

# Minor For Soil Science And Agricultural Chemistry

## (P.G. 1<sup>st</sup> Sem)

**Course Title: Principles of Plant Breeding**

**II. Course Code : GPB 502**

**III. Credit Hours : 4(3+1)**

**(M.M.:100- Mid term-25, End term- 50, Practical-25)**

IV. Why this course? Development of plant variety is the ultimate aim of any plant breeding program. A post graduate in the subject of agriculture must know what are the different selection methods, techniques and related crop improvement strategies. Further, knowledge of genetic resources, evolution and their role in development of noble varieties is the need of the

V. Objective of the Course: To impart theoretical knowledge and practical skills about plant breeding objectives, genetic consequences, breeding methods for crop improvement.

VI. Theory

Unit I

Early Plant Breeding; Accomplishments through plant breeding; Objectives of plant breeding; Patterns of Evolution in Crop Plants: Centre of Origin, Agro-biodiversity and its significance. Pre-breeding and plant introduction and role of plant genetic resources in plant breeding.

Unit II

Genetic basis of breeding: self and cross pollinated crops including mating systems and response to selection; Nature of variability, components of variation; Heritability and genetic advance, genotype environment interaction; General and specific combining ability; Types of gene actions and implications in plant breeding. Pure line theory, pure line and mass selection methods; pedigree, bulk, backcross, single seed descent and multiline breeding; Population breeding in self-pollinated crops with special reference to diallel selective mating; Transgressive breeding.

Unit III

Breeding methods in cross pollinated crops; Population breeding: mass selection and ear-to-row methods; S1 and S2 progeny testing, progeny selection schemes, recurrent selection schemes for intra and inter-population improvement and development of synthetics and composites.

Unit IV



Hybrid breeding: genetical and physiological basis of heterosis and inbreeding, production of inbreeds, breeding approaches for improvement of inbreeds, predicting hybrid performance; seed production of hybrid and their parent varieties/ inbreeds. Self-incompatibility, male sterility and apomixes in crop plants and their commercial exploitation. Breeding methods in asexually/ clonally propagated crops, clonal selection. Special breeding techniques: Concept of plant ideotype and its role in crop improvement, concept of MAS.

## VII. Practical

• Floral biology in self and cross pollinated species; • Selfing and crossing techniques; • Selection methods in segregating populations and evaluation of breeding material; • Analysis of variance (ANOVA); 16 • Estimation of heritability and genetic advance; • Maintenance of experimental records; • Learning techniques in hybrid seed production using male-sterility in field crops; • Prediction of performance of double cross hybrid. VIII. Teaching methods • Power point presentation • Chalk and Board • Smart board • Lectures • Assignments, quiz • Group tasks, student's presentations IX. Learning outcome The knowledge of this course will enable the student to know breeding methods, different hybridization techniques for genomic reshuffling. The course will also acquaint the student with importance of floral biology, mutation breeding and participatory plant breeding, etc.

## X. Suggested Reading

1. Allard RW. 1981. Principles of Plant Breeding. John Wiley & Sons.
2. Chahal GS and Gossal, SS. 2002. Principles and Procedures of Plant Breeding Biotechnological and Conventional approaches. Narosa Publishing House.
3. Chopra VL. 2004. Plant Breeding. Oxford & IBH.
4. George A. 2012. Principles of Plant Genetics and Breeding. John Wiley & Sons.
5. Gupta SK. 2005. Practical Plant Breeding. Agribios. Jain HK and Kharakwal
6. MC. 2004. Plant Breeding and—Mendelian to Molecular Approach, Narosa Publications, New Delhi
7. Roy D. 2003. Plant Breeding, Analysis and Exploitation of Variation. Narosa Publ. House.
8. Sharma JR. 2001. Principles and Practice of Plant Breeding. Tata McGraw-Hill.
9. Sharma JP. 2010. Principles of Vegetable Breeding. Kalyani Publ, New Delhi.
10. Simmonds NW. 1990. Principles of Crop Improvement. English Language Book Society.
11. Singh BD. 2006. Plant Breeding. Kalyani Publishers, New Delhi. Singh S and Pawar IS. 2006. Genetic Bases and Methods of Plant Breeding. CBS.

