

PLANT PHYSIOLOGY Lecture 21 - Photosynthesis - Transpiration Compromise

- I. Focus of photosynthesis - transpiration compromise**
 - A. Stomatal apparatus**
 - 1. Hole - stomate (pl. = stomates) OR stoma (pl. = stomata)
 - 2. Cells regulating opening - guard cells
 - 3. "Helper" cells - subsidiary cells
 - B. When open**
 - 1. Photosynthesis is high (high CO₂ influx)
 - 2. Transpiration is high
 - a) Good news - cooling and nutrient flow
 - b) Bad news - loss of water
- II. Factors affecting stomatal opening**
 - A. Water** - when abundant in plant, stomates open
 - B. Temperature** - at optimal temperature, stomates open (closed when cold or hot)
 - C. Light** - stomates open when light (except CAM plants)
 - D. CO₂ concentration** - stomates open when not enough CO₂
- III. Mechanism of Stomatal opening (all occurring in guard cells)**
 - A. Light** turns on photosynthetic metabolism
 - B. Malic acid** is produced
 - C. Malic acid** dissociates to produce H⁺
 - D. H⁺** is effluxed and K⁺ is influxed
 - E. K⁺** goes into the vacuole and decreases osmotic potential (Ψ s)
 - F. Water** flows in from adjacent epidermal cells
 - G. Stomatal pore** opens
- IV. Stress response**
 - A. Abscisic acid** is produced
 - B. Stomates** close