

21GPBR211 FUNDAMENTALS OF PLANT BREEDING

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

COURSE DESCRIPTION AND OBJECTIVES:

The aim of this course to expose the students to basic and applied principles of Plant Breeding, mode of reproduction and breeding methods for crop improvement

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Understanding the plant breeding methods for self, cross and vegetative propagated crops
2	Greater understanding about the advantages and disadvantages of breeding techniques to become self-entrepreneur or work in seed companies
3	Learn about centers of origin / diversity, components of Genetic variation; Heritability and genetic advance

SKILLS:

- ✓ *Design plant breeding methods for self, cross and vegetative propagated crops*
- ✓ *Expertise in analysis of seed and plant material quality*
- ✓ *Practice pollination methods*



Source :

<https://www.gulfagriculture.com/breakthrough-in-global-data-exchange-on-plant-breeding/>

ACTIVITIES:

- o Draw floral structure of self-pollinated and cross pollinated crops
- o Demonstrate emasculation and hybridization techniques
- o Estimation of heterosis, inbreeding depression and heritability
- o Prepare Layout of field experiments

UNIT - 1

History : Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding; Heritability and genetic advance

UNIT - 2

Modes of Reproduction: Modes of reproduction and apomixes; self – incompatibility and male sterility genetic consequences, cultivar options; Domestication, Acclimatization, introduction, Centre of origin / diversity; Genetic basis and breeding methods in self-pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population (Single seed descent, Bulk Pedigree)

UNIT - 3

Concept: Multiline concept; Concepts of population genetics and Hardy Weinberg Law; Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties

UNIT - 4

Breeding Methods: Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding; mutation breeding- methods and uses; Breeding for important biotic and abiotic stresses; Haploids and it's significance in Breeding. Aneuploids, Monosomics, Trisomics and Nullisomics and their analysis

UNIT - 5

Tools-DNA: Biotechnological tools - DNA markers and marker assisted selection. Genome editing Participatory Varietal Selection (TRICOT Method)

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

1. Plant Breeder's kit
2. Study of germplasm of various crops
3. Emasculation and hybridization techniques in self-pollinated crops – rice, groundnut
4. Emasculation and hybridization techniques in self-pollinated crops – green gram, sesame
5. Emasculation and hybridization techniques in cross pollinated crops – maize, castor
6. Emasculation and hybridization techniques in often cross pollinated crops – cotton, red gram
7. Consequences of inbreeding on genetic structure of resulting populations
8. Study of male sterility systems
9. Handling of segregation populations
10. Methods of calculating mean, range, variance, standard deviation
11. Designs used in plant breeding experiments
12. Layout of field experiment
13. Analysis of Randomized Block Design
14. Estimation of heterosis, inbreeding depression and heritability
15. Prediction of performance of double cross hybrids; work out the mode of pollination in a given crop and extent of natural out crossing

REFERENCES:

1. Gupta, S.K. 2010. Plant Breeding Theory and Techniques. Wiley India Pvt. Ltd. New Delhi
2. Allard, R.W. 2010. Principles of Plant Breeding. John Wiley and Sons, New York. Poehlman, J.M. and Borthakur, D. 1995. Breeding of Asian Field Crops. Oxford and IBH Publishing Co., New Delhi
3. Sharma, J.R. 1994. Principles and Practice of Plant Breeding Tata McGraw Hill Publishing Company Ltd., New Delhi
4. Phundan Singh, 2014. Essentials of Plant Breeding. Kalyani Publishers, New Delhi
5. Singh, B.D. 2015. Plant Breeding: Principles and Methods. Kalyani Publishers, New Delhi
6. Gupta, S.K. 2010. Plant Breeding Theory and Techniques. Wiley India Pvt. Ltd. New Delhi
7. Allard, R.W. 2010. Principles of Plant Breeding. John Wiley and Sons, New York
8. Poehlman, J.M. and Borthakur, D. 1995. Breeding of Asian Field Crops. Oxford and IBH Publishing Co., New Delhi
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