

PLANT PHYSIOLOGY Lecture 22 - Growth & Development

- I. Growth and development are essential processes**
 - A. Start with emergence and end with senescence (maturity)**
 - B. Cellular mechanisms**
 - 1. Cell division
 - 2. Cell enlargement
 - 3. Cell differentiation
- II. Growth factors**
 - A. External factors**
 - 1. Climate (microenvironment)
 - 2. Edaphic (soil features)
 - 3. Biological (other plants, insects, fungi, etc.)
 - B. Internal factors**
 - 1. Resistance to climate, edaphic, & biological (stress)
 - 2. Photosynthetic rate
 - 3. Respiration
 - 4. Partitioning of assimilate (esp nitrogen)
 - 5. Chlorophyll and other pigments
 - 6. Type of meristems
 - a) Diffuse (cambium / fertilized egg) - low cell activity; requires hormone
 - b) Massed (apical) - high cell activity; has own hormones
 - 7. Capacity to store foods
 - 8. Enzymes
 - 9. Genetic
 - 10. Differentiation
- III. Differentiation**
 - A. Requisites**
 - 1. Available assimilate
 - 2. Favorable temperature
 - 3. Proper enzymes
 - B. If requirements met, differentiation occurs**
 - 1. Cell wall thickening
 - 2. Deposit of cell inclusions (sugar, starch, secondary, etc.)
 - 3. Hardening of protoplasm
- IV. Growth dynamics and the typical growth curve (lag, log, linear, and senescence phases)**
- V. Laws and agronomic factors**
 - A. Liebig law of minimum - one nutrient deficiency sets capacity for yield**
 - B. Blackman - rate determined by most limiting factor**
 - C. Mitscherlich - limiting factor, when added in increments, gives diminishing return**
 - D. Macy - first get Liebig then get Mitscherlich**
- VI. Allometry - relation between different rates of growth of plant organs**
 - A. Harvest index related to allometry**
 - B. Root/shoot ratio (allometry): note nitrogen fertility**
 - C. Apical and lateral growth: note hormones**
 - D. Vegetative and reproductive growth**
 - 1. Determinant - grow to a certain size and then stop
 - 2. Indeterminant - continuously growing
 - 3. Annuals, biennials, and perennials