

PLANT PHYSIOLOGY Lecture 25 - Photoperiodism

- I. Phase development (plant growth occurs in several phases of development)
  - A. Stages
    - 1. Germination
    - 2. Vegetative (juvenile through maturity)
    - 3. Reproductive (ripeness to flower, flowering, and fruiting)
    - 4. Senescence (seed ripening)
    - 5. Dormancy (seed)
  - B. Monocarpic - plants follow phasic sequence closely. Flower once (determinant) - puts ALL into seed. Examples are annuals and biennials
  - C. Polycarpic - difficult to recognize phasic development. Flowers repeatedly (indeterminant) - puts partial commitment to sexual reproduction. Examples are woody plants and shrubs - perennials
- II. Flowering and fruiting
  - A. Production of seeds is (usually) main objective of crop production - as a result of various physiological and morphological events that lead to flowering and fruiting in response to temperature and photoperiod (length of day)
  - B. Two main cues of photoperiod and temperature
    - 1. Latitude - day length
    - 2. Time of year - season
- III. Classification - photoperiod responses
  - A. Short-day plants: flowering promoted by day length shorter than a critical maximum. Usually influenced by other environmental factors (temperature). Examples: maize, soybean, morning glory
  - B. Long-day plants: flowering promoted by photoperiod longer than critical minimum. Influenced by genotype x environment. Examples: winter wheat, oats, tobacco
  - C. Day-neutral plants: insensitive to photoperiod but associated with age factor. Examples: rice and cotton
  - D. Short-long-day plants: sequence of short days followed by exposure to long days. Examples: white clover, orchardgrass
  - E. Long-short-day plants: sequence of long days followed by exposure to short days. Examples: aloe, kalanchoe
- IV. Regulation of flowering - night breaks and light quality
  - A. Key concept: length of NIGHT (not day) is the operative factor in photoperiodism
  - B. Night breaks
    - 1. Brief interruption of dark period by white or red light destroys the long night effect (can be reversed by far-red)
      - a) In short-day plants (soybeans) flowering is inhibited
      - b) In long-day plants (wheat) flowering is promoted
  - C. Light quality
    - 1. Summary
 

	<b>INHIBITS</b>	<b>PROMOTES</b>
accumulation of $P_r$	Long day	Short day
accumulation of $P_{fr}$	Short day	Long day