Cell Wall Thickening

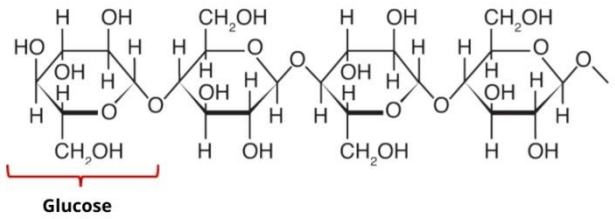
Components of the Cell Wall

The cell wall is chiefly composed of **insoluble polysaccharides**.

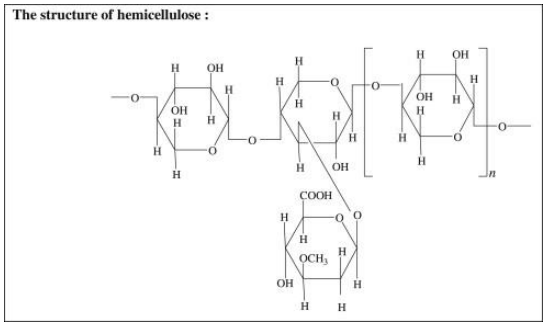
The most common constituent is **cellulose**. Certain other polysaccharides like **pectin**, **hemicellulose**, **lignin** and **xylan** may also be present.

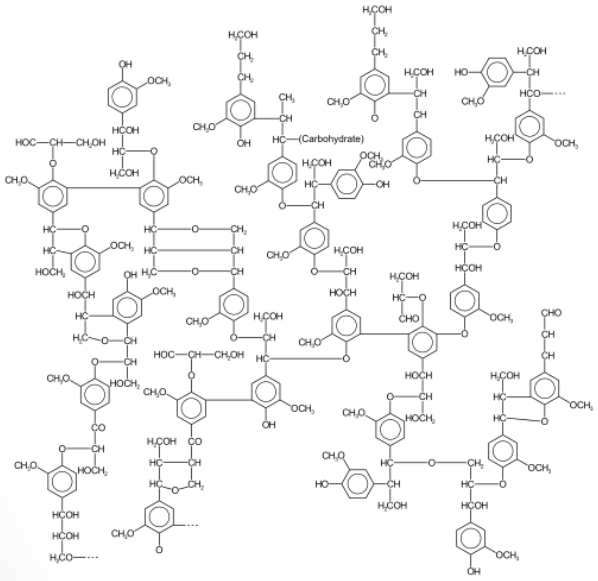
Cellulose is made of repeating molecules of glucose attached end to end in a b(1-4) linkage.

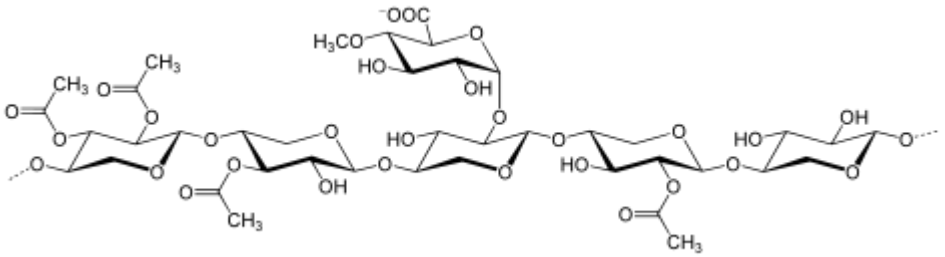
CELLULOSE STRUCTURE

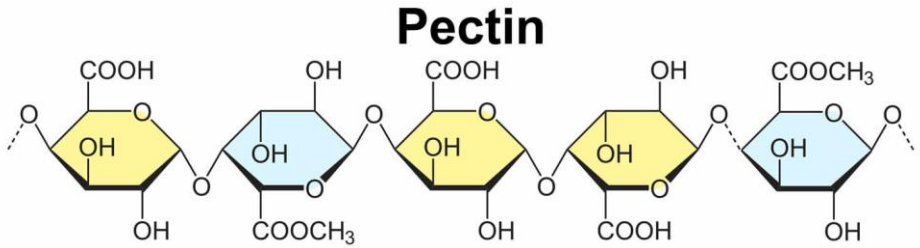


Amapex









- **The primary cell wall**

  - Generally a thin, flexible and extensible layer formed while the cell is growing.
  - In the primary cell wall **pectic** substances accompany the **cellulose** and **hemicellulose** in early stages.
  - The primary wall usually consists of a **single** layer. As cell enlargement begins, this membrane may become unevenly thickened. Here ***primary pit field or primordial pit*** may be formed.

