

**BACHELORS WITH BOTANY AS MAJOR (CT - III)**  
**6<sup>th</sup> SEMESTER**

**BOT622J3: BOTANY \_ PLANT BREEDING**

**CREDITS: THEORY: 4; PRACTICALS: 2**

***COURSE OBJECTIVES:***

***OBJECTIVES:***

*To impart theoretical knowledge and practical skills about plant breeding objectives, modes of reproduction and genetic consequences, breeding methods for crop improvement.*

***LEARNING OUTCOME:***

- (i) Learn important breeding procedures in self- and cross-pollinated crops*
- (ii) Understand exploitation of heterosis utilizing male sterility and other methods*
- (iii) know about the various population improvement programmes*
- (iv) Learn about hybrid breeding and its implications on crop improvement*
- (v) Learn about floral biology of self- and cross-pollinated crops*
- (vi) Knowledge on the fundamentals of mutation, polyploidy and wide hybridization and their role in crop improvement*

**UNIT-1**

- Definition, history of plant breeding, aims and general objective of plant breeding, major achievements and future prospects; modes of reproduction in crop plants,
- Self-incompatibility (heteromorphic SI, homomorphic SI), utilization of self-incompatibility in plant breeding;
- Male sterility- genetic consequences (Genetic MS, Cytoplasmic Genetic MS, Transgenic MS); Chemical Hybridizing Agents;
- Centres of origin/diversity of major crop plants.
- Brief account of genetic variation, heritability and genetic advance

**UNIT-II**

- Plant Introduction and role of plant genetic resources in plant breeding- primary and secondary introduction, advantages and disadvantages; Acclimatization- Definition, concept, factors affecting acclimatization.
- Breeding methods in self-pollinated crops –Mass selection (definition, genetic basis, main features, merits, demerits, achievements);
- Pure line selection (definition, uses of pure line, merits, demerits, achievements),
- Hybridization techniques and handling of segregating population (Pedigree and bulk methods-brief account) method;
- Back cross method (definition, objective and achievements), procedure for transfer of dominant and recessive gene through backcross method

**UNIT-III**

- Concepts of population genetics and Hardy-Weinberg Law, factors affecting Hardy-Weinberg Law;
- Methods of breeding in cross pollinated crops; Population improvement Schemes- mass selection, ear to row method, recurrent selection; development of inbred lines and hybrids,
- Hybrid breeding - heterosis and inbreeding depression, effects and estimation of heterosis, genetic basis/theories of heterosis & Inbreeding depression.
- Wide hybridization- Definition, types, incompatibility barriers for wide hybridization, techniques for overcoming incompatibility barriers.

## **UNIT-IV**

- Breeding methods in asexually propagated crops, Clonal selection- Definition, features of asexually propagated crops, procedure of clonal selection, its merits and demerits;
- Mutation breeding concept (definition, procedure and scope);
- Breeding for important biotic and abiotic stresses (insect resistance, draught and salt stress tolerance);
- Role of Polyploidy in plant breeding,
- Concept of molecular breeding and marker assisted selection (brief account).

## **PRACTICAL**

- Plant Breeder's kit,
- Study of germplasm of various crops.
- Study of floral structure of self-pollinated crops.
- Study of floral structure of cross-pollinated crops
- Emasculation and hybridization techniques in self- & cross-pollinated crops using suitable growing crop plant in the field.
- Study of male sterility system.
- Methods of calculating mean, range, variance, standard deviation, heritability.
- Designs used in plant breeding experiments, analysis of Randomized Block Design.
- To work out the mode of pollination in a given crop and extent of natural out-crossing.
- Demonstration charts on mass selection, pure line selection, back cross method.
- Demonstration charts on various male sterility mechanisms.

## **SUGGESTED READINGS**

- Plant Breeding Principles and Methods by B. D. Singh Kalyani Publication New Delhi.
- Essentials of Plant Breeding by Phundan Singh Kalyani Publication New Delhi
- Principles and Practices of Plant Breeding by J. R. Sharma McGraw Hill Publishing company Limited, New Delhi.
- Plant Breeding Theory and Practices by V. L. Chopra Oxford and IBH. Publishing Company, New Delhi.
- Introduction to Plant Breeding by R. C. Choudhary Oxford and IBH. Publishing Company, New Delhi.
- Elementary Principles of Plant Breeding by R. C. Choudhary Oxford and IBH. Publishing Company, New Delhi.

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