

PLANT PHYSIOLOGY Lecture 27 - Circadian Rhythms and Geotropism

Circadian Rhythm

- I. What is a Circadian Rhythm?
  - A. "Circadian" from latin: circa (approximately) and dies (day) - "rhythms with a free-running period of approximately by not exactly 24 hours should be called circadian
- II. What are the cycles of interest for regulating plant growth?
  - A. Diurnal - daily
  - B. Lunar or tidal - every 28 days
  - C. Annual - yearly as detected by seasons
- III. Clock criteria
  - A. Accuracy - frequently and regularly reset by environmental cues
  - B. Response and adjustment - organism takes advantage of clock for predicting events
- IV. Clock mechanism
  - A. Exogenous - responds to external stimuli
  - B. Endogenous - responds according to an internal clock mechanism
- V. Basic concepts of the rhythm
  - A. Occurs and detected by daily cycles
  - B. Period - time between comparable points
  - C. Amplitude - extent to which observed response varies from the mean
  - D. Range - difference between maximum and minimum values
  - E. Pattern - how the cycles "look"
- VI. Key concepts
  - A. The rhythm can be entrained
  - B. The rhythm may be affected by light (phytochrome) and temperature
  - C. The rhythm can be altered by chemicals
- VII. Mechanism
  - A. May be related to membrane permeability ( $K^+$  movement?)
  - B. May include protein synthesis
- VIII. Conclusion
  - A. "Anyone doing biological experiments should be aware of the profound effects of the physiological clock on virtually all aspects of an organism's functions."

Geotropism

- I. What is geotropism?
  - A. Geotropism - tropistic response to the earth
  - B. Modern term is more precise - "gravitropism"
- II. Method of detection / mechanism
  - A. Gravity sensitive bodies are called "statoliths" (they are probably starch grains within amyloplasts)
  - B. In roots: auxin is synthesized in and released from the tip and redistributed appropriately