

PLANT ANATOMY Lecture 12 - Xylem (Conducting Sclerenchyma)

- I. **Location and function of xylem**
 - A. Found in vascular bundles and tissues in all plant parts
 - B. Gross wood anatomy (note: xylem is the Greek word for "wood")
 - 1. Axial system (longitudinal system)
 - a) Tracheids - water transport
 - b) Vessels - water transport
 - c) Fibers - support
 - d) Parenchyma - storage & transport
 - 2. Ray system (cross or horizontal system)
 - a) Parenchyma - storage & transport
 - b) Sometimes tracheids (conifers) - water transport
 - C. Main functions
 - 1. Water transport
 - 2. Support
 - D. Terms associated with xylem (Martin Ax story)
 - 1. Water
 - 2. Tracheids and vessels
 - 3. Passive
 - 4. Up
 - 5. Apoplast - dead
- II. **Primary and secondary xylem**
 - A. Primary: protoxylem & metaxylem
 - B. Secondary: secondary
- III. **Types of Xylem (All are called "tracheary elements")**
 - A. Tracheids
 - 1. Found in all vascular plants - most primitive
 - 2. Function to provide conduction AND support
 - 3. Long and narrow with tapered ends
 - 4. No holes in end walls - only connections are pits
 - 4. Types of pits (they smooth flow of water)
 - a) Bordered pit pair - common
 - b) Torus/margo structure (acts as a valve to seal old tracheids) - unique to conifers
 - c) Vestured pit - some dicots (protects pit membrane)
 - B. Vessels elements
 - 1. Found almost exclusively in flowering plants (also some ferns, horsetails, and gymnosperms)
 - 2. Very efficient in conducting water through the plant
 - 3. Short and wide
 - 4. Vessel elements line up end to end to make a vessel
 - 5. Perforations on end walls connect vessel elements to make a very long vessel (sometimes the entire length of the plant!)
- IV. **Evolutionary and developmental trends in xylem**
 - A. Tracheid and vessel element secondary wall formation
 - 1. Annular
 - 2. Helical
 - 3. Scalariform - reticulate
 - 4. Circular bordered pits
 - B. Evolutionary and developmental trends in vessel elements
 - 1. From tracheids to vessel elements
 - 2. Bigger holes in end walls
 - 3. Flatter end walls
 - 4. Shorter cells
 - 5. Broader diameter
- V. **Other aspects of the vascular tissue associated with xylem**
 - A. Xylem parenchyma - absorb air bubbles & secretion of sealing stuff
 - B. Fibers - to provide strength