

PLANT ANATOMY Lecture 9 - Cell Structure, Cell Wall, & Epidermis

- I. Why are plants (and other organisms) divided into cells?
 - A. Some organisms are composed of only one cell
 1. Examples: Euglena (a protistan - one cell)
Siphonales (a protistan [algae])
 - B. Why then, cells?
 1. Provide strength and rigidity
 2. Control of osmotic relations
 3. Division of labor
 4. Damage can be localized
 - C. Generalized tissue system
 1. Symplast - all living cells (plasmodesmata are symplastic)
 2. Apoplast - all dead cells (intercellular spaces and cell walls are apoplastic)
- II. Cell wall structure
 - A. Primary wall is deposited as the cell enlarges
 - B. Primary wall constituents (a composite structure)
 1. Cellulose
 2. Hemicellulose (xylose)
 3. Pectic substances (polyuronides - rhamnogalacturan)
 4. Proteins
 - C. Living connections - plasmodesmata - go through the primary wall
 - D. Secondary wall is deposited by some cells AFTER cell enlargement
 - E. Secondary wall constituents (typical fleshy growth)
 1. Cellulose (50% or higher)
 2. Hemicellulose (5-30%)
 3. Lignin (1-20%)
 4. Pectic substances
 5. Proteins
 - F. Secondary wall chemistry
 - H. Overall cell wall structure
 1. Primary wall stains green with fast green
 2. Secondary wall stains red with safranin
- III. Epidermis
 - A. Roots
 1. Epidermal parenchyma (secrete a mucilage when young)
 2. Trichoblasts - hair cells
 - B. Aerial organs
 1. Cuticle - all aerial parts have a cuticle
 - a) Cuticle is cellulose, pectic substances, cutin, wax, etc.
 - b) Consists of CW impregnated with cutin, cutin layer, & epicuticular wax
 - c) Deposited channels - ectodesmata & teichode OR general diffusion
 2. Epidermis
 - a) Epidermal parenchyma - unspecialized; with potential of CW modification
 - b) Inner wall of CW loosens and becomes mucilagenous (lowers water loss)
 - c) Unique parenchyma - idioblasts "crazy cells" peculiar deposits
 - d) Can have multiple epidermis
 3. Guard cells
 - a) Guard cells are the only epidermal cells to contain chloroplasts
 - b) Stomatal apparatus consists of stomatal pore, guard cells, & subsidiary
 - c) Dicots have kidney-shaped, monocots have dumbbell-shaped
 - d) Distribution: floating leaves (top), terrestrial (top & bottom OR bottom)
 4. Trichomes - plant hairs or outgrowths of epidermis
 - a) Gymnosperms - none; ferns - simple; angiosperms - dicots (varied), monocots (simple or none)
 - b) Categories - nonglandular & glandular
 - c) Types of nonglandular - simple, dendroid, stellate, scale, sunken
 - d) Types of glandular "trichomes" - glands (oil), hydathodes (water), secretory cells (varied), laticifers (latex), and lathocysts (crystals)