


MANGALORE UNIVERSITY
DEPARTMENT OF BIOCHEMISTRY

MSc in Biochemistry

SOFTCORE BCS 454: PLANT BIOCHEMISTRY

Total Number of Lecture Hours: 42

Total Number of Credits: 03

Course Objectives

- To study the overall plant metabolism and physiology
- Assessment of the plant respiratory mechanism in detail
- To study photosynthesis (light reactions and carbon cycle)
- Evaluation of assimilation of mineral nutrients.

Course Outcomes

- Knowledge in plant cell structure, metabolism and physiology.
- Familiarity in photosynthetic pathway and regulation.
- Awareness in plant defense and secondary metabolites.
- Familiarity in stress physiology and host parasite interaction

Unit I

14hrs.

Plant cell: Overview of plant structure, major tissues in plant, structure and components of a plant cell, plant cell membrane and constituents, transport systems across cell membrane, genome organization in plant (nucleus, plastids and mitochondrial). **Solute transport and photoassimilate translocation:** Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem. Transpiration, mechanisms of loading and unloading of photoassimilate. **Respiration:** Plant Glycolysis - cytosolic and Plastidic process; plant mitochondrial electron transport and regulation.

Unit II

14hrs.

Photosynthesis (Light reactions and carbon cycle): Photosynthetic apparatus in plants, photosystems I and II, light harvesting antennae complex. Electron flow and phosphorylation; cyclic and noncyclic, oxygen evolution, Calvin cycle, C₃, C₄, and CAM cycle. Photorespiration, regulation of photosynthesis, RUBISCO.

Plant hormones: Biosynthesis, storage, breakdown and transport. Physiological effects and Mechanisms of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid.

Plant defense and secondary metabolites - Terpenes, phenols, flavonoids and nitrogenous compounds and their roles in plant physiology. Methods in phytochemicals: extraction, fractionation and characterization.

Unit III

14 hrs.

Assimilation of mineral nutrients: Nitrogen metabolism- Importance of nitrogen in biological systems, nitrogen cycle. Nitrogen fixation; symbiotic and non-symbiotic, nitrogenase complex, energetics and regulation. Formation of root nodules in legumes. Assimilation of nitrate and ammonium ion. Sulfur assimilation.

Stress physiology: Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress.

Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, Viruses, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen induced diseases in plants, cell-cell fusion in both normal and abnormal cells.

References

1. Principles of Biochemistry; David L. Nelson and Michael M. Cox, 6th Edition, W. H. Freeman (2013).
2. Biochemistry; Donald Voet, Judith G. Voet, 4th Edition, John Wiley and Sons (2010).
3. PM, Plant Biochemistry, Harborne JB (1997) Academic Press.
4. Introduction to Plant Biochemistry, Goodwin TW, Mercer EI (1983)
5. Plant Physiology; Taiz and Zeiger, 3rd Edition
6. Plant Biochemistry; Hans Walter Heidt, 3rd Edition, Elsevier Publishers
7. Biochemistry & Molecular biology of Plants: Buchanan BB, Gruissem W, Jones RL (2000) American Society of Plant Physiologists Rockville
8. Singhal G (1999) Concepts in Photobiology: photosynthesis and photomorphogenesis: Springer Science & Business Media.