- The young cell wall remains plastic and adaptable to changing volume. With the attainment of the final cell size, the primary cell wall takes on mature structure.

Plasmodesmata: protoplasmic connections between two adjacent cells, separated by the cell wall.

- **The secondary cell wall**
  - A thick layer formed inside the primary cell wall after the cell is fully grown. It is not found in all cell types.
  - The secondary cell wall is made up of one to many layers, most frequently **three.**
  - It is incapable of increase in area.
  - Secondary wall is mainly compose of **cellulose** or both the cellulose and hemicellulose .
  - In some cells (such as xylem), the secondary cell wall contains **lignin**, which strengthens and waterproofs the wall.
  - Cutin, suberin, tannin, oils and inorganic salts may also be found here.

These long and thin cellulose molecules are united into a "**Micro fibril**". These micro fibrils are arranged in a very regular, ordered arrangement and because of this they exhibit almost "crystalline" properties.

The micro fibrils form fine threads which may coil around one another like a cable. Each "cable" is called a "**Macrofibril**".

Call wall Thickening

The deposition of secondary wall material all around the cell is called cell wall thickening. The thickening is localized in certain areas of the cell wall in special pattern. it is due to the deposition of lignin in the inner side of cell wall.

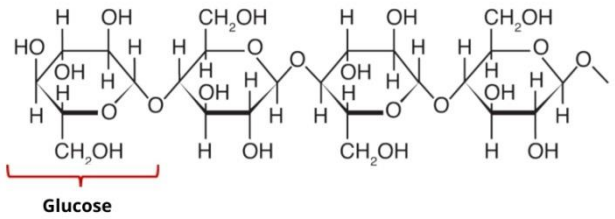
Components of the Cell Wall

The cell wall is chiefly composed of **insoluble polysaccharides**.

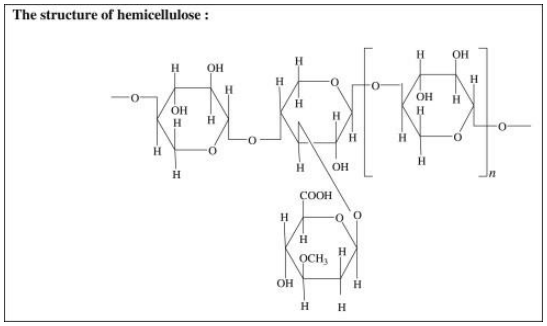
The most common constituent is **cellulose**. Certain other polysaccharides like **pectin**, **hemicellulose**, **lignin** and **xylan** may also be present.

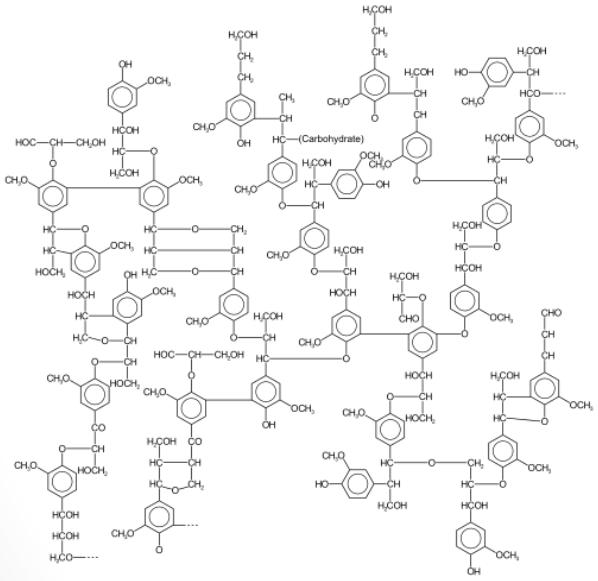
Cellulose is made of repeating molecules of glucose attached end to end in a b(1-4) linkage.

