

**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 closing, CO<sub>2</sub> 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**