

## LSC 453 - PLANT PHYSIOLOGY

1. **Water relations:** Properties of water, Properties of solutions, Cell water potential, Soil plant atmosphere continuum.
2. **Photosynthesis:** Light absorption, energy conversion, reaction centre complex, photosystem organization of thylakoids membrane, electron transport pathway in chloroplast membrane, ATP synthase, carbon fixation in C3, C4, CAM plants.
3. **Respiration:** Citric acid cycle, plant mitochondria electron transport, plant mitochondria ATP synthesis, biochemical basis of photo-respiration.
4. **Photomorphogenesis:** Phytochromes, cryptochromes, photomorphogenesis
5. **Transport processes in plant:** Active and passive transport systems, xylem and phloem transport, intra cellular movement of macromolecules, ion channels, driving forces and flow, transport of metabolites from the source to the sink, genetic regulation of transport systems in response to nutrients availability and growth status.
6. **Mineral nutrition and assimilations of inorganic nutrients:** Plant microrrhiza association, nitrogen metabolism, sulfur metabolism, phosphate metabolism, calcium metabolism, assimilation of cations, chloride dynamics.
7. **Lipid metabolism in plants:** Fatty acid biosynthesis, membrane lipid biosynthesis, lipid desaturation, triacylglycerols, complex lipids, cell wall lipids.
8. **Plant hormones:** Introduction and concept, types of growth regulators.
  - (a) **Auxin:** The master growth hormone, *Avena* coleoptiles bioassay, discovery, distribution, roles and functions, auxin mutants, perception, and binding proteins, signal transduction, auxin responsive genes/promoters/factors. Model for gene regulation, derepression of early auxin genes, Acid theory, polar auxin transport, chemiosmotic model, applications.
  - (b) **Gibberellins:** Foolish seedling disease, location, forms, functions, mechanism, signal transduction and mechanism of action of Gas - alpha-amylase as an example, commercial applications.
  - (c) **Cytokinins:** Location, functions and mechanism of action, commercial applications.
  - (d) **Ethylene:** Discovery, locations and functions, mutants, mechanism of actions, applications.
  - (e) **Abscisic acid:** Natural stress hormone, discovery, location and functions, mutants VP1, ABA and ABI, mechanism of action.
  - (f) **Brassinosteroids, Jasmonic acid, Salicylic acid, Polyamines.**
9. **Plant immune system:** Plant defense system, genetic basis of plant pathogen interaction, systemic acquired resistance, MAM, PAM, PAMP-Triggered Immunity (PTI) and effector-triggered immunity (ETI), hypersensitive response, functions, relevance with diseases, apoptosis, Importance in plant development, role and model of programme cell death.

### Suggested Readings

1. Plant Physiology - by Frank Salisbury, Cleon Ross
2. Introduction to Plant Physiology - by W.G. Hopkins
3. Plant Physiology - by Taiz and Zeiger
4. Plant-pathogen Interaction - by N. Talbot
5. Biochemistry and Molecular Biology of Plants - by Buchanan et al.