

UNIVERSITY OF MYSORE

SYLLABUS FOR Ph.D. ENTRANCE EXAMINATION

SUBJECT: Applied Botany

Unit 1. Seed Technology: Embryogenesis and seed development; biochemical, hormonal and physiological changes during seed development; orthodox and recalcitrant seeds; seed dormancy. Agricultural situation in India – impact of green revolution, notified varieties, seed act. International organizations – ISTA, OECD, UPOV, AOSA, APSA, CGIAR, ISHI, FIS, EPPO, NSHS. Seed production strategies - classes of seeds and maintenance, seed production requirements. Seed drying, processing, storage and marketing. Concept and testing of Seed quality – varietal purity, physical purity, numerical determination, moisture, germination, vigour and TTC test; Seed certification – domestic and international. Seed health: Definition and importance of seed borne diseases, types of disease cycle, quarantine, phytosanitary certificates, important seed borne diseases, seed borne nature and transmission, seed health testing for fungi, bacteria, viruses and nematodes.

Unit 2. Molecular plant pathology: Fundamentals of plant pathology, Fungal infection - disease development - basic concepts of necrotrophy and biotrophy, host barriers , role of toxins and enzymes; Bacterial diseases – cell wall degrading enzymes, toxins, hormones, extracellular polysaccharides, determinants of host specificity, effector proteins, quorum sensing; Viral diseases – structure and replication, infection, symptoms, transmission, short and long distance movement; Resistance mechanisms – classical concepts, preformed defences, induced defences, PR-proteins, gene-for-gene resistance, signaling mechanisms; Molecular diagnostics – classical approaches, serological tests, nucleic-based techniques; Plant disease management – conventional approaches, biotic/abiotic elicitors, biological control, PGPR.

Unit 3. Crop improvement: Basic concepts and scope of plant breeding, principles and methods of plant breeding in self, cross and asexually propagated plants; male sterility, breeding for disease resistance, polyploidy and mutation breeding, somaclonal variation, Marker assisted selection. Transgenic technology: Scope of plant transgenics, plant transformation techniques, Agrobacterium-mediated genetic transformation, Ti and Ri plasmids; viral vectors; direct gene transfer methods; selection of transformants. Transgenic traits – herbicide resistance, resistance against biotic and abiotic stress, nutritional quality, male sterility; Concerns and constraints of transgenic technology, ethical issues; Molecular farming. Intellectual Property Rights – WTO, WIPO, GATT, TRIPS, Plant breeders' Rights.

Unit 4. Cell and Tissue culture technology: Importance, Types of media and their composition, role of growth hormones/regulators; organogenesis, somatic embryogenesis, embryo rescue, somaclonal variation, cell suspension culture and its importance, synthetic seeds; Micropropagation techniques; haploid culture, protoplast culture, bioreactor systems for mass cultivation of plant cells; commercial production.

Unit 5. Molecular markers: DNA Polymorphism in plants and microbes, molecular taxonomy, DNA fingerprinting, Genetic markers – RAPD, SCAR, RFLP, AFLP, SSR, SNP, SSCP, ISSR, DGGC; cDNA library, PCR techniques, quantitative PCR; genome sequencing techniques.

Unit 6. Molecular medicine: Natural products as modern drug targets, ethnobotanical approach and screening, plants and microbes as sources of natural metabolites; extraction, purification and characterization of natural metabolites, establishing bioactive potential and screening against different targets, assay-guided fractionation, high throughput screening, clinical trials; use of softwares in drug development.

Unit 7. Biodiversity: Introduction to basic concepts – organization of life, hierarchy of interaction, levels of ecological organization; genetics, species and ecosystems, values of biodiversity, problems and threats to biodiversity; evolution and speciation, evolutionary theory, genetic basis of evolutionary mechanism, speciation, extinction; agricultural ecology, centres of origin/diversity, domestication of species, agro-ecosystem characteristics, sustainable agriculture, agricultural biodiversity; conservation of genetic resources for food and agriculture, *in situ* and *ex situ* conservation; gene flow – vertical and horizontal gene transfer; ecology of GM crops, environmental effects, potential risks and benefits of GMOs.