

Cell wall

I-Wall layer

1- <i>Allium</i>	root tip L.S. (Telophase)	Cell plate
2- <i>Allium</i>	root tip L.S. (Cytokinesis)	Middle lamella
3- <i>Diospyrus</i>	endosperm T.S.	primary cell wall
4- <i>Draceaena</i>	old stem T.S	Secondary cell wall

II-Intercellular spaces

- 1- Ordinary schizogenous intercellular spaces In *Dracaena* stem C.S
- 2- Specialized schizogenous intercellular spaces In *Pinus* leaf
- 3- Lysigenous schizogenous intercellular spaces In *Eucalyptus* leaf
- 4- Schizolysigenous intercellular spaces In *Zea mays* stem

The primary cell wall in plant consist of cellulose , hemicelluloses , non-cellulosic polysaccharides and pectin . this wall is true , living and thin ; in sometime the primary cell wall become thick but it could be recognized by the presence of plasmodesmata .

The primary cell wall may be lignified to be secondary cell wall which is thick and dead .

The stages of cell wall formation

- 1- Cell plate (Ca & mg pectate)
- 2- Middle lamella
- 3- Primary cell wall
- 4- Secondary cell wall (cellulose , non cellulosic polysaccharides , lignin & suberin)

The Intercellular spaces

Its dividing to 4 kinds :-

- 1- Ordinary I.S. (formed by division of middle lamella)
- 2- Specialized I.S. (it have special function , and hear it specialized to transport resin substances)
- 3- Lysigenous I.S. (formed by lyses of cells)
- 4- Schizolysigenous I.S. (formed by division and lyses of cells)

Lab 2

Pits

- 1- Primary pit field In *Allium cepa* stripped of epidermis
- 2- Simple pits pair In *Sambucus* (Elder) pith C.S,
- 3- Bordered pit pair In *Pinus* Xylem R.L.S
- 4- Ramiform pits In *Pyrus communis* (pear fruit) stone cell or brachysacclereids)
- 5- Half bordered pit pair or Semibordered pit pair In *Pinus* Xylem T.L.S.
- 6- Aspirated pit pair In *Pinus* Xylem T.L.S.

Pits define as depressions or cavities on cell walls . and it consist of :-

- 1- Pit membrane (middle lamella & primary cell wall)
- 2- Pit cavity
- 3- Pit aperture

Types of pits

- 1- Primary pit field (a depressions on primary cell wall & usually associated with plasmodesmata .)
- 2- Simple pit (a cavity in secondary cell wall)
- 3- Borderd pit (associated with xylem transport elements [tracheids & vessels] , it consist of :- 1- border 2- torus 3- pit chamber 4- pt membrane 5- pit aperture)
- 4- Ramiform or Branched pits (occure when the secondary cell wall becom more thick , so its become like a canal connected between cell lumen and surface)

Pit combination

- 1- Simple pit pair (between parenchyma cell)
- 2- Bordered pit pair (between xylem transport elements)
- 3- Half bordered pit pair or Semi bordered pit pair (between parenchyma cell and xylem transport element)
- 4- Aspirated pit (happened when the torus closed the pit aperture of only one pit in Bordered pit pair to be un functional)

Lab3

Plant cell content

I-Living contents

- | | |
|-----------------------|--|
| 1-Cytoplasm & nucleus | In onion (stripped of epidermis) |
| 2-Plastids | a-Chloroplast in green pepper |
| | b- Chromoplast in red pepper or tomato |
| | c- leucoplast in potato |

II- Non-living contents

- | | |
|------------------|--|
| 1-starch grain | in potato , rice, bean |
| 2-Crystal | a- druses in <i>Tilia</i> stem T.S.
b- Prismatic in onion scaly leaf
c- raphides in <i>Mirabilis</i> stem T.S.
d- cystolith in <i>Ficus</i> leaf T.S. |
| 3-Aleurone grain | in <i>Ricinus</i> endosperm |

Living contents

Consist of cytoplasm , nucleus and other organelles like mitochondria , ribosomes , plastids , etc .

