

PLANT ANATOMY Lecture 4 - Stems

- I. Main functions of stems
 - A. Support
 - B. Conduction of water and nutrients
 - C. Storage
 - D. Production of new living tissue
- II. Primary stem growth in angiosperms - dicots and monocots
 - A. FOCUS ON DICOTS
 - 1. What gives rise to different tissues?
 - a) Meristems
 - b) Cells differentiate - become destined to dermal, ground, or vascular
 - c) protoderm = dermal; ground mer. = ground; procambium = vascular
 - 2. Apical meristem - angiosperms
 - a) Shoot apex - point above youngest primordia (lateral outgrowth from apical meristem that will become a leaf)
 - b) Promeristem - place where no visible differentiation can be seen (can be same as shoot apex)
 - 3. Differentiation of cells
 - a) Dermal tissue
 - 1) Epidermis - covered by a cuticle
 - 2) Can have chloroplasts (esp. guard cells of stomatal apparatus)
 - b) Ground tissue
 - 1) All around procambial strands
 - 2) Two parts
 - a) Cortex - outer part between procambial strands & epidermis
 - b) Pith - inside region
 - c) Procambial strand
 - 1) Phloem (protophloem) - outside & continuous
 - 2) Xylem (protoxylem) - inside & discontinuous (no immediate need for water)
 - 4. Arrangement of vascular bundles - DICOTS
 - a) Originate as ring of "residual mer." that differentiates - xylem & phloem
 - b) Bundles become separated by regions of parenchyma (pith rays)
 - c) Bundles are arranged in a ring-like structure
 - B. DIFFERENCES BETWEEN DICOTS AND MONOCOTS
 - 1. Arrangement of vascular bundles is scattered
 - 2. Pith and cortex cannot be defined
 - 3. Very few species undergo secondary growth
 - a) Most grasses lack a vascular cambium
- III. Additional primary growth of vascular tissue - DICOTS AND MONOCOTS
 - A. Phloem - conduction of organic stuff (sugars)
 - 1. Protophloem - permits conduction of organics during rapid growth - later crushed
 - 2. Metaphloem - matures and functions after rapid growth
 - B. Xylem - conduction of water and mineral nutrients
 - 1. Protoxylem - permits conduction of solubles during rapid growth - later gets torn apart to form a lacuna (monocots) or obliterated (dicots)
 - 2. Metaxylem - matures and functions after rapid growth
- IV. Secondary stem growth in angiosperms (introduction)
 - A. Requirements for secondary growth
 - 1. Secondary thickening meristems: found mostly in dicots - some monocots
 - a) Vascular cambium (like procambium) - between primary xylem & phloem
 - 1) Fascicular cambium - forms from within vascular bundles
 - 2) Interfascicular cambium - origin. fr. parenchyma between bundles
 - b) Cork cambium - forms from cells of cork cambium
 - 1) Cork (phellem) to the outside; phelloderm (parenchyma) to the inside