

**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 CO<sub>2</sub> 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. CO<sub>2</sub> concentration** - stomates open when not enough CO<sub>2</sub>
- 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<sup>+</sup>
  - D. H<sup>+</sup>** is effluxed and K<sup>+</sup> is influxed
  - E. K<sup>+</sup>** goes into the vacuole and decreases osmotic potential ( $\phi_s$ )
  - F. Water** flows in from adjacent epi dermal cells
  - G. Stomatal pore** opens
- IV. Stress response**
  - A. Abscisic acid** is produced
  - B. Stomates** close