

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

M. Sc. BOTANY SEMESTER –III

Core course 9: M3BOT01-CT09

Paper I: *Plant Physiology*

Unit-I Credit hours: 12

Photosynthesis: Historical account, Evolution of photosynthetic apparatus, physiological and ecological significance, Factors effecting photosynthesis. Photo pigments; types, structure, Photosystems; types, structure and function. Photophosphorylation. Photo-protective mechanisms. Carbon assimilation; C₃, C₄ and CAM pathways, Photorespiration and its significance.

Unit-II Credit hours: 12

Respiration: Over view, Historical account, Evolution of anaerobic and aerobic metabolism, Aerobic respiration: glycolysis, TCA cycle, Pentose phosphate pathway, Oxidative electron transport and chemiosmotic hypothesis of ATP synthesis, alternative oxidase system, Anaerobic respiration. Fermentation: Alcohol and Lactic acid fermentations. Gluconeogenesis

Unit-III Credit hours: 12

Lipid and Nitrogen metabolism: Oxidation of Fatty acids, β -oxidation, Ketone Bodies, ammonium assimilation (reductive amination, GS-GOGAT system, transamination).

Biological nitrogen fixation: Non symbiotic and Symbiotic, nitrification and denitrification. Structure of nodule and heterocyst, Role and structure of Nitrogenase, Leghemoglobin, Genetics of Nitrogen fixation.

Unit-IV Credit hours: 12

Secondary metabolism: Function and uses of Glycosides, anthraquinones, isothiocyanates, flavonols, lactones phenols, saponins, cardiac glycosides. Alkaloids, indoles, isoquinolines, tropanes, pyridine and piperidine, steroidal alkaloids. Phenols and Tannins.

Unit-V Credit hours: 12

Stress physiology: Types of stress and physiological consequences, Response and resistance mechanisms, Molecular mechanism of tolerance, Stress tolerant Transgenics.

Heat stress and heat shock proteins, Osmotic adjustments, Reactive oxygen species and oxidative stress, Metal toxicity. Biotic stress and response, HR and SAR mechanisms.

Practicals

1. Determination of water potential of plant tissue by falling drop method.
2. Determination of osmotic potential of cell sap.
3. Determination of osmotic potential of cell sap by plasmolytic method.
4. Demonstration of mechanism of opening and closing of stomata.
5. Determination of the rate of transpiration.
6. Study of effect of plant hormone on rate of transpiration.
7. Demonstration of osmosis by using egg membrane.
8. Effect of osmotic potential of external solution on the rate of imbibition.
9. Determination of stomatal index, frequency and pore area.
10. Effects of chemicals and temperature on the permeability of protoplasmic membrane.
11. Estimation of water content, dry matter and ash content of plant.

Reference Books

1. Plant Physiology; Lincoln Taiz and Eduardo Zeiger, Sinauer Associates; 3rd ed. 2002.
2. Introduction to Plant Physiology; William G. Hopkins and Norman P. A. Huner. Wiley; 3 Ed., 2003.
3. Plant Physiology; Frank B. Salisbury and Cleon Ross. Brooks Cole; 4th edition 1992.
4. Water Relations of Plants, Paul Jackson Kramer. Academic Press. May 1983.
5. Plant Stress Biology: From Genomics to Systems Biology. Wiley-VCH, 2009.
6. Plant Abiotic Stress (Biological Sciences Series); Eds: Matthew A. Jenks and Paul M. Hasegawa. Wiley-Blackwell, 2005.
7. Plant Physiology; Eds; Meirion Thomas. Prentice Hall Press; 5th edition. 1973.
8. Physiology and Molecular Biology of Stress Tolerance in Plants; Eds; K.V. Madhava Rao, A.S. Raghavendra and K. Janardhan Reddy. Springer; 1st edition, 2006.
9. Oxidative Stress in Plants; Dirk Inze and Marc Van Montagu. CRC Press; 1st edition, 2001. Antioxidants and Reactive Oxygen Species in Plants (Biological Sciences Series). Ed; Nicholas Smirnoff. Wiley-Blackwell. 2005.
10. Plant Physiology; Hans Mohr, Dr Hans Mohr, Hans Mohr. Springer. 1995.

MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

M. Sc. BOTANY SEMESTER –III

Core course 10: M3BOT02-CT10

Paper II: *Plant Systematics and Resources Utilization*

Unit-I Credit hours: 12

Fundamentals of Systematics: Historical account of development of Taxonomy, Plant nomenclature, Taxonomic structure (concept of taxa, species, genus, family), numerical taxonomy, Botanical gardens, Herbarium, Taxonomic terminology; floral formula and floral diagram. Phylogeny; origin and evolution of angiosperms

Unit –II Credit hours: 12

Systems of angiosperm classification – broad outline and relative merits and demerits of major systems of classification (Bentham and Hooker; Engler and Prantl; Hutchinson; Takhtajan; Angiosperm Phylogeny Group).

