

**PLANT PHYSIOLOGY Lecture 26 - Responses to Temperature**

- I. Cardinal temperatures**
  - A. Minimum temperature at which growth occurs
  - B. Optimal temperature at which growth occurs
  - C. Maximum temperature at which growth occurs
- II. Phenomena of cardinal temperatures**
  - A. Cardinal temperatures of most crops seeds are very close to those of normal vegetative growth
  - B. More precisely, however, different tissues within the same plant have differing cardinal temperatures
  - C. Cardinal temperature mechanisms are probably a result of enzyme induction
- III. Positive responses to low temperature**
  - A. Vernalization
    - 1. Specifically refers to low-temperature induction of flowering
    - 2. Location of response is probably in meristems
    - 3. Mechanism: "vernalin" - may be very similar to gibberellin
  - B. Breaking of seed dormancy
    - 1. Important terms
      - a) Quiescence - seed unable to germinate because specific external requirements have not been met
      - b) Dormancy - seed fails to germinate because of internal conditions (even though external conditions have been met)
    - 2. What happens during germination?
      - a) Hydration/imbibition
      - b) Formation or activation of enzymes
      - c) Radicle elongation
      - d) Growth of seedling
  - C. Breaking of bud dormancy
    - 1. Bud dormancy is often induced by low temperatures (and photoperiod)
  - D. Induction of underground storage organs
    - 1. Low temperatures can induce formation of bulbs, corms, and tubers
  - E. Vegetative form and growth of plants
    - 1. Growth rates are induced by temperature - thermoperiodism
- IV. Mechanism of low-temperature response**
  - A. Enzyme-related
  - B. May be related to feedback inhibition
  - C. At low temperatures, a substance might accumulate because another compound inhibiting its production might not