

DSE-6 Plant Physiology and Metabolism

MM : 100
Time : 3 hrs
L Credit
4 4

Sessional : 30
ESE : 70
Pass Marks : 40

Total Hours: 60

Learning objective:

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

Learning outcomes:

- The student shall be able to understand basic knowledge of plant physiology and metabolism.
- The student shall be able to understand transpiration, guttation and essential elements required for growth and development.
- The student shall be able to understand the structure, function, composition of vascular tissues.
- The student shall be able to understand the physiology and biochemistry and mechanism of action of phyto-hormones, photosynthesis and respiration.
- The student shall be able to take the decisions for carrier point of views in research, industries and academia entrepreneurship 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)**

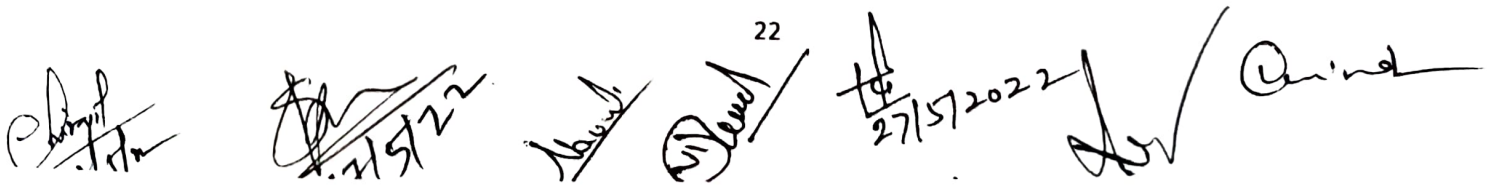
Photosynthetic pigments (Chl. a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; electron transport and mechanism of ATP synthesis; C₃, C₄ and CAM pathways of carbon fixation; photorespiration. glycolysis, anaerobic respiration, TCA cycle; oxidative phosphorylation, 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.

22

 The bottom of the page contains several handwritten signatures and dates. From left to right, there is a signature, a signature with the date '21/5/22', a signature, a signature with the date '27/5/2022', and another signature. The number '22' is written above the second signature from the left.

DSE 6 SEMESTER VI / BBO-E651 (LAB COURSE CC-06)

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. To demonstrate that light is necessary for photosynthesis.
5. To demonstrate that CO₂ is necessary for photosynthesis.
6. To demonstrate the activity of catalase and study the effect of pH and enzyme concentration.
7. To demonstrate that O₂ is releasing during photosynthesis with the help of hydrophytic plant.
8. Comparison of the rate of respiration in any two parts of a plant.
9. Separation of chlorophyll pigments by paper chromatography.
10. To demonstrate the analysis of soil pH, N, P and K.

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 & Physiology ELBS/Longmans-London.
5. Mayer, Anderson & Bonning(1965: Introduction to Plant Physiology D.Van Nostrand . 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.
11. Day, P. M. & Harborne, J.B. (Eds.,) 2000: Plant Biochemistry. Harcourt Asia (P) Ltd., India & Academic Press, Singapore.
12. A Laboratory Manual Of Plant, Physiology, Biochemistry And Ecology Author: Akhtar Inam Publisher: Agrobios (India).
13. Advanced Methods In Physiology And Biochemistry (pb) Author : Padmanaban G , Chandrasekaran CN , Thangavelu AU , Dr. Sivakumar R , Kalimuthu N., Dr. Boominathan P , Dr. Anbarasan P,Agrobios.
14. Methods in Plant Biochemistry and Molecular Biology. 1997. Dashek, WV (ed.). CRC Press.
15. Wilson and Walker .Practical Biochemistry: Principles and Techniques. Cambridge University Press. U.K.
16. Thimmaiah, SR. 2004. Standard Methods of Biochemical Analysis. Kalyani Publishers.
17. Henry, RJ. 1997. Practical Application of Plant Molecular Biology. Chapman & Hall, London

[Handwritten signature]
27/5/22

[Handwritten signature]

[Handwritten signature]
27/5/2022

[Handwritten signature]