PLANT PHYSIOLOGY Lecture 29 - Stress Physiology

I. Important concepts of stress physiology
- A. Stress - any force applied to an object
- B. Biological stress - change in environmental conditions that might reduce or adversely change plant's growth or development
- C. Strain - change in the object's dimensions
- D. Biological strain - reduction or change in function
  1. Elastic biological strain - reversible strain (photosynthesis)
  2. Plastic biological strain - irreversible strain (frost, high temperature, limited water)

II. Responses to stress
- A. Avoiders
  1. Avoid - adapt to prevent problems (less leaf area and sunken stomata)
  2. Escape - get away from stress (dormant seeds in dry season)
- B. Tolerators
  1. Resist - save or accumulate substances (water) needed to prevent future strain (water collector or salt secretion)
  2. Endure - continue striving for survival (desiccation as preservation)

III. Types of stress of modern concern: water, temperature (hot and cold), pollution, and nuclear winter
- A. Water stress
  1. Mechanism - order of strain and response
     a) Cell growth, wall synthesis, protein synthesis, hormone synthesis (ABA and cytokinin), stomatal opening, CO_2 assimilation, respiration, proline accumulation, sugar accumulation
     b) How to avoid (most plants): OSMOTIC ADJUSTMENT
  2. Flow diagram

- B. Temperature stress (cold or hot)
  1. Mechanism - problem and solution
     a) Non-optimal temperature
     b) Membrane-related
  2. Flow diagram

- C. Air pollution stress - affects root and soil pH
  1. Smaller plants, less leaves, less root growth, more disease
- D. Nuclear winter - causes low temperature, less light, and polluted water