

PLANT ANATOMY Lecture 20 - Secondary Stem Growth

- I. Reasons and types of secondary stem growth**
 - A. Reasons for secondary growth in stems vs. roots**
 - 1. Method of satisfying the demand during growth (plumbing analogy)
 - 2. In dicot perennials & gymnosperms new yearly leaves & needles need new vascular systems
 - 3. Greater herbage (topside) requires greater support
 - B. Types of secondary growth**
 - 1. Continuous vascular cylinder (most common - angiosperms)
 - a) Leftover procambium produces cells - becomes fascicular cambium
 - b) Parenchyma between bundles becomes interfascicular cambium
 - c) Both fascicular and interfascicular cambium produce secondary phloem and secondary xylem - they become or behave as a vascular cambium
 - 2. Enlarging vascular bundles (less common - woody vines)
 - a) Leftover procambium produces cells - becomes fascicular cambium
 - b) Interfascicular cambium produces parenchyma to the inside and the outside
 - c) Bundles remain separate
 - d) Woody vines have this type of arrangement because
 - 1) They remain flexible
 - 2) Abundant parenchyma can repair damage
 - 3. Anomalous secondary growth (not uncommon)
 - a) Leads to unusual distribution of xylem and phloem (phloem inside & out)
 - b) Can arise from multiple cambia
- II. Distribution of secondary vascular tissues**
 - A. Usually 5x more xylem produced than phloem
 - B. More xylem because of high demand for water
 - C. Xylem in trees forms conspicuous rings because the vascular cambium produces different sized cells (small in the Fall and large in the Spring)
 - D. Phloem doesn't form distinguishable rings because it doesn't form a secondary wall - old phloem gets squashed
 - E. Vascular system last for only one year - then a new system is provided
- III. The cambial zone: theoretically thought to be one layer)**
 - A. Axial system**
 - 1. Vascular cambium: gives rise to tracheids & sieve cells, vessels & sieve tube members - fibers and sclerids come out of this too
 - 2. Fusiform initials - make axial phloem (usually sieve cells) and xylem (usually tracheids) elements
 - 3. Sometimes a fusiform initial can become a ray initial
 - B. Transverse (ray) system**
 - 1. Ray initials - make xylem and phloem rays as well as ray parenchyma
 - 2. Purposes of ray system
 - a) Storage (starch grains)
 - b) Produce tyloses
 - c) Absorb air bubbles
 - d) Produce callose
- IV. Summary of axial and ray systems**
 - A. See diagram
- V. The periderm (includes phellem, phellogen, and phelloderm) EX: potato skin is periderm**
 - A. Phellogen is the cork cambium**
 - 1. Produces phellem (cork) to the outside (which, in turn, produces its own suberin as well as lenticles for aeration)
 - 2. Produces phelloderm to the inside (cork skin)
 - B. Periderm gradually gets pushed outward. Older periderms tend to stick outside or fall off - they split because of the increasing diameter of the stem**