

PLANT ANATOMY Lecture 19 - Shoot Apex & Primary Stem Development

- I. Types of meristems
 - A. Apical meristems - located at the apex of the organ
 - B. Basal meristem - located at the base of the organ
 - C. Intercalary meristems - occur between their derivatives such as in monocots
 - D. Lateral meristems - along the periphery of the organ (vascular & cork cambium)
 - E. Axillary meristems - in buds at leaf axils
- II. Types of apical meristems
 - A. NOTE: in roots it was a subapical meristem (goes both directions); in shoots it is an apical meristem
 - B. Types of apical meristems in shoots - you have to look at the apex through the full season to grasp the whole concept of zonation
 - 1. Single cell - single apical mother cell: found in algae, bryophytes, and many LVPs
 - 2. Group of cells - group of apical initials: LVPs
 - 3. Cytohistological zonation - apical initials (top layer - peripheral meristem & mother cells), central mother cells zone (major mass below AI - don't do much), peripheral zone (corners - leaves & branches; VERY active), and rib meristem (vertical cells - pith): gymnosperms
 - 4. Tunica-carpus - 1-2 (or 3) top layers and a bunch of bottom layers: angiosperms
 - a) Tunica layer has anticlinal (perpendicular) divisions
 - b) Carpus has anticlinal and periclinal (parallel) divisions
- III. Definitions associated with shoot apex and leaf primordia
 - A. Shoot apex (4 types as mentioned) - divided by an imaginary line from one primordium to the other
 - B. Other ambiguous terms
 - 1. Shoot tip, growing point, stem tip, vegetative point
 - C. Physiological definition
 - 1. Promeristem - part of the stem tip where no visible differentiation can be seen
 - a) Does not have to be the same as the shoot apex (can be more or less)
 - D. Leaf primordia
 - 1. Primordia always initiated from the side
 - 2. Developing leaves always arch over the apex to form a closed, humid chamber
 - 3. Monocots - leaf initiation forms as a ridge around primordia and apex - for protection (adaptation to grazing)
- IV. What happens at the promeristem? ANS: longitudinal differentiation
Promeristem

Protoderm	Procambium	Ground meristem
Epidermis	Primary Primary Fundamental tissue	
	Xylem	Phloem

"Leftover" procambium (EXCEPT monocots)
- V. Plastochron definitions and shoot apex behavior
 - A. Leaf primordium - a leaf in its earliest stage of differentiation
 - B. Plastochron - time interval between the initiation of one leaf and initiation of the next)
 - C. Shoot apex behavior
 - 1. Annual apex - includes plants that have a highly branched growth habit because the tip dies every year
 - 2. Perennial apex - branches are real long and last for more than one year
 - D. Monocot behavior
 - 1. Primary thickening meristem - fast initial thickening
 - 2. Proliferation of parenchyma just below apex
 - 3. Intercalary meristem (at each internode) tied in w/ primary thickening meristem
 - 4. Imagine growth like a telescope
 - 5. Lack of secondary growth & presence of primary thickening & intercalary meristems allows us to cut grass
 - 6. Procambium in monocots committed to primary vasc. - NO leftover procambium