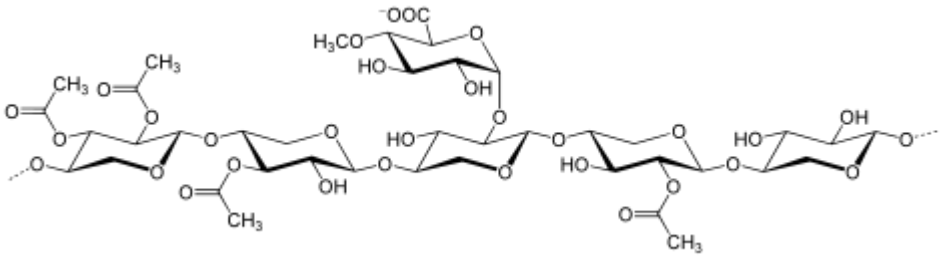
CELLULOSE STRUCTURE

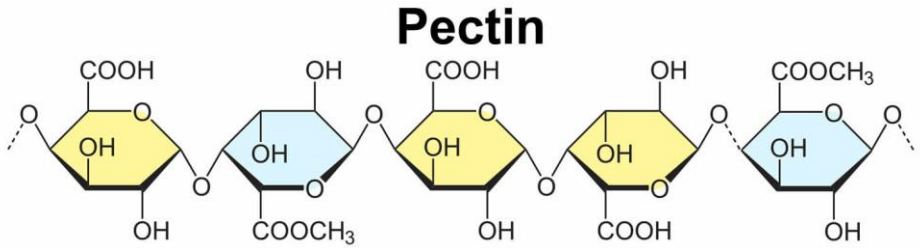


Amapex









Types of Thickening

Annular or ring like thickening

Rings of lignin are deposited one above the other in the interior of the original cell wall

Spiral Thickening

Thickening tales place in the form of spiral bands.

Scalariform Thickening

The lignin are deposited in the form of the steps of a ladder.

Reticulated Thickening

The thickening occurs in irregular fashion and a net like structure is formed

Pitted thickening

The deposition of secondary wall material is not uniform. At places it is discontinuous to enclose areas called pits. The pits may be simple or bordered with overhanging wall material.

