

**JYOTI NIVAS COLLEGE AUTONOMOUS  
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

**Programme: B.Sc.**

**Semester: V**

**BOTANY PAPER VI**

**MOLECULAR BIOLOGY, GENETIC ENGINEERING AND PLANT  
PHYSIOLOGY- I**

**Course Code: 18VBO6**

**No. of Hours: 45**

**COURSE OBJECTIVES:**

- Gain knowledge about Fundamentals of Molecular Biology.
- Learn the scope and importance of molecular biology.
- To gain knowledge about the water relations, Transpiration in Plant Physiology

**LEARNING OUTCOMES:**

- Understand the biochemical nature of nucleic acid and their role in living systems.
- To understand the applications of Genetic Engineering in the field of agriculture, medicine & industry.
- Comprehend the importance of water in plant life and mechanisms for transport of water and solutes in plants.

**UNIT I Molecular Biology**

**13 HRS**

**NucleicAcids: DNA:** Discovery of genetic material (Hershey & Chase experiment). Detailed structure and functions of **B** DNA (Watson and Crick model), Types of DNA – **A**, **C** and **Z**. Replication; Meselson and Stahl's Experiment, semi-conservative & rolling circle model – Enzymes and Proteins involved at replication fork. **RNA:** Discovery, structure and functions of m-RNA, t-RNA and r-RNA. Salient features of Genetic code. Transcription and Translation in Prokaryotes. Gene regulation in prokaryotes – Lac operon concept. Eukaryotes - Britten and Davidson model.

**UNIT II Genetic Engineering**

**14 HRS**

Recombinant DNA technology; Introduction. and steps involved. Enzymes: DNA ligases, Type II Restriction enzymes. **VECTORS:** Plasmids pBR 322 (pUC18 and Ti plasmids, Cosmids, Phagemids, Phasmids and Shuttle vectors (BAC & YAC). Detailed account on *Agrobacterium* mediated transformation method, Gene gun method and Electroporation. Gene Libraries: Construction of genomic and cDNA libraries. Screening – *In situ* hybridization and Plaque Hybridization. Brief account on Sequencing (Sanger's method)

Plant Biotechnology: Introduction and applications of Transgenic plants- Bt cotton, Golden rice, edible vaccines. Ethical issues involved in genetic engineering. Brief mention of Intellectual Property Rights (IPR)

## **PLANT PHYSIOLOGY I**

### **UNIT III Water relations**

**6 HRS**

Importance of water, Membrane permeability, Imbibition, Diffusion, Osmosis - Endosmosis, Exosmosis, Plasmolysis, DPD, OP, TP, WP. Concept of water potential. Ascent of sap - Definition, Mechanism and theories - Root pressure and transpiration pull theory. Factors affecting ascent of sap. Absorption of water and mineral salts – Mechanism of water absorption (active and passive). Carrier ion concept and Protein Lecithin theory.

### **UNIT IV Transpiration**

**6 HRS**

Different types, structure of stomatal complex, stomatal distribution (monocots and dicots), mechanism of stomatal movement – theories (starch sugar interconversion hypothesis and potassium ion and proton transport). Significance, factors affecting Transpiration. Anti-transpirants and their applications. Guttation.

### **UNIT V Mineral nutrition in plants**

**6 HRS**

Major elements (N, K, P, Mg), and Minor elements (Zn, Mn, Mo, Co) and their role and deficiency symptoms in plants. Hydroponics a brief account. Phloem transport – Introduction, Mechanism - Transcellular or streaming hypothesis, mass flow hypothesis. Vein loading and unloading. Factors affecting phloem transport.

## **REFERENCES**

1. Devlin Plant Physiology
2. Joshi, P. Genetic Engineering and its applications, Panima book distribution, Bangalore
3. Menetre, S S. Molecular basis of cytoplasmic male sterility in crop plants,
4. Purohit, S S. Molecular biology and Biotechnology, Daya Publishing House, New Delhi.
5. Rajan .Physiology, L B Publication.
6. Ratoedge. Basic Biotechnology, L B Publication.
7. Richardson .Translocation in plants. ELBS, Longman.
8. Sawahel and Wagley. (1997). Plant genetic engineering, Daya Publishing House, New Delhi.
9. Sunderajan, S. (1997) College Botany Vol .IV, Himalaya Publication.
10. Taiz, C & Zeiger, E. (1998) Plant Physiology. 2<sup>nd</sup> Ed. Sinauer Associates, Inc.

11. Vyas, S.P. & Kohi, D.V. Methods in Biotechnology and Bioengineering, Daya Publishing House, New Delhi.
12. Yadav. Biotechnology, L.B. Publication.
13. Noggle and Fritz – Plant Physiology

### **BOTANY PRACTICAL – VI**

1. Qualitative tests for starch, protein, reducing sugar and lipids.
2. Quantitative estimation of DNA.
3. Preparation of Phosphate/ Acetate Buffer.
4. Determination of osmotic potential of cell sap by plasmolytic method.
5. Determination of stomatal index.
6. Mass flow, Girdling, Cyclosis, Osmoscope.
7. Study of Phloem transport by ringing experiment. (Comment on).
8. Spotters – any 5 ( Molecular Biology-2, Genetic Engineering -2, Physiology – 2)
9. Electrophoresis.
10. Test and Repetition

**ACTIVITY FOR V SEMESTER:** Making chart/Models