

Photosynthesis

October 20, 2009 PMB 102/IB101

-Introduction to Photosynthesis

- Leaf considered main site, but can occur in roots, stems.
- leaf consists of three tissue systems, epidermal, vascular and mesophyll.
 - Mesophyll can be comprised of two distinctive types of cells, palisade parenchyma and spongy parenchyma.
 - consider the "division of labor" by the parenchyma
 - palisade have greater wall surface area and relatively less intercellular spaces
 - spongy have less wall surface area and greater intercellular spaces.
- maximizing light absorption
 - "sieve effect"
 - epidermal modifications
- vascular tissues
 - venation
 - reticulate (dicots), versus parallel (monocots)
 - transfer cells
- Leaf structure and environment
 - Xerophytes
 - thickened cuticle
 - sunken stomata
 - increased leaf thickness
 - Lithops = "window plant"
 - Hydrophytes
 - thin, reduced vascular tissue, no cuticle, few to no stomata
- Sun/shade leaves

-Structure/Function Aspects of Photosynthetic systems

- Calvin cycle fixes CO₂ into C₃ compound = C₃ plant
 - Structurally C₃ plants show typical mesophyll with palisade and spongy parenchyma
 - C₃ plants show photorespiration
- C₄ pathway of photosynthesis
 - fixes CO₂ initially into C₄ compound (an acid) = C₄ plant
 - structurally C₄ plants have specialized mesophyll with a bundle sheath differentiated around vascular tissue (Kranz anatomy)
- C₄ plants eliminate photorespiration by compartmentalizing the O₂-sensitive steps in internal bundle sheath cells
- C₃/C₄ intermediates
 - have intermediate anatomy between C₃ and C₄ plants
- Crassulacean Acid Metabolism = CAM
 - C₄ pathway operates, but no specialization in mesophyll
 - separates C₃ and C₄ pathways in time, not spatially