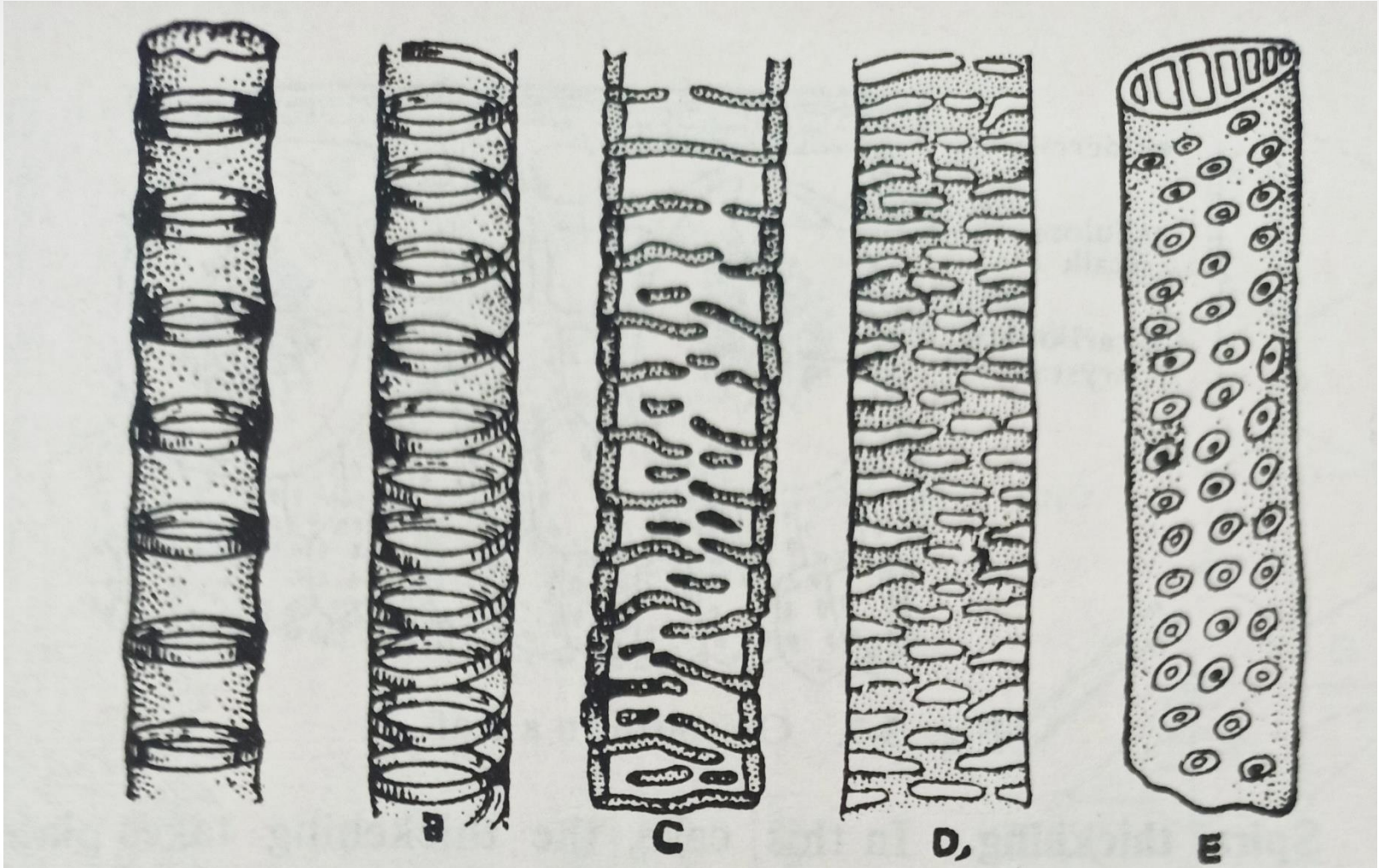


Fig. 3-5. Various types of thickenings. A—annular; B—spiral; C—scaleriform; D—reticulate and E—pitted.

