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PBA Lead Professors and Organizers

International Plant Breeding Academy

The Seed Biotechnology Center at the University of California, Davis is offering a professional development course to teach the principles of plant breeding to seed industry personnel. This two-year course addresses the reduced numbers of plant breeders being trained in academic programs. Participants meet at UC Davis for three 6-day weeks per year over two years (six sessions). Readings and exercises continue between sessions via internet to allow participants to maintain their current positions while being involved in the course.

Curriculum

Introduction to plant breeding

- Plant breeding objectives
- Germplasm resources and pools
- Crop evolution
- Reproductive systems

Statistics

- Sources of variance
- Analysis of variance
- Expected mean squares and mean separations

Genetics

- Transmission genetics
- Hardy-Weinberg equilibrium
- Inbreeding coefficients
- Quantitative genetics model
- Inbreeding depression and hybrid vigor

Selection theory

- Principles of selection and the gain equation
- Heritability and extensions to relevant selection models
- Use of block corrections in selection

Recombination and population development

- Selection limits
- Linkage drag
- Recombination in inbred lines and populations
- Polyploidy
- Interspecific hybridization
- Population size

Establishing and monitoring goals and priorities

- Population improvement vs cultivar development
- Minimum standards, intermediate optima, and directional response

Breeding methods 1

- Line Breeding: bulk, pedigree, backcross

Selection methods 1

- Single trait selection: mass selection, line selection, multiple stage selection

Breeding methods 2

- Population improvement
- Inbred line development
- Evaluating hybrids and combining ability

Selection methods 2

- Multiple trait selection: independent culling, tandem selection, selection indices
- Indirect selection methods: theory
- Linkage disequilibrium
- Indirect selection methods: conventional breeding
- Indirect selection methods: DNA markers

Genotype by environment interactions

- GxE and decisions in population development
- Genetic correlation: treatment of GxE
- Selection environment: single vs multiple environments
- Designs to control GxE
- Variance component analysis

Breeding systems

- Breeding for hybrids
- Genetic control of pollination: sex expression, self-incompatibility, male sterility
- Breeding cultivars
- Breeding clones
- Breeding populations (synthetics)

Resistance breeding

- Diseases
- Insects
- Stress

Special topics

- Mutation breeding
- Biotechnology (transgenic)
- Mechanization
- Off season nurseries
- Data management

Finishing varieties

- Cultivars vs hybrids
- Protecting varieties and intellectual property

Course goal: This course develops the skills and abilities of *current industry personnel* to enable them to become independent breeders or more valuable contributors to larger breeding programs.

Course level: The Academy will provide training in plant breeding equivalent to that obtained in a Master of Science program. It will provide greater depth in the specific subject matter of plant breeding but possibly less breadth than some MS programs require. As participants will not be enrolled in a formal degree program, they would not be eligible for a graduate degree. However, the Academy program may be recognized by graduate institutions, at their discretion, as equivalent to formal university courses for transfer credit. Participants will receive an official UC Davis certificate for completing the Academy.

Invited speakers (partial list):

- Dr. Gurdev Khush (UC Davis)
- Dr. Kent Bradford (UC Davis)
- Dr. Allen Van Deynze (UC Davis)
- Dr. Richard Michelmore (UC Davis)
- Dr. Alan Bennett (UC Davis)
- Dr. Paul Gepts (UC Davis)
- Dr. David Francis (Ohio State)
- Dr. Jim Holland (NC State)
- Dr. David Stelly (Texas A&M)
- Dr. Dave Douches (Michigan State University)



The 2006-2008 Academy

- 15 students from US, North America and Hong Kong
- 50% of students from small companies
- 60% from California
- 30% agronomic crops
- Biotech, organic and conventional crops



For more information, please contact
The Plant Breeding Academy
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