There are 3 kinds of plastids different according to their position , function and its pigments :-

- 1- Chloroplast (in green parts in plant ; photosynthesis ; chlorophyll A , chlorophyll B & little amount of Xanthophylls and carotene)
- 2- Chromoplast (in any part in plant ; assisting in photosynthesis ; Carotene & xanthophylls)
- 3- Leucoplast (in plant parts which not contact with light ; starch production and storage ; no pigment)

Non-living contents

1-Starch grains

The starch grain different according to :

- a-The differences in position and shape of hilum .
- b-the presence or absence of starch stratification .
- c- grain shape and size .
- d-the structure of the grain (simple or compound)

-Starch grain in potato (ovoid shape , with circular & terminal hilum , and starch stratification can be recognized)

a- simple b- compound c- semi compound

-Starch grain in rice (prismatic shape , the hilum and starch stratification can not be recognized)

-starch grain in bean (ovoid shape , with centric & cracked hilum ,and starch stratification can be recognized).

2- Crystals

The crystals different according to its shape and chemical composition :-

- a- Prismatic (calcium oxalate)
- b- Raphides (calcium oxalate)
- c- Druses or rosette (calcium oxalate)
- d- Cystolith (consist of body [calcium carbonate] and stalk [cellulose])

3-Aleurone grain

Its storage protein composite of crystalloid (Albumin) and globoid (Globulin with complex salt of calcium & magnesium phosphate) .

Lab4

Meristematic tissue

Apical meristem

A-Shoot apex

- 1-Single apical cell theory in *Dictyota* & *Equisetum*
- 2-Tunica corpus theory in *Ricinus*, *Salvia*, *Coleus*

B-Root apex

- 1-one apical initial zone in *Allium cepa*
- 2-three apical initial layers in *Zea mays*

The properties of meristematic tissues are :

1-Simple size. 2- have thin walls(primary cell wall). 3-have no intercellular spaces.

Meristematic tissues divided according to :

- 1- Position : a- apical. b_intercalary. c_lateral.
- 2- Origin.
- 3- Function .

Apical meristem : Shoot apex :- Meristematic cells in shoot apex are different in number ,arrangement ,shape and division.

Theories of shoot apex :

- 1- Single apical cell theory :

In this theory there is one cell either lenticular shape and division periclinially like in *Dictyota* or pyramidal shape which is dividing anticlinally like in *Equisetum*

- 2- Tunica corpus theory .

In this theory there are two zone different in three position,structures and cells division .

Corpus	Tunica
1-Central position	1-Terminal position.
2-It cells are big,irregular	2-It cells are small in size and more
	Regular.
3-The cells divided are anticlinal ,periclinal and oblique.	3-Have one division :anticlinal.

Root apex :

- 1- One apical initial zone : The tissue plant contain from one initial zone like in *Allium cepa* .
- 2- Apical initial layers :There are three initial zone in root apex ex. *Zea mays* .

Epidermis

Epidermis tissue type

- 1- Simple (uniserrate) epidermis
- 2- Multiple (multiserrate) epidermis
- 3- Sunken stomata

in *Zea mays* leaf
in *Ficus* leaf
in *Pinus* leaf

The Trichomes

- 1- Peltate hair
- 2- Pointed uni cellular(uniserrate) hair
- 3- Pointed multicellula (uniserrate) hair
- 4- Stellate unicellular
- 5- Colletors
- 6- Stiging hair

in *Olea* leaf
in *Malva* leaf
in *Heleanthus* petiole
in *Matthiola* leaf
in *Rosa* petiole
in *Urtica* leaf

Simple & Multiple Epidermis :

Epidermis classify to :
*Simple When it contain one layer of cell.
*Double When it contain two layers of cells.
*Multiple or Multiserat When it contain many layers of cells.

Epidermis cells types:

*Gard & subsidiary cells forms Stomata normally found in epidermis cells level but may be found in descending level: means (Sunken stoma) it one methods of plant adaptive to reduce water loss such as Pinus.

*motor cells: big & living cells ,thin walls ,plastid free , storage big amount of water subside to reduce loss it .

*Lithocytes : big cells inside contain cystolith .

*Trichomes :it is one of epidermis appendages ,it have many faction & many types:

- Peltate such as (lower surface) Olive ,it like tooth margin disk contain stalk .
- Pointed unicellular such as Malva.
- Pointed multicellular such as Helianthus leaf .
- Stellate unicellular such as Matthiola one cell branched to star shape.

*Glandular Trichomes: it have secretion Functions such as:

- Stinging hair such as Urtica .
- Colleters such as Rosa.