

## **7th Semester Courses**

### **PBG 401 Breeding Oilseed Crops                    3(2-1)**

#### **Objectives**

To enable students to understand the breeding oilseed crops

Genetic improvement of the oil seed crop plants.

Application of new innovative techniques in breeding oil seed crops

#### **Theory**

Origin of oilseed crops; Role of oilseed crops in the economy of Pakistan; Conventional and non-conventional oilseeds, desert and costal plants, Oil trees; Constraints to lower crop yield; Breeding objectives; Breeding methods; Male sterility mechanisms and its exploitation in hybrid seed production; Exploitation of heterosis in different oilseed crops; Development of inbred lines, synthetics, hybrids and polycrosses; Development of double low (erucic acid and glucocinolates) and triple low varieties in rapeseed mustard crops; Quality parameters of edible oils, omega series, iodine number melting point, smoke point etc. Prospects of oilseeds for biofuel and bioenergy.

#### **Practical**

Identification of different oilseed crops, their reproductive biology and selfing and crossing techniques in various oilseed crops; Estimation of oil content and quality; Development of hybrid populations of oilseed crops; Selection practices in segregating populations; Estimation of genetic diversity through principal components and cluster analysis; Visit to oil industry/research organization.

#### **Suggested Readings**

1. Nagata, T. and S. Tabata. 2003. Brassica and Legumes - From Genome Structure to Breeding. Springer Verlag, New York, USA
  2. Ramanath. 2004. Applied Genetics of Oilseed Crops. Daya, New Delhi, India 21
  3. G. Nagraraj. 2009. Oil seeds, properties, processing, products and procedures, New India, publishing agency, Pilam Pura, New Delhi.
  4. Elevitch, C.R., 2006. Traditional trees of Pacific Island, their culture, environment and use, permanent agriculture resources, Honolulu Hawaii Pg: 292-300.
  5. Pant, C. 2010. Production and processing of oilseed, Oxford book company. J pur, New Dehli. Pg 126-131.
  6. Chopera, U.L., and S. Parkas. 1996. Oilseeds and vegetable brassicas Indian prepective export and IBH publishing.
- Cavendish, M. 2001. Endangered wildlife and plants of the world. Marshall Cavndish Corporation.

### **PBG-403 Breeding Pulse Crops                    3(2-1)**

#### **Objectives**

To enable students to understand the breeding pulse crops

Genetic improvement of the breeding pulse crops.

Application of new innovative techniques in breeding pulse crops

#### **Theory**

Importance, origin of pulses and present status; Botanical description of pulses species; Objectives and methods of breeding for yield and quality; Breeding pulses for biotic stress i.e., Fusarium wilt, Ascochyta blight, mungbean yellow mosaic virus resistance etc.; Breeding for reduced

photoperiod sensitivity; Wide hybridization; Desi-Kabuli introgression; Mutation breeding and use of modern techniques.

### **Practical**

Reproductive biology of pulse crops; Selfing and crossing procedures; Recording and analyzing of data of various plant parameters of different pulse crops; Calculation for Correlation, Path coefficient and Regression analysis; Visit to research institutes.

### **Suggested Readings**

1. Kausar, A.G. and S. Bark-Ullah. 1991. Proceedings Awareness Seminars (Part-1). Government of Punjab, Agriculture Department.
  2. Pehlman, J.M. 1991. The Mungbean. Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, Bombay, Calcutta.
  3. Sexana, M.C. and K.B. Singh. 1987. The Chickpea CAB International, Wallingford, Oxon, UK
  4. Singh, D.P. (Ed). 2001. Genetics and Breeding of Pulse Crops. Kalyani Publishers New Delhi-110002.
- Ali, M. 2006. Drought Management Strategies for Pulse crops. Agrotech Publishing Academy, Udairpur, India.

### **PBG 405 Breeding Vegetable Crops 3(2-1)**

#### **Objectives**

To enable students to understand:

- Significance and classification of vegetables
- Reproductive mechanisms in various vegetables
- Role of biotechnology in vegetable improvement

#### **Theory**

Introduction, classification and importance of vegetable crops. Reproductive systems of important vegetables. Breeding objectives of important vegetable crops. Breeding and hybridization constraints of vegetables and possible improvement strategies. Hybrid seed production in vegetables. Breeding for quality, biotic and abiotic stresses and shelf- life. Role of biotechnology in improvement of vegetable crops.

