

PLANT ANATOMY Lecture 23 - Leaf Structure

- I. Leaf cross section of a terrestrial dicot
 - A. Axiality of the leaf
 - 1. Leaf axil is found at the primordia - stem junction
 - a) Adaxial - closest to the axal (ends up to be upper leaf surface)
 - b) Abaxial - away from the axal (ends up to be lower leaf surface)
 - B. Leaf anatomy (from the upper to the bottom surface)
 - 1. Adaxial epidermis - upper epidermis, often cutinized
 - 2. Palisade parenchyma/mesophyll - major photosynthetic tissue
 - 3. Spongy parenchyma/mesophyll - less photosynthetic tissue, allows gas exchange
 - a) Abundant in aerenchyma and some chlorenchyma
 - 4. Vascular bundle (usually in spongy mesophyll)
 - a) Xylem on top and phloem on the bottom
 - 5. Abaxial epidermis - lower epidermis, has stomata (and substomatal chambers)
- II. Variations in angiosperm leaf anatomy
 - A. Palisade layer
 - 1. Number of layers related to light (more light, more palisade)
 - B. Bundle sheath extension NOTE: the bundle sheath are those cells that encase the bundle
 - 1. Found in bundles 1-3 (that is of 6 orders possible in minor venation)
 - 2. Bundle sheath extensions anchor the vascular bundle and provide water transport
 - C. Paraveinal mesophyll
 - 1. Horizontal sheath extensions - layer of cells at phloem between spongy & palisade parenchyma. Protein builds up in this layer.
 - 2. Major function is in transportation of photosynthate
 - D. Aquatic leaf modifications
 - 1. Spongy mesophyll modification with large air spaces to keep leaf afloat
 - 2. Stomata located on the upper surface of the leaf
 - E. Xeromorphy - adaptation to dry conditions NOTE: hydromorphic = wet; mesomorphic = normal
 - 1. Thick cuticle - sealer to prevent water evaporation; also a barrier to light
 - 2. Multiple epidermis - acts as a filter for sunlight - gives reasonable intensity for palisade layer
 - 3. Stomatal crypt - restricted to pockets, sometimes lined with trichomes
 - F. Sun/shade leaves
 - 1. Sun leaves - thick with bigger cells
 - 2. Shade leaves - thin with smaller cells
 - G. C₃ and C₄ plants
 - 1. C₃ refers to plants with a 3 carbon photosynthetic product
 - a) Normal bundle sheath size
 - 2. C₄ refers to plants with a 4 carbon photosynthetic product
 - b) Enlarged bundle sheaths
 - 3. Nature of grasses
 - a) Festucoid - cool season - small double bundle sheath (C₃)
 - b) Panicoid - warm season - large single bundle sheath (C₄)
 - H. Stomatal position
 - 1. Epistomatous - Aquatic plants
 - 2. Hypostomatous - terrestrial and desert plants
 - 3. Amphistomatous - grasses
 - I. Grass leaf features
 - 1. Bulliform cells - enlarged epidermal cells (can be found in other species)
 - a) Enable rolling of the leaf - common to bambusoid grasses
 - 2. Fusoid cells found along either side of the bundle
 - a) No known function