

PLANT ANATOMY Lecture 5 - Leaves

- I. Leaf Function
 - A. Photosynthesis
 - 1. Harvest light energy and convert it to ATP and NADPH
 - 2. Fix CO₂
 - B. Transpiration
 - 1. Driving force for xylem transport of water and dissolved nutrients (adhesion & cohesion)
 - 2. Evaporative cooling of leaves when temperature is high
 - C. Stomates - control gas exchange and transpiration (mechanism is osmosis at the guard cell level)
- II. Leaf morphology and terminology
 - A. Lamina - flat form of the blade
 - B. Attachment to the stem
 - 1. Petiole (common in dicots)
 - 2. Sessile (leaf directly attaches to stem or sheath)
 - C. Structures at leaf - stem junction (more common in grasses)
 - 1. Ligule - small flap of tissue extending upward from the sheath
 - 2. Auricle - two earlike points found at the leaf - stem junction
- III. Leaf development and structure
 - A. Leaf development
 - 1. Leaf primordia initiated in region of apical meristem
 - 2. Primary meristematic tissue: protoderm (epidermis), ground meristem (leaf mesophyll), and procambium (vascular tissue)
 - B. Leaf structure
 - 1. Epidermis
 - a) Usually no chloroplasts in epidermal cells - except in guard cells
 - b) Extra-thick wall on outside (atmospheric) surface of epidermal cells
 - c) Cutin & waxes form cuticle - usually thicker on upper epidermis
 - d) Stomata (stomates)
 - 1) "Holes" in epidermis to allow exchange of gases
 - 2) Bordered by guard cells which control stomatal opening
 - 3) Commonly found only on lower epidermis in dicots - both surfaces in monocots
 - 2. Mesophyll
 - a) All internal leaf tissue (except some vascular tissue)
 - b) In dicots, usually organized into 2 layers
 - 1) Palisade parenchyma - upper layer
 - a) Elongated cells, perpendicular to leaf surface
 - b) Numerous, large chloroplasts
 - c) Principle photosynthetic tissue of leaf
 - 2) Spongy parenchyma
 - a) Irregularly shaped cells with conspicuous air spaces
 - b) Fewer chloroplasts than palisade layer
 - c) Air spaces important in diffusion of gases
 - c) Most monocots & gymnosperms - not 2 layers - mesophyll similar to spongy parenchyma
 - 3. Vascular bundles
 - a) Transport materials to & from leaf
 - b) Larger bundles visible as leaf veins
 - c) Xylem found on top, phloem found on bottom of vascular bundles
 - d) Runs throughout mesophyll
 - 1) Most mesophyll within 1-2 cells of vascular bundle
 - 2) Found mostly within the spongy layer in dicots
 - e) Bundle sheath
 - 1) Tight sheath of cells surrounding the vascular bundles
 - 2) Controls movement of materials to & from vascular tissue