

PLANT ANATOMY Lecture 13 - Phloem

- I. Location and function of phloem**
 - A. Found in vascular bundles and tissues in all plant parts**
 - B. Gross wood anatomy (note: phloem is the Greek word for "bark")**
 - 1. Axial system (longitudinal system)**
 - a) Sieve elements - food transport**
 - 1) Sieve cells and sieve-tube members (with companion cells)**
 - b) Sclerenchyma cells - support and some storage**
 - 1) Fibers and sclereids**
 - c) Parenchyma cells - storage**
 - 2. Ray system (cross or horizontal system) - there really isn't a phloem ray system**
 - a) Parenchyma cells - storage & radial transport**
 - C. Main functions**
 - 1. Sugar (food) transport**
 - 2. Support (to a lesser extent than xylem)**
 - D. Terms associated with phloem: "SAPS"**
 - 1. Sugar sieve cells, sieve tube members, companion cells, active, down, symplast (living)**
- II. Primary and secondary phloem**
 - A. Primary: protophloem & metaphloem**
 - B. Secondary: secondary**
- III. Types of Phloem (all are called "sieve elements")**
 - A. Sieve cells (analogous to tracheids)**
 - 1. Found mostly in gymnosperms and lower vascular plants - very few angiosperms**
 - 2. Function to provide primitive sugar transport**
 - 3. Long and moderately narrow with rounded ends**
 - 4. Holes in end walls referred to as sieve areas**
 - 5. Associated cells called albuminous cells**
 - B. Sieve tube members (analogous to vessel elements)**
 - 1. Found only in angiosperms**
 - 2. Efficient in the transport of sugar**
 - 3. Relatively wide with flat end walls**
 - 4. Holes in side walls called sieve areas**
 - 5. Holes in the end wall form a sieve plate**
 - 6. Associated cells called companion cells**
- IV. Additional information and development of phloem**
 - A. Sieve tube members are alive at maturity but have no nucleus**
 - 1. Companion cells help out sieve tube members; albuminous cells help out sieve cells (companion cells are really BIG in minor leaf veins)**
 - 2. Nucleus for STM is in companion cell**
 - 3. Connection between STM and companion cell is sieve area**
 - 4. Minor veins of leaves - companion cells are transfer cells (herbaceous dicots)**
 - a) Ingrowth of cell wall increases surface area of membrane**
 - b) Enables more sugar to be pushed into STM**
 - c) Ingrowths enable more active energy transport**
 - B. Structural features of STMs**
 - 1. Callose forms around pores of sieve plate for protection**
 - 2. P-protein exists in STMs and tends to pile up against the sieve plate when damage occurs - forms toward the point of damage**
 - C. Sieve tube members in comparison to xylem**
 - 1. Sieve tube members are under positive pressure (xylem is under negative pressure)**
 - 2. STMs are constantly ballooning out - STMs tend to explode**
 - 3. Analogous to vessel is the sieve tube - but all sieve tubes have openings**
 - D. Development of STM & companion cell**
 - 1. Begin as one cell that divides**
 - 2. May be more than one companion cell per STM**
 - 3. Trend encountered in STM: from sieve cell to STM (shorter & fatter)**