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GPB-211 Fundamentals of Plant Breeding 3(2+1)

Theory:

Historical development, concept, nature and role of plant breeding, objectives of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction, pollination and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options. Domestication, Acclimatization, introduction; Centre of origin/diversity. Component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops- mass and pure line selection, pedigree, bulk, SSD and backcross methods, hybridization techniques and handling of segregating population; 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; 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; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Development and release of varieties.

Practical:

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregating populations. Methods of calculating mean, range, variance, standard deviation, heritability.

Designs used in plant breeding experiment, analysis of Randomized Block Design and components of genetic variance. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

Lecture Schedule:Theory

S. No.	Name of topic	No. of Lectures
1	Plant breeding: concept, nature, objectives and role of plant breeding	1
2	Historical development of plant breeding	1

3	Major achievements and future prospects	1
4	Genetics in relation to plant breeding	1
5	Modes of reproduction and pollination, apomixes	1
6	Self – incompatibility	1
7	Male sterility- genetic consequences	1
8	Domestication, Acclimatization, introduction, Centre of origin/diversity	1
9	Component of Genetic variation; Heritability and genetic advance	1
10	Genetic basis of self- pollinated crops and pure line theory	1
11	Breeding methods in self- pollinated crops- mass and pure line selection	1
12	Hybridization techniques	1
13	Handling of segregating population (pedigree, bulk and back cross method)	1
14	Multiline concept	1
15	Concepts of population genetics and Hardy-Weinberg Law	1
16	Genetic basis and methods of breeding cross pollinated crops	1
17	Population improvement and modes of selection	1
18	Heterosis and inbreeding depression	1
19	Development of inbred lines and hybrids	1
20	Composite and synthetic varieties	1
21	Breeding methods in asexually propagated crops	1
22	Clonal selection and hybridization	1
23	Wide hybridization and pre-breeding	1
24	Polyploidy in relation to plant breeding	1
25	Mutation breeding- methods and uses	1
26	Breeding for important biotic and abiotic stresses	1
27	Breeding for important abiotic stresses	1
28	Biotechnological tools-DNA markers	1
29	Marker assisted selection	1
30	Participatory plant breeding	1
31	Intellectual Property Rights and Patenting	1

32	Plant Breeders and & Farmer's Rights	1
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Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Plant Breeder's kit	1
2	Study of germplasm of various crops	1
3	Study of floral structure of self pollinated crops	1
4	Study of floral structure of cross pollinated crops	1
5	Emasculation and hybridization techniques in self pollinated crops I	1
6	Emasculation and hybridization techniques in self pollinated crops II	1
7	Emasculation and hybridization techniques in self & cross pollinated crops	1
8	Emasculation and hybridization techniques in self & cross pollinated crops	1
9	Consequences of inbreeding on genetic structure of resulting populations	1
10	Study of male sterility system	1
11	Handling of segregating populations	1
12	Methods of calculating mean, range, variance, standard deviation, heritability	1
13	Designs used in plant breeding experiment	1
14	Analysis of Randomized Block Design and components of genetic variance	1
15	To work out the mode of pollination in a given crop and extent of natural out crossing	1
16	Prediction of performance of double cross hybrids	1

References:

1. Alard, R.W. 2000. Principles of Plant Breeding. John Willey & Sons, New York.
2. Chahel, G.S. and S.S. Ghosal. 2002. Principles and Procedures of Plant Breeding, Biotechnological and Conventional Approaches. Narosa Publishing House, New Delhi.
3. Singh, B.D. 2005. Plant Breeding. Kalyani Publishing House, New Delhi.
4. Singh, P. 2001. Essentials of Plant Breeding-Principles and Methods. Kalyani Publishing House, New Delhi.
5. Jain, H.K. and M.C. Kharkwal. 2004. Plant Breeding- Mendelian to Molecular Approach. Narosa Publishing House, New Delhi.
6. Sharma, A.K. 2005. Breeding Technology of Crop Plants (Edt.). Yash Publishing House, Bikaner.

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