B.Sc. II Year

BBO-C401 Semester – IV

DSC-4 Plant Physiology and Metabolism

MM : 100
Time : 3 hrs

Sessional : 30
ESE : 70
Pass Marks : 40

Learning objective:

- To understand the importance of plant physiology and metabolism, plant-water relations and mineral nutrition.
- To acquire an overall translocation of metabolites, photosynthesis, and respiration, enzymes and nitrogen metabolism.
- To become familiar with general techniques used in plant physiology and metabolism.
- To become familiar with various types phyto-hormones and Photoperiodism.

Learning outcomes:

At the end of course student will be able

- The student will be able to understand basics knowledge of plant physiology and metabolism, transpiration, guttation and essential elements required for growth and development.
- The student will be able to understand the structure, function, composition of vascular tissues.
- The student will be to understand the physiology and biochemistry and mechanism of action ofphyto-hormones, pphotosynthesis and respiration.
- The student will be able take the decisions for carrier point of views in research, industries and academia entrepreneurships etc.

Unit 1: Plant-Water Relations and Mineral Nutrition **(16 Lectures)**

Importance of water, water potential and its components; transpiration and its significance; factors affecting transpiration; root pressure and guttation. Essential elements, macro and micronutrients; criteria of essentiality of elements; role of essential elements; transport of ions across cell membrane, active and passive transport.

Unit 2: Translocation of Metabolites **(6 Lectures)**

Phloem structure, function, composition of phloem sap, girdling experiment; pressure flow model; phloem loading and unloading.

Unit 3: Photosynthesis and Respiration **(18 Lectures)**

Photosynthetic pigments (Chl. a, b, xanthophylls, carotene); photosystem I and II, reaction center, antenna molecules; electron transport and mechanism of ATP synthesis; C_3, C_4 and CAM pathways of carbon fixation; photorespiration. Glycolysis, anaerobic respiration, TCA cycle; oxidative phosphorylation, oxidative pentose phosphate pathway

Unit 4: Enzymes and Nitrogen Metabolism **(8 Lectures)**

Classification, structure and properties; mechanism of enzyme action and enzyme inhibition. Biological nitrogen fixation (process of nodule formation, *nif*-genes, nitrogenase, mechanism of nitrogen fixation), nitrate and ammonia assimilation.

Unit 5: Plant Growth Regulators and Photoperiodism **(8 Lectures)**

Discovery and physiological roles of Auxins, Gibberellins, Cytokinins, ABA and Ethylene. Photoperiodism (SDP, LDP, day neutral plants); Vernalization.

DSC-4 SEMESTER-IV BBO-C451(LAB COURSE-CC-04)

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. To study the effect of two environmental factors (light and wind) on transpiration by excised twig.
3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
4. Demonstration of Hill reaction.
5. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
6. To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.
7. Comparison of the rate of respiration in any two parts of a plant.
8. Separation of amino acids by paper chromatography.

Demonstration experiments (any four)

1. Bolting.
2. Effect of Auxins on rooting.
3. Suction due to transpiration.
4. R.Q.
5. Respiration in roots.

Suggested readings:

1. Steward, F.C (1964): Plants at Work (A summary of Plant Physiology) Addison-Wesley Publishing Co., Inc. Reading, Massachusetts, Palo alto, London.
2. Devlin, R.M. (1969): Plant Physiology, Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi.
3. Noggle, R.& Fritz (1989): Introductory Plant Physiology Prentice Hall of India.
4. Lawlor, D.W. (1989): Photosynthesis, metabolism, Control & PhysiologyELBS/Longmans-London.
5. Mayer, Anderson &Bonning(1965): Introduction to Plant PhysiologyD.VanNostrand . Publishing Co., N.Y.
6. Mukherjee, S. A.K. Ghosh(1998) Plant Physiology, Tata McGraw Hill Publishers(P)Ltd., New Delhi.
7. Salisbury, F.B & C.W. Ross (1999): Plant Physiology CBS Publishers and Printers,New Delhi.
8. Plummer, D.(1989) Biochemistry–the Chemistry of life,McGraw Hill Book Co., London, N.Y. New Delhi, Paris, Singapore, Tokyo.
9. Day, P.M.&Harborne, J.B. (Eds.,) (2000): Plant Biochemistry.Harcourt Asia (P) Ltd., India & Academic Press, Singapore.

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