

# Plant Breeding

## 1. Plant Breeding in Nepal

- 1.1 History and status of plant breeding
- 1.2 Plant breeding methods and use of native agricultural plant genetic resources
- 1.3 On-station and on-farm research
- 1.4 Stakeholders in plant breeding and their contribution
- 1.5 Improved varieties, release processes and types of seeds
- 1.6 Plant breeding for food and nutrition security
- 1.7 Government policy, plan, strategy and action plan for crop improvement

## 2. Genetics

- 2.1 Cell, nucleic acids and cell division
- 2.2 Linkage and crossing over
- 2.3 Probability and statistical testing
- 2.4 Gene action, interaction and partition of genetic variance
- 2.5 Mendelian genetics and inheritance
- 2.6 Gene, molecular biology and genomics
- 2.7 Heterosis and inbreeding
- 2.8 Sex determination
- 2.9 Chromosomal aberrations
- 2.10 Quantitative and qualitative traits, their gene action and interaction
- 2.11 Population genetics
- 2.12 Quantitative genetics

## 3. Plant Breeding: Principles and Practices

- 3.1 Genetic variation and plant breeding
- 3.2 Introduction to plant breeding
- 3.3 Plant introduction, domestication and acclimatization
- 3.4 Center of origin and diversity
- 3.5 Modes of pollination and reproduction
- 3.6 Pollination control
- 3.7 Quant-qualitative characters
- 3.8 Selection in self-pollinated crops
- 3.9 Genetic composition and selection in cross pollinated crops
- 3.10 Hybridization techniques
- 3.11 Breeding phases and activities
- 3.12 Heterosis and inbreeding

#### **4. Plant Breeding: Self-pollinated Crops**

- 4.1 Plant introduction
- 4.2 Mass selection
- 4.3 Pureline selection
- 4.4 Pedigree method
- 4.5 Back cross method
- 4.6 Bulk method
- 4.7 Single seed descent method
- 4.8 Multiline variety, cultivar mixture
- 4.9 F<sub>1</sub> hybrid

#### **5. Plant Breeding: Cross-pollinated Crops**

- 5.1 Plant introduction
- 5.2 Mass selection
- 5.3 Population improvement: Progeny selection, half/full sib Selection, recurrent selection
- 5.4 Synthetic variety and composite variety
- 5.5 Varietal hybridization
- 5.6 Cultivar mixture
- 5.7 Hybrid variety

#### **6. Plant Breeding: Vegetative Propagated Crops**

- 6.1 Genetic structure
- 6.2 Hybridization and heterosis fixing
- 6.3 Clonal selection

#### **7. Plant Breeding: Special Methods**

- 7.1 Conventional breeding
- 7.2 Mutation breeding
- 7.3 Polyploidy breeding
- 7.4 Heterosis breeding
- 7.5 Wide hybridization
- 7.6 Ideotype breeding
- 7.7 Biofortification
- 7.8 Gene pyramiding
- 7.9 Resistance breeding
- 7.10 Molecular breeding
- 7.11 Participatory plant breeding

## **8. Plant Biodiversity and Conservation**

- 8.1 Plant biodiversity and agrobiodiversity
- 8.2 Agrobiodiversity in Nepal: Status, conservation methods and use in breeding
- 8.3 Classification of agricultural plant genetic resources
- 8.4 Germplasm: Red listing, collection, conservation and utilization
- 8.5 Genetic diversity and database
- 8.6 CBD, WTO and ITPGRFA
- 8.7 Plant breeders' right, patenting variety and product, Geographical indication

## **9. Plant Biotechnology**

- 9.1 Cell and tissue culture
- 9.2 Molecular markers and molecular breeding
- 9.3 Gene and QTL tagging and mapping
- 9.4 Genetic engineering
- 9.5 Omics sciences in plant breeding
- 9.6 Bioinformatics
- 9.7 Achievements and future of plant biotechnology

## **10. Statistics**

- 10.1 Field plot techniques
- 10.2 Different experimental trials
- 10.3 Biometrical techniques in plant breeding
- 10.4 Experimental designs
- 10.5 Chi-square test, probability
- 10.6 Analysis of variance, covariance and genetic parameters
- 10.7 Correlation, path coefficients and regression analysis
- 10.8 Heritability, genetic gain, combining ability
- 10.9 Stability and adaptability analysis
- 10.10 Computer packages and its role in plant breeding