Taxonomic evidence – Role of morphology, anatomy, embryology, palynology, phytochemistry, molecular systematics

Unit –III Credit hours: 12

Angiosperm families: Diagnostic features of Ranunculaceae, Leguminosae (Subfamily; Papilionoideae, Caesalpinioideae, Mimosoideae), Solanaceae, Asteraceae, Cucurbitaceae, Lamiaceae, Euphorbiaceae, Orchidaceae, Liliaceae, Poaceae. Combretaceae, Loranthaceae, Lemnaceae, Cyperaceae.

Unit –IV Credit hours: 12

Ethnobotany: Introduction, History and development of ethnobotanical study; scope and potential applications; methods in ethnobotanical study. Applied Ethnobotany and intellectual property rights.

Economic Botany: Origin, evolution, Botany, cultivation and uses of fibre yielding plants, cereal crops, sugar yielding plants, pulses, dye plants, gum yielding plants, oil yielding plants.

Unit –V Credit hours: 12

Economic Botany: Origin, evolution, Botany, cultivation and uses of fruits and nuts, vegetables, spices, condiments, beverages, medicinal plant, rubber yielding plants and petrocrops. Centres of origin.

Practicals:

- (i) Study of at least 20 locally available families of flowering plants
- (ii) Identification of genus and species of locally available wild plants
- (iii) Preparation of botanical keys
- (iv) Training in using floras and herbarium for identification of specimens described in the class.
- (v) Field trips within and around the campus, compilation of field notes and preparation of herbarium sheets of such plants.
- (vi) Knowledge of at least 25 plant species of economically and traditionally important plants.

Reference books:

1. Cronquist, A. 1988. The Evolution and Classification of Flowering Plants (2nd ed.) Allen Press, U.S.A.
2. Davis, P. H. and V. H. Heywood 1991. Principles of Angiosperm Taxonomy. Today and Tomorrow Publications, New Delhi
3. Gurcharan Singh. 2004. Plant Systematics : Theory and Practice Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Heywood (ed.) Modern Methods in Plant Taxonomy.
5. Jones, S.B., Luchsinger, A.L. 1987. Plant Systematics.
6. Judd Walter S., Campbell C. S., Kollogg, E. A., Stevens P.F. and M. J. Donoghue 2008. Plant Systematics: A phylogenetic approach. Sinauer Associates, INC, Publishers. Sunderland, Massachusetts, USA.
7. Lawrence, George H. M. 1951. Taxonomy of Vascular Plants. Oxford and IBH Publ. Co. Pvt. Ltd., New Delhi
8. Nordenstam, B., El Gazaly, G. and Kassas, M. 2000. Plant Systematics for 21st century.
9. Quicke, Donald, L. J. 1993. Principles and Techniques of Commemorative Taxonomy. Blakie Academic and Professional, London
10. Radford, A.E. 1986. Fundamentals of Plant Systematics, Harper & Row Publ. USA.
11. Stace, C. A. 1980. Plant Taxonomy and Biosystematics Edward Arnold, London.
12. Takhtajan, A.L. 1997. Diversity and Classification of Flowering Plants. Columbia Univ. Press, New York.
13. Tiagi, Y.D. and Aery, N.C. Flora of Rajasthan (South and South -east Region). Himanshu Publications, New Delhi, Udaipur.
14. Woodland, D.W. 1991. Contemporary Plant Systematics. Prentice Hall, New Jersey.
15. Katewa, S.S. & Jain Anita. Ethnobotany, Phytogeography, Plant Resources Utilization and conservation. Apex Publishing House, Jaipur. 2007.
16. Kocchar, S.L. 1998. Economic Botany of the Tropics, 2nd edition, Macmillan India Ltd., Delhi.

17. Nair, M.N.B. et al. (eds) 1998. Sustainable Management of Non-wood Forest Products. Faculty of Forestry, University Putra Malaysia, 434004 PM Sardong, Selanger, Malaysia.
18. Paroda, R.S. and Arora, R.K. 1991. Plant Genetic Resources Conservation and Management. IPGRI (Publication), South Asia Office, C/o NBPGR, Pusa Campus, New Delhi.
19. Plant Wealth of India 1997. Special Issue of Proceedings Indian National Science Academy B-63.