## Plant Resource Utilization , Palynology And Biostatistics

**Course Code: BEB610** **Credit: 04 (L-3, T-1, P-0)**
**Contact Hours: 60** **MM: 100**

**Course Objectives:**

- Identify characteristics of self- and cross-pollinated plants
- Identify sources of genetic variation to conduct a breeding program
- Determine breeding methodology appropriate for plants with different mating systems
- Conduct basic statistical analyses related to plant breeding
- Analyze journal articles related to cultivar development
- Conduct and analyze a selection experiment
- Communicate background information and original ideas related to breeding a specific crop
- Know different techniques to improve the plant varieties using tissue culture techniques for commercial purposes.

**UNIT I: General account:** history of plant breeding, the disciplines to be known by a breeder – botany of the crop, cytogenetics (agronomy, physiology, pathology, entomology, biochemistry, bacteriology, statistics, plant biotechnology); objectives of plant breeding: high yield, improved quality, disease and pest resistance, early maturity, photosensitivity, varieties for new seasons, resistant varieties; activities in plant breeding: creation of new varieties, selection, evaluation, multiplication and distribution; centres of origin: different centres and their significance; germplasm conservation: *in situ* seed banks, plant banks, shoot tip banks, cell and organ banks, DNA banks, germplasm evaluation, cataloguing, multiplication and distribution

**UNIT II:Plant introduction:** history of plant introduction- primary and secondary, plant introduction agencies: procedure of plant introduction: quarantine, cataloguing, evaluation, multiplication, distribution, acclimatization, purpose of plant introduction, achievements, merits and demerits; methods of reproduction; incompatibility: different types – self incompatibility, homomorphic and heteromorphic incompatibility – gametophytic and sporophytic incompatibility, mechanism of self- incompatibility, pollen- stigma interaction, pollen tube -style interaction, pollen tube -ovary interaction –significance of self- incompatibility, methods to overcome self- incompatibility- bud pollination, surgical methods and off season pollination, high temperature, irradiation (iv) Sterility : male sterility – genetic male sterility - cytoplasmic male sterility – cytoplasmic genetic male sterility, application in crop improvement

**Unit III:Selection:** history of selection, pureline selection, mass selection, pedigree selection, bulk method of selection, merits and demerits, achievements of each type; backcross method of selection : Introduction, requirements, applications of back cross methods, genetic consequences of repeated back crossing, procedure of back cross method - transfer of a dominant gene, transfer of a recessive gene, number of plants necessary in backcross generation, selection of the characters being transferred, transfer of quantitative characters, modification of back cross method, production of F2 and F3, use of different recurrent parents, application of back cross method in cross pollinated crops, merits and demerits, achievements; hybridization: history , techniques and consequences, objectives, types of hybridization –interspecific, intergeneric, distant 26 hybridization, procedure of hybridization, choice of parents, evaluation of parents, emasculation – different methods, bagging, tagging, pollination , harvesting and storing of the F1 seeds and selfing, consequences of hybridization.

**UNIVT IV:Plant Tissue Culture:** history of plant tissue culture research - basic principles of plant tissue callus culture, meristem culture, organ culture, Totipotency of cells, differentiation and dedifferentiation; methodology - sterilization (physical and chemical methods), culture media, Murashige and Skoog's (MS medium), phytohormones, medium for micro-propagation/clonal propagation of ornamental and horticulturally important plants; callus subculture maintenance, growth measurements, morphogenesis in callus culture – organogenesis, somatic embryogenesis; endosperm culture – Embryo culture -culture requirements –

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applications, embryo rescue technique; production of secondary metabolites; cryopreservation; Germ plasm conservation.

**Suggested Readings:**


1. Gardner EJ, Simmons MJ, Snustad DP (2008). Principles of Genetics. 8th Ed. Wiley-India.
2. Klug WS, Cummings MR, Spencer, C, Palladino, M (2011). Concepts of Genetics, 10th Ed., Benjamin Cummings
3. Griffiths, A.J.F., Wessler, S.R., Carroll, S.B., Doebley, J. (2010). Introduction to Genetic Analysis. W. H. Freeman and Co., U.S.A. 10 edition.
4. Singh, B.D. (2005). Plant Breeding: Principles and Methods. Kalyani Publishers. 7th edition.
5. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Amsterdam, Netherlands: Elsevier Science.
6. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications. Washington, U.S.: ASM Press.
7. Kochhar, S.L. (2011). Economic Botany in the Tropics, 4th edition, New Delhi, Delhi: MacMillan Publishers India Ltd.
8. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory Practice. Elsevier Science Amsterdam.The Netherlands.


**CO:**By the end of this course, students will be able to:

- Understand the "Science of Heredity".
- Realize the role of genes in evolution of species.
- To understand linkage, segregation and mutation of genes during evolution.
- Understand the science of plant breeding.
- To introduce the student with branch of plant breeding for the survival of human being from starvation.
- To study the techniques of production of new superior crop verities.
- To study the evolution in living organisms

**Practicals:**

1. Hybridization techniques - Emasculation, Bagging (for demonstration only).
2. Induction of polyploidy conditions in plants (for demonstration only).
3. Practice of hybridization techniques in a self-pollinated and cross pollinated plants (any available plant).
4. A visit to agricultural research centre for observation and record of inter variety, inter specified integration plants.
5. Study of tissue culture methodologies.
6. Methods of plant propagation a) Budding b) Grafting c) Rooting d) Layering e) Cutting.

**Course Outcomes**

1. Understand the science of plant breeding.
2. To introduce the student with branch of plant breeding for the survival of human being from starvation.
3. To study the techniques of production of new superior crop verities.
4. Understand the modern strategies applied in Genetics and Plant Breeding to sequence and analyze genomes
5. Get the detail knowledge about modern strategies applied in Plant Breeding for crop improvement i.e. Mass selection, Pureline Selection and Clonal selection.
6. Know about exploitation of Heterosis, hybrid and variety development and their release through artificial hybridization.

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