SEED TECHNOLOGY

Seed and its importance: Afforestation activity and seed requirements in India; seed problems- Limiting factors in tree propagation and afforestation

Important Tree Families and Tree bearing Seeds: Floral biology, pollination, fertilization, embryogenesis, Development and maturation of seed bearing organs and seeds in angiosperms and gymnosperms; Seed structure of monocot and dicots, Apomixis, parthenocarpy, polyembryony and somatic embryoids and synthetic seeds. Morphology and anatomy of Fruit and Seed; Chemical composition of seed, seasonality and periodicity of flowering and fruiting; External Factors influencing seed Production; Mass Blooming, Staggered Blooming, Episodic Blooming

Seed dispersal: Definition, purpose, modes – anemochory, zoochory and hydrochory, practical application - pre and post dispersal hazards, seed polymorphism – types, causes, consequences on seedling recruitment, purpose.

Role of seed technology in nursery stock production: Production of quality seed, identification of seed collection areas**,** seed orchard- types and seed orchard design; location and maintenance of seed orchards-isolation and roughing, seed source, provenance and stands.

Seed Sources: Selection of seed tree, genotypic and phenotypic selection, plus tree – pure stands, elite seed tree, isolated tree location, locality factors.

Phenology, maturity indices, factors affecting seed maturity, soil seed bank- their types and importance.

Seed collection: Planning and Organization, collection methods, factors affecting seed collection, Seed maturity test, containers for collection and seed storage, seed transportation techniques.

Genetic Implications of Seed Handling; Seed Documentation; Seed Sources Record, Seed Handling Record, Seed Testing Record, Seed Stock and dispatch record.

Seed processing: Reduction of bulk, maintaining viability and identity of seed lots, seed extraction, drying, blending, cleaning, grading, treating, bagging, labeling, safety precautions during processing and storage.

Seed Storage : Requirements and types of seed storage. Factors affecting seed storage and role of moisture, temperature, RH and moisture equilibrium. Seed deterioration causes and methods of control. Physiological, biochemical and molecular changes in seed ageing. Seed drying and Packaging needs. Eco-physiological role of storage, Storage categories-orthodox and recalcitrant seeds, precautions of handling of recalcitrant seeds, natural longevity of tree seeds- microbiotic, mesobiotic, macrobiotic seeds, seed ageing, factors affecting longevity – storage conditions, methods and containers, storage units.

Seed testing: Seed Testing concepts and objectives, its role in seed quality control. Sampling, mixing and dividing, determination of genuineness, moisture, purity, vigour, viability, germination; Different viability and vigour tests, seed priming. International Seed Testing Association (ISTA), its role in development of seed testing procedures, rules and seed quality assurance for international seed trade.

Seed Dormancy - classification of dormancy, pretreatments for breaking seed dormancy and seed promoting germination- metabolic events- GA – ABA signaling in seed germination, mechanisms and genes involved in seed germination, hormonal events in breaking dormancy

Phytosanitary problems and Seed treatment: Susceptibility to pests and diseases, effects of pests and pathogens to seed quality, important seed insect orders, families and genera, fungus types and species specificity, conditions and modes of infestation/ infection, disease and pest control in seeds; Phytosanitary problems during transfer of seeds. Use of pesticides, botanicals, mycotoxins for seed treatments. Carry over infestation, principles of fumigation and safe use of fumigants.

Seed Certification: Seed certification – history, concept, organization, phases and minimum certification standards. Classes of tree seeds, certification procedures of tree seeds, Seed legislation in India, highlights of the Seed Act, 1966, The Seeds Rules 1966, National Seed Policy 2002, The Seeds bill, 2004 and Seed bill 2010, National Seed Plan, etc.

Seed Industry Development and Marketing: Trends in National and International seed industry development. International Seed Trade Federation (ISF) and Indian seed associations. Economics of seed production. Market survey, demand forecasting, pricing policies, marketing channels, planning and sales promotion. Role of Government, semi Government, co-operative and private sectors in seed trade. Responsibilities of seed companies and dealers in Seed Act. Seed import and export.

Seed Senescence – definition and concept; Factors influencing - abiotic and biotic, theories of seed deterioration - manifestation of seed senescence – physical and physiological- biochemical basis of seed deterioration.

Ecology – seed ecology- definitions, importance, genetic effects, geographic adaptation of seeds and biotic factors on germination, regeneration, influence of ecological factors on seed production, physiological disorders, reproductive allocation, reproductive effort, assessment of resource allocation.

Protection of Plant Varieties: Plant Variety Protection (PVP) and its significance. Protection of Plant Varieties and Farmers' Right Act, (PPVFRA 2001), its essential features. International Union for the Protection of New Varieties of Plants (UPOV) - its role in development of Plant breeders Rights and Seed Industry Development. DUS testing principles and application. Biodiversity Act. Criteria for protection of Essentially Derived Varieties (EDVs) and Genetically modified (GM) varieties.

Seed sampling methods (for various tests and quality control) and statistical analysis of data.