

# BOTANY

**Cryptogams:** Algae, Fungi, Bryophytes, Pteridophytes - structure and reproduction from evolutionary viewpoint. Distribution of Cryptogams in India and their economic potential.

**Phanerogams: Gymnosperms:** Concept of Progymnosperms. Classification and distribution of Gymnosperms. Salient features of Cycadales, Coniferales and Gnetales, their structures and reproduction. General account of Cycadofilicales, Bennettitales and Cordaitales.

**Angiosperms:** Plant morphology, Inflorescences, Nomenclature; Comparative account of various systems of Angiosperm Classification including APG. Numerical taxonomy, Chemotaxonomy, Taxonomy in relation to anatomy, embryology, palynology, serology and molecular study. Dendrology, Herbarium and Botanical Garden. Important angiospermic families: Magnoliaceae, Rosaceae, Leguminosae, Malvaceae, Sterculiaceae, Bignoniaceae, Sapindaceae, Anacardiaceae, Combretaceae, Myrtaceae, Asteraceae, Meliaceae, Sapotaceae, Apocynaceae, Acanthaceae, Lamiaceae, Lauraceae, Salicaceae, Euphorbiaceae, Dipterocarpaceae, Verbenaceae, Rubiaceae, Poaceae (Graminae).

**Anatomy and Embryology:** Stomata and their types. Anomalous secondary growth, Anatomy of C<sub>3</sub> and C<sub>4</sub> plants. Development of male and female gametophytes, pollination, fertilization. Endosperm its development and function. Patterns of embryo development. Polyembryony, apomixis, Applications of palynology. Seed structure and formation

**Microbiology and Plant Pathology:** Viruses, bacteria, and plasmids-structure and reproduction. Phyto-immunology. Applications of microbiology in agriculture, industry, medicine and pollution control in air, soil and water. Important plant diseases caused by viruses, bacteria, mycoplasma, fungi and nematodes. Mode of infection and dissemination. Molecular basis of infection and disease resistance/defence. Physiology of parasitism and control measures. Fungal toxins, Modelling and disease forecasting, Plant quarantine.

**Plant Utility and Exploitation:** Origin of cultivated plants, Vavilov's centres of origin. Plants as sources for timber, food, fodder, gums, resins, dyes, fibres, spices, beverages, drugs, narcotics and insecticides. Importance of Ethnobotany, Energy plantation.

**Morphogenesis:** Totipotency, polarity, symmetry and differentiation. Cell, tissue, organ and protoplast culture. Somatic hybrids and Cybrids.

**Cell Biology:** Techniques of Cell Biology. Prokaryotic and eukaryotic cells -structural and ultrastructural details. Structure and function of extracellular matrix or ECM (cell wall) and membranes-cell adhesion, membrane and vesicular transport. Structure and function of cell organelles, Nucleus, nucleolus, nuclear pore complex. Chromatin and nucleosome. DNA and RNA. Cell signalling and cell receptors. Signal transduction (G-1 proteins, etc.). Mitosis and meiosis; molecular basis of cell cycle. Numerical and structural variations in chromosomes and their significance. Study of polytene, lampbrush and B-chromosomes structure, behaviour and significance.

**Genetics, Molecular Biology and Evolution:** Development of genetics, gene versus allele concepts (Pseudoalleles). Quantitative genetics and multiple factors. Linkage and crossing over, methods of gene mapping. Sex chromosomes and sex-linked inheritance, sex determination and molecular basis of sex differentiation. Mutation (biochemical and molecular basis). Cytoplasmic inheritance and cytoplasmic genes. Prions and prion hypothesis. Structure and synthesis of nucleic acids and proteins. Genetic code and regulation of gene expression. Multigene families. Organic evolution-evidences, mechanism and theories.

**Plant Breeding, Biotechnology and Biostatistics:** Methods of plant breeding -- introduction, selection and hybridization (pedigree, backcross, mass selection, bulk method). Male sterility and heterosis breeding. Use of apomixis in plant breeding. Micropropagation and genetic engineering methods of transfer of genes and transgenic crops; development and use of molecular markers in plant breeding.

**Physiology and Biochemistry:** Water relations, Mineral nutrition and ion transport, mineral deficiencies. Photosynthesis, Respiration. Nitrogen fixation. Enzymes, coenzymes, energy transfer and energy conservation. Importance of secondary metabolites. Pigments as photoreceptors. Photoperiodism and flowering, senescence. Growth substances-their chemical nature, growth indices, growth movements. Stress physiology. Fruit and seed physiology. Dormancy, storage and germination of seed. Fruit ripening

**Ecology and Plant Geography:** Ecological factors. Concepts and dynamics of community. Plant succession. Concepts of biosphere. Ecosystems and their conservation. Pollution and its control. Phytogeographical and biogeographical regions of India. Protected Areas. Forest types of India, afforestation, deforestation and social forestry. IUCN, CITES, IPCC, Threatened species, Endemism and Red Data Books. Convention of Biological Diversity (CBD), Sovereign Rights and Intellectual Property Rights. Global warming.