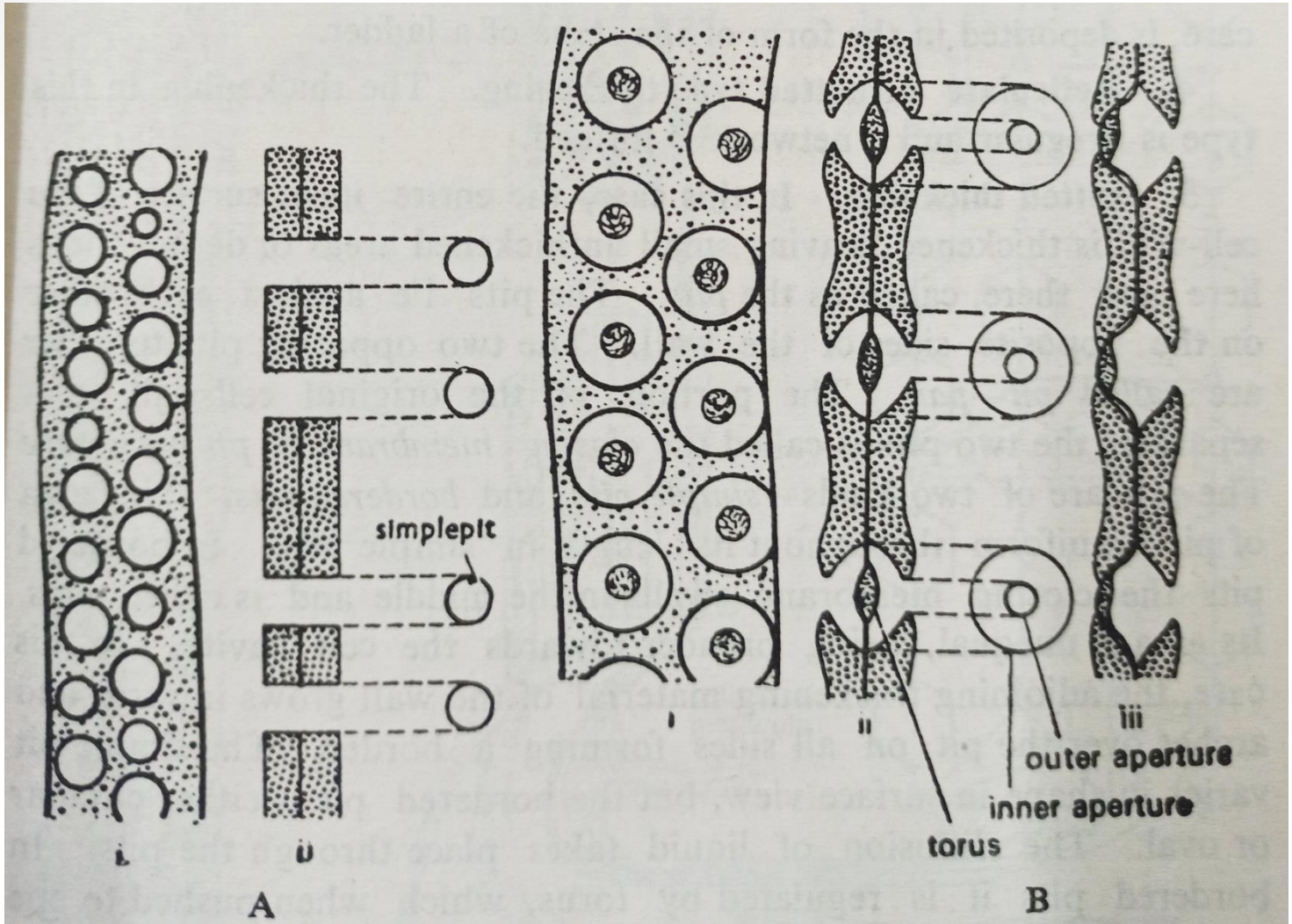
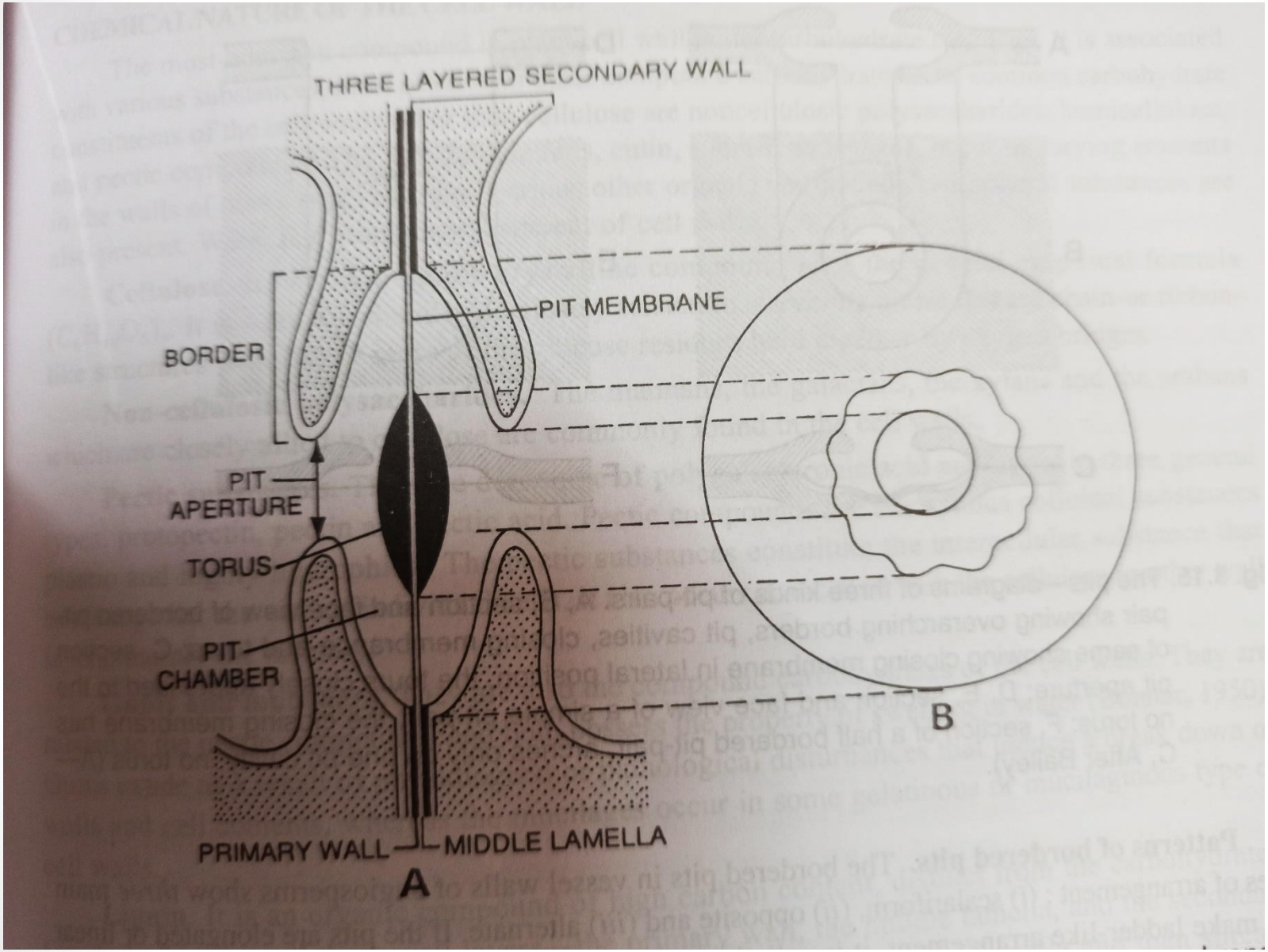
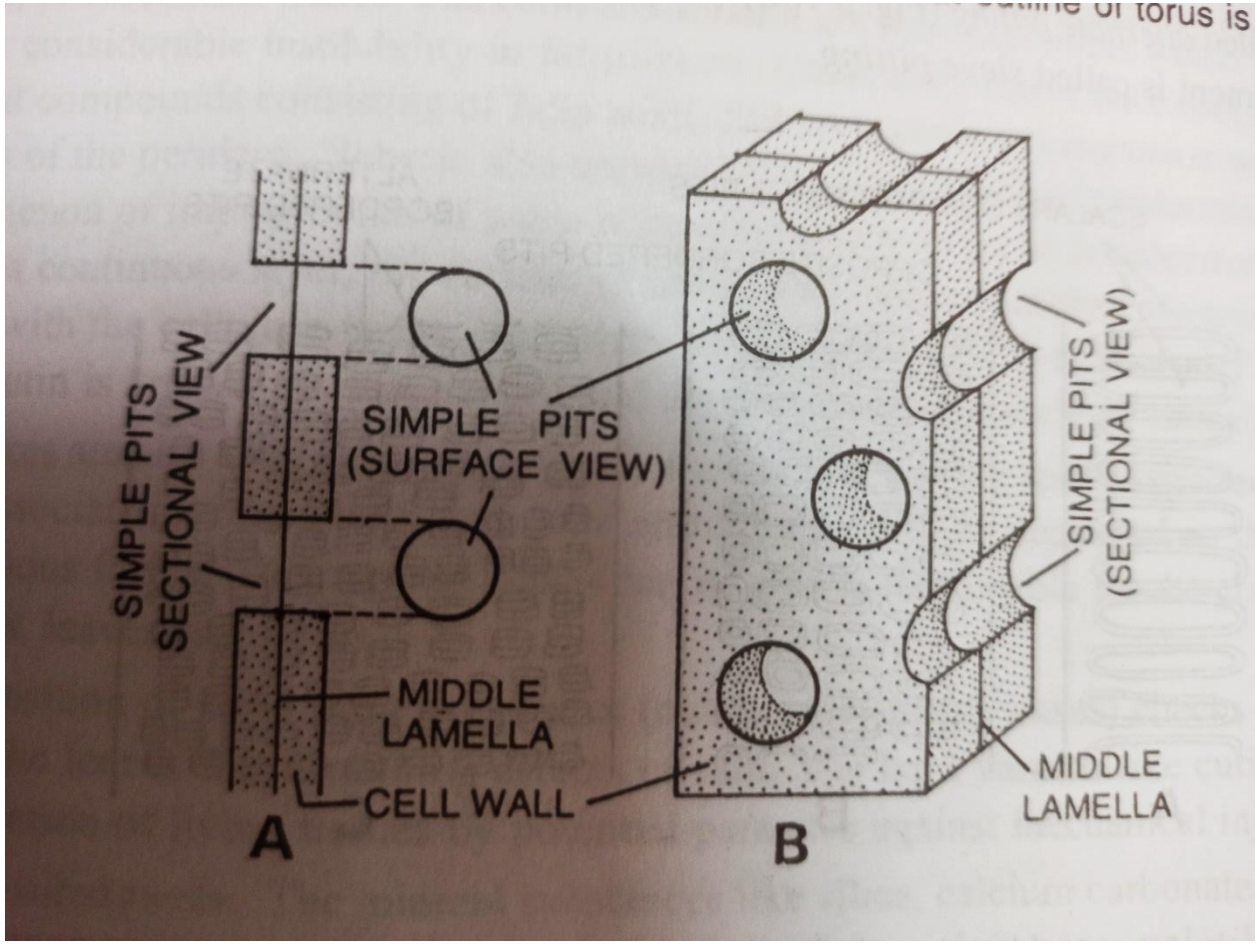
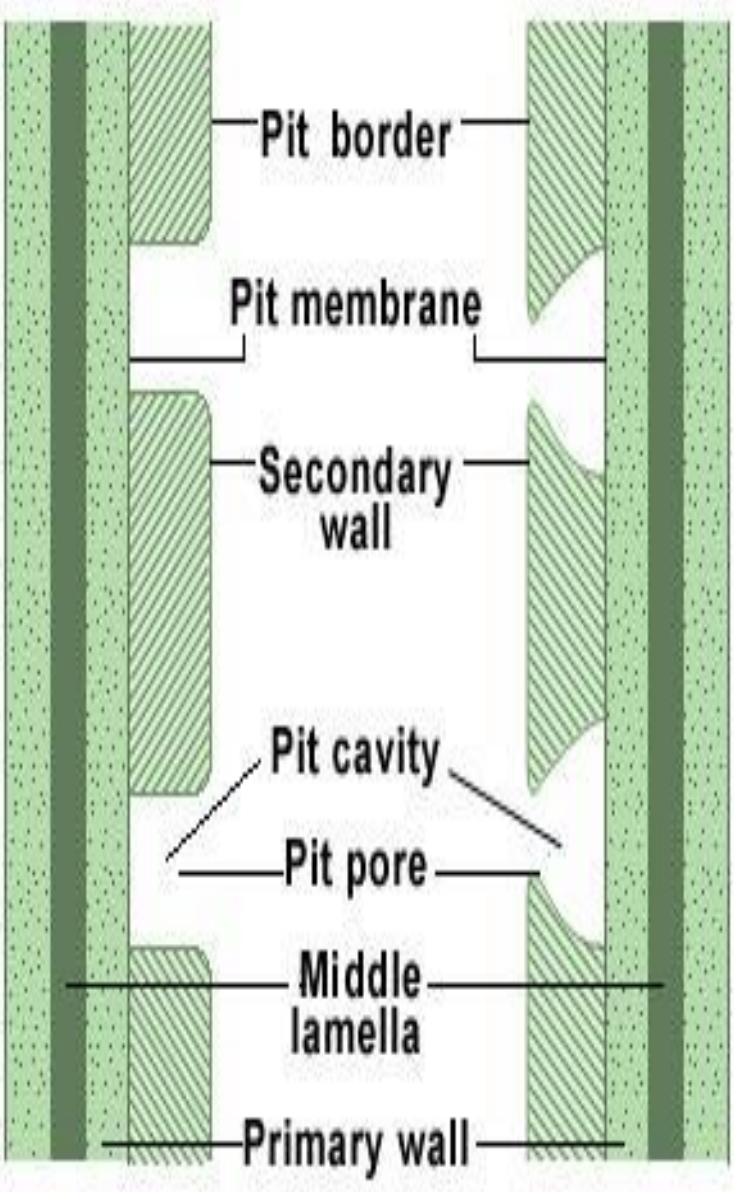


Fig. 3-6, Pitted thickening. A—Simple pits, (i) surface view, (ii) sectional view. B—Bordered pits, (i) surface view, (ii) sectional view, (iii) aspirated pit.


THREE LAYERED SECONDARY WALL
PIT MEMBRANE
BORDER
PIT
APERTURE
TORUS
PIT
CHAMBER
PRIMARY WALL
MIDDLE LAMELLA
A
B


SIMPLE PITS
SECTIONAL VIEW
SIMPLE PITS
(SURFACE VIEW)
MIDDLE
LAMELLA
CELL WALL
A
SIMPLE PITS
(SECTIONAL VIEW)
MIDDLE
LAMELLA
B

PITTED THICKENING



✓Apoplastic area

- Middle lamella
- Intercellular space
- Cell wall (both primary and secondary)

✓Symplastic area

Implication of CWT

- ✓Quality of crop
- ✓Lodging behavior
- ✓Disease infestation
- ✓Insect infestation

What we learned?