SYLLABUS

BOTANY PAPER – 2

1. Plant-water relation, membrane transport and translocation of water and solutes.

2. Enzymes– General characteristics, Classification, mechanism of action, kinetics of enzymatic catalysis, regulation of enzyme activity, active sites, coenzymes, activators and inhibitors, isozymes.

3. Photosynthesis- Pigments, photophosphorylation, Mechanism of photosynthesis, photorespiration, photosynthesis in C4 plants, CAM.

4. Nitrogen fixation and Nitrogen metabolism. Fatty acid metabolism. Signal transduction: overview, receptors and G-proteins, phospholipid signaling, second messengers, two-component sensor-regulator system in bacteria and plants.

5. Respiration- Glycolysis, TCA cycle, Oxidative phosphorylation, Glycogen breakdown, inter conversion of hexoses and pentoses.

6. Seed dormancy and germination. Concept of growth and development. Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid and jasmonic acid. Plant rhythms and biological clock. Secondary metabolites. Plant responses to biotic and abiotic stresses. Physiology of flowering- Photoperiodism and Vernalization.

7. Ultrastructure of prokaryotic and eukaryotic cells; Cell membrane- structure and function; Cell organelles-structure and functions; Ultrastructure of nucleus; DNA: Structure, A, B and Z forms, replication, damage and repair; Cells cycle; Structure of chromatin and its organization; Special types of chromosomes; Banding patterns; Chromosomal aberrations and numerical chromosome abnormalities.

8. Genetics of prokaryotes and eukaryotic organelles; Mapping of bacteriophage genome; Genetic transformation, Conjugation and Transduction in bacteria; Cytoplasmic male sterility. Mendelism, Allelic and non-allelic gene interactions.

9. Techniques in cell biology-in situ hybridization, FISH, GISH. Genetic code, transcription and translation, RNA processing; Teminism; Regulation of gene expression in prokaryotes and eukaryotes; Genetic mapping; Independent assortment and crossing over, molecular mechanism of recombination, genetic markers. Mutations, molecular basis of spontaneous and induced mutations and their role in evolution. Principles of plant breeding, important conventional methods of self and cross pollinated and vegetatively propagated crops; Mutation breeding.

10. Basic concepts, principles and scope of Biotechnology, plant cell and tissue culture. Concept of totipotency; Micropropagation by axillary bud proliferation and adventitious shoot bud differentiation; Embryogenesis and organogenesis; Somatic hybridization, protoplast- isolation, fusion and culture; Artificial seeds; Somaclones and somatic hybrids; in-vitro production of secondary metabolites and bioactive compounds.

11. Recombinant DNA Technology: Restriction enzymes, Gene cloning- principles and techniques; construction of gene library (genome and cDNA library); DNA sequencing, polymerase chain reaction, RT-PCR, DNA finger printing. Genetic engineering of plants: Aims and strategies for development of transgenics, Methods of gene transfer in plants, intellectual property rights and possible ecological risks and ethical concerns. Microbial genetic manipulation. Structural and functional genomics, microarray, genome sequencing projects (with special reference to rice, wheat, chick pea and tomato) and proteomics.

12. Principles and practices of statistical methods in biological research, samples and population, Data collection and processing in research; Basic statistics (averages, statistics of dispersion, coefficient of variation, standard error and deviation); Confidence limits, Probability, Distribution (Binomial, Poisson and Normal), Tests of statistical significance, Simple Correlation and Regression, Analysis of Variance.