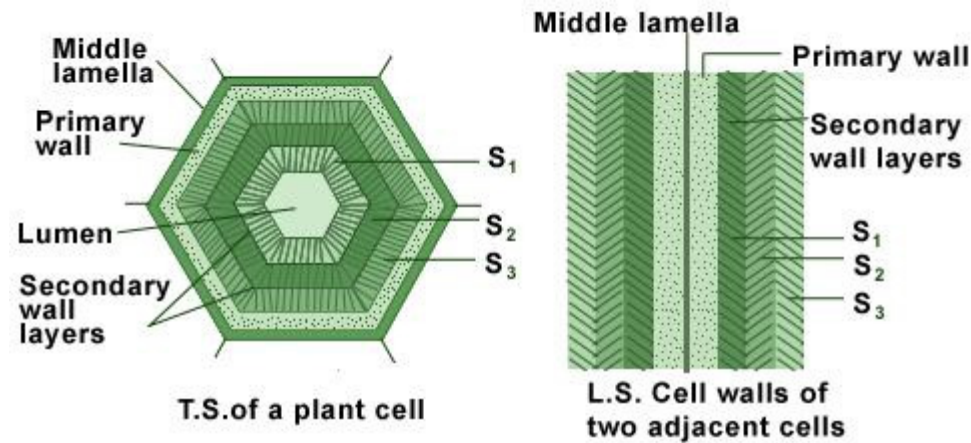
The Primary cell wall :

- Is formed during the early stage of growth and development .
- It is found in all plant cells and is 1-3 Mm thick .
- It is composed chiefly of cellulose , hemicellulose and pectic compounds.
- The primary cell wall is elastic, and undergoes extension with growth of the cell.

The Secondary cell wall :

- is laid down on the primary cell wall when the latter has finished its growth .
- it is found only in certain mature and highly specialized cells .
- it is about 5-10 Mm Thick .

- It has 3 layers the outer layer, the middle layer and the inner layer.



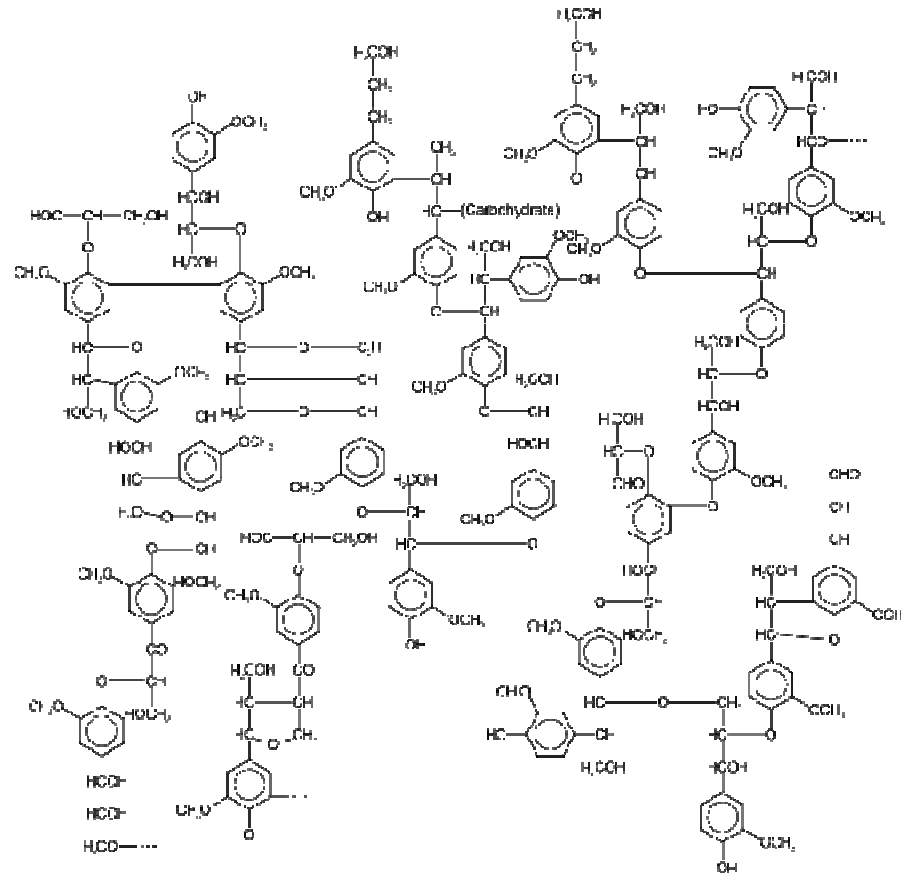
- when the primary cell wall becomes harder , it changes into secondary cell wall, sometimes the cell deposits new cell wall material to form secondary cell wall .
- The secondary cell wall coat channels (pits) which play an important role in maintaining temperature, Osmotic pressure, transporting different ions and nutrients .

- Since the matrix of the wall is a highly hydrated polysaccharide gel (The primary cell wall being 60% water by weight) , water , gases , and small water soluble molecules penetrate rapidly compared to the plasma membrane .
- In order of a plant cell to grow or change its shape, the cell wall has to stretch or deform. Because the cellulose microfibrils are highly inelastic, such changes must involve the movement of microfibrils past one- another.

Lignin :

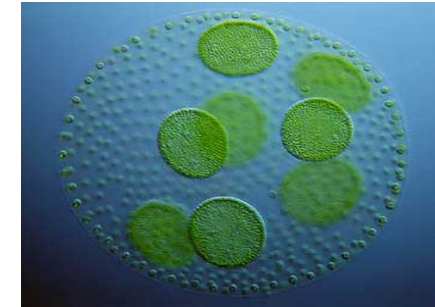
- Lignification occurs after the laying down of polysaccharide components of the wall and towards the end of the growing period of the cell .
- The term lignin covers a group of high molecular weight polymeric compounds .
- It's derived from carbohydrates and gives rigidity and strength to the cell wall .

lignin



- It's found in woody tissues .
- During the process of lignification, lignin is added to the matrix of the cell wall .
- The process of lignification starts with primary cell wall and extends to the middle lamella and secondary cell wall .

Algal cell walls



- Algal cell walls are built on the same pattern as those of higher plants in that they consist of microfibrils embedded in polysaccharide matrix .
- Most algae have cellulosic microfibrils but other have microfibrils composed of B 1-4 mannans or B 1-3 xylans .
- Algal cell walls are **never lignified** .
- They are built up many layers but these can't be subdivided into a primary and a secondary wall .