

## Sixth Semester

### **PBG-302 Breeding Fibre Crops 3(2-1)**

Origin of fibre crops; Brief review of breeding work done on cotton, jute and other fibre crops; Genetic resources of fibre crops; Breeding objectives; Breeding cotton and jute for yield and quality traits; Development of hybrid and organic cotton; Breeding for coloured cotton; Breeding for insects/pests and diseases resistance; Prospects of biotechnology in improvement of fibre crops; Development of transgenic cotton; Status of Bt cotton in Pakistan.

#### **Practical**

Selfing and crossing techniques in fibre crops; Identification of different species of cotton; Testing of fibre traits; Visit to HVI lab; Identification of insect pest and Pest scouting in cotton; Collection of diallel data on different quantitative characters and analysis for combining ability effects.

#### **Suggested Readings**

1. Afzal, M. and M. Ali. 1983. Cotton Plant in Pakistan. Ismail Aiwan-e-Science, Shahrah-e-Roomi, Lahore.
  2. Munro, J.M. 1987. Cotton Longman Group Ltd. ESSEX. England.
  3. Sleper, D.A. and J.M. Poehlman, 2006. Breeding Field Crops. 5<sup>th</sup> ed. Blackwell Publishing Company, USA.
  4. Shiron, J. (Editor). 2004. Transgenic cotton. Science pren 16 Donghuangchenggen North Street Beijing 100717, China.
  5. Singh, P. 2004. Cotton Breeding. Kalyani Publishers. New Delhi. India.
- Singh, P. 2000. Biometrical Techniques in Plant Breeding. 2<sup>nd</sup> Ed. Kalyani Publishers, New Delhi, India.

### **PBG-304 Breeding Sugar Crops 3(2-1)**

#### **Objective**

The purpose of this course is to introduce the students with different breeding techniques in sugar crops.

#### **Theory**

Origin and geographical distribution of sugar crops; Classification and botanical features; Officinarum and barberi canes: their evolution and present status; Nobalization of cane; Constraints of breeding sugarcane; Objectives and breeding methods; Methods of creating variability in sugarcane, Cytological behavior of sugarcane; Co-products of sugarcane; Sugarbeet: botany, genetics, induction of flowering, objectives and breeding methods; Strategies for seed production; Alternate sugar crops: their scope and future prospects.

#### **Practical**

Identification of sugarcane species; Selfing and crossing techniques in sugarcane; Morphogenetic features of sugar beet; Evaluation of sugarcane and sugar beet for quality parameters. Estimation of brix value; Assessment of genetic diversity through metroglyph and D2 analysis; Visit to sugar industries/research institutes.

#### **Suggested Readings**

1. Blackburn, F. 1984. Sugarcane. Longman Group Ltd. Essex, UK.
2. Jaggard, K.W. (Ed.). 1989. Sugar beet: A grower's guide. Sugar Beet Research and Education Committee, London, UK.

3. Malik, K.B. 2009. Cane and sugar production Published by Directorate of Agriculture information Punjab Lahore.
4. Mathur, R.B.L. 1992. Hand book of cane sugar technology. (2nd Ed.). Oxford and IBH, Publ. Co. (Pvt), Ltd, New Delhi, India.
5. Sleper, D.A. and J.M. Poehlman, 2006. Breeding Field Crops. 5th ed. Blackwell Publishing Company, USA.
6. Razdan, M.K. (Ed.). 2003. Introduction to plant tissue culture. (2nd ed.). Intercept, New York, USA.
7. Yadava, R.L. 1991. Sugarcane production technology; constraints and potentialities. Oxford and IBH Publishing Co., Pvt. Ltd., New Delhi, India.

### **PBG 306 Biodiversity and Plant Genetic Resources 3(3-0)**

#### **Objectives**

To enable students to understand:

- Importance of biodiversity in plant breeding
- Strategies of germplasm collection and conservation
- Role of biotechnology in identification and preservation

#### **Theory**

Importance of plant biodiversity, characteristics of wild and domesticated plant species, Origin and distribution patterns of crop species. Centres of origin. Wild relatives of crops, Exploration of genetic resources. Principles and strategies of germplasm collection, seed banks. Mechanism of gene banking, maintenance, evaluation and conservation. Utilization of genetic resources in crop research and plant breeding. Introduction to national and international germplasm centres.

#### **Books recommended**

1. Sleper, D.A. and J.M. Poehlman. 2006. Breeding Field Crops. 5th Ed., Iowa State University Press, Ames, USA.
2. Dhillon, B.S., R.K. Tyagi and A. Lal. 2004. Plant Genetic Resource Management. Narosa, New Delhi, India.
3. Brown, A. H. D., O. H. Frankel, D. R. Marshall and J. T. Williams. 1989. The Use of Plant Genetic Resources. Cambridge University Press, Cambridge, UK.

### **PBG 308 Molecular Genetics 3(2-1)**

#### **Objectives**

To enable students to understand:

- Concept of genetic codes and gene function
- Basics of genetic engineering and biotechnology

#### **Theory**

DNA as genetic material, chemistry of nucleic acids; DNA replication; types of RNA, Recombinant DNA technique, DNA transcription and translation. Transposable elements, Construction of genetic linkages map. Genetic Transformation, various techniques of developing transgenic plants. Marker assisted analysis and QTL mapping. Features of the genetic code, split gene and redundant DNA. Gene mutation, molecular basis of gene mutation, factors affecting mutation rate.

## **Practical**

DNA extraction, isolation and quantification. Gel electrophoresis, DNA amplification. 20

## **Books Recommended**

1. Klug, W. S. and M. R. Cummings. 2010. Concepts of Genetics. Dorling Kindersley, Pvt. (Ltd.) New Delhi, India.
2. Rothwell, V. N. 1993. Understanding Genetics: A Molecular Approach. 2nd ed., John Wiley and Sons New York, USA.
3. Bilgrami, K. S. and A. K. Pandey. 1992. Introduction of Biotechnology. CBS Publishers & Distributers, New Delhi, India.
4. Maniatis, T., E. F. Fritsch and J. Sambrook, 1989. Molecular Cloning. A Laboratory Manual. Cold Spring Harbour, USA.

## **PBG 310 Breeding Cereal Crops                    3(2-1)**

### **Theory**

Importance, origin and domestication of food cereals; Phenology of major cereal crops; Breeding objectives and methods for different cereal crops for yield and quality traits; Variety development under stressed and non-stressed environments; Exploitation of male sterility system for hybrid development; Wide hybridization; Genetic improvement using novel techniques.

### **Practical**

Reproductive biology, selfing and crossing techniques; Identification of phenological stages in different cereal species; Handling of segregating populations; Assessment of genetic variability; Data recording on various plant attributes and calculation for heterosis, heritability and Line  $\times$  Tester analysis.

### **Suggested Readings**

1. Heyne, E.G. 1987. Wheat and Wheat Improvement. 2<sup>nd</sup> edition, ASA, CSSA and SSSA. Agronomy Monograph 13, Madison, Wisconsin, USA.
  2. Nanda, J.S. 2000. Rice Breeding and Genetics. Oxford & IBH Publishers Co Pvt. LTD. New Delhi, India.
  3. Sleper, D.A. and J.M. Poehlman, 2006. Breeding Field Crops. 5<sup>th</sup> ed. Blackwell Publishing Company, USA.
  4. Rehman, A. and K. Alam. 1994. Principles of Crop Breeding. University of Agriculture, Faisalabad, Pakistan.
- Singhal, N.C. 2003. Hybrid Seed Production in Field Crops. Kalayani Publishers, New Delhi, India.