#### **Practical**

Study of reproductive biology of important vegetables. Selfing and crossing techniques in major vegetables. Layout of field experiments and data recording for various genetic parameters. Visit to research stations.

#### **Books recommended**

1. Arya, P.S. 2003. Vegetable Breeding, Production and Seed Production. Kalyani Publisher, New Delhi, India.
2. Kallou, G. and B. O. Bergh. (Eds) 1999. Genetic Improvement of Vegetable Crops. Pergoman Press, New York. USA.
3. Swiader, J. M., G. W. Ware and J. M. McCollum. 1992. Producing Vegetable Crops. 4th ed. Interstate. Publisher, Inc, Danville, Illinois, U.S.A.
4. Bassett, M. J. (ed.) 1986. Breeding Vegetable Crops. Avi Publishing Co., Inc. Westport, Connecticut, U.S.A.

### **PBG 407 Breeding Fodder and Forage Crops 3(2-1)**

#### **Objectives**

To enable students to understand the breeding fodder and forage crops

Genetic improvement of the breeding fodder and forage crops using modern techniques.

Application of new innovative techniques for the improvement of crops

#### **Theory**

Introduction to major fodder and forage crops, grasses, legumes. Reproductive systems in fodder crops, breeding objectives and methods, forage trees, forage grasses, mix fodder cropping, hay and silage production, anti-quality agents in fodder and forage crops and remedies, fodder quality components.

#### **Practical**

Pollination, fertilization and seed setting in fodder and forage crops. Handling of self-, cross-pollinated and apomictic fodder and forage species. Determination of nutritive quality; nutritive value, intake and digestibility, toxic substances. Visit to research organizations, livestock farms and feed industry.

#### **Suggested Readings**

1. Chatterjee, B.N., 1989. Forage Crop Production: Principles and Practices. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
  2. Poehlman, J.M. and D.A. Sleper. 1995.
  3. Field Crops. 4th ed. Iowa State University Press/Ames, Iowa, USA
  4. Rognli, O.A., E.T. Solberg, I. Schjelderup, (Eds.) 1994. Breeding Fodder Crops for Marginal Conditions. Series: Developments in Plant Breeding, Vol. 2. Springer
- Sleper, D.A., K.H. Asay and J.F. Pedersen, (Ed.) 1989. Contributions from Breeding Forage and Turf Grasses. CSSA Special Publication 15, Amer. Soc. Agron., Madison, Wisconsin, USA.

### **PBG 409 Intellectual Property Rights in Crop Varieties 3(3-0)**

#### **Objectives**

To make the students abreast about:

Intellectual property rights

Registration of crop varieties and seed certification

#### **Theory**

Intellectual Property Rights (IPR): introduction and implementation; IPR; issues and challenges. Strategies to maximize benefits from IPR. Plant Variety Protection (PVP) and farmer's rights. Biological diversity and utilization of germplasm resources. Plant Breeder's Rights Act: background, requirements; advantages and disadvantages. Patenting biological material. International harmonization of patent laws. Plant variety registration and seed certification. A critical review of —WTO, TRIPS and seed industry in Pakistan.

#### **Books recommended**

1. Helfer, L.R. 2004. Intellectual Property Rights in Plant Varieties: International legal regimes and policy options for national governments. FAO Legislative Study 85, Food and Agriculture Organization, Rome, Italy.
2. Erbisch, F.U. and K.M. Mareid (eds). 2003. Intellectual Property Rights in Agricultural Biotechnology. CABI Publishing Company, USA.

3. Helfer, L.R. 2002. Intellectual Property Rights in Plant Varieties: an overview with options for national governments. FAO Legal Papers, Online #31, Food and Agriculture Organization, Rome, Italy.
4. Evenson, R.E. 1999. Intellectual Property Rights; access to plant germplasm and crop production scenarios in 2020. *Crop Sci.*, 39:1630-1635.