TEXAS A&M AGRILIFE RESEARCH | EXTENSION

TEXAS A&M UNIVERSITY

TEXAS A&M PLANT BREEDING BULLETIN

September 2018

TEXAS A&M UNIVERSITY--EDUCATING AND DEVELOPING PLANT BREEDERS WORLDWIDE TO ALLEVIATE HUNGER AND POVERTY THROUGH GENETIC IMPROVEMENT OF PLANTS

The National Association of Plant Breeders held its annual meeting at the University of Guelph in August 2018. The annual meeting was a great success with plant breeders, both public and private, and people from related industries in attendance. The meeting included two new efforts by the membership to enhance the experience for outstanding undergraduate and graduate students.

Through the generosity of an NAPB member that was matched by the membership, we established the Borlaug Scholars Program that provided travel scholarships for undergraduate students who have identified already that they are interested in a career in plant breeding and for graduate students majoring in plant breeding. This year the NAPB recognized the following as Borlaug Scholars:

Katelyn Fritz: UG student from Iowa State University
Andrew Herr: UG student from Iowa State University
Dorothy Krish: UG student from St Mary's University
Tavin Schneider, UG student from Montana State University

Adam Bolton: G student from the University of Wisconsin
Austin Dobbels: G student from the University of Minnesota
Kevin Falk: G student from Iowa State University
Elizabeth Prenger: G. student form the University of Georgia

This program was a tremendous success in 2018 and we expect it to be an ongoing program within NAPB. Anyone interested in making a donation to this outstanding effort should go to https://www.a-s-

f.org/napb-borlaug-scholars-donation and all interested in plant breeding should check the NAPB website for more information on this program.

The second ”new” NAPB activity at Guelph was a premeeting workshop co-sponsored by Corteva Agriscience Agriculture Division of DowDupont and Monsanto and was an effort for graduate students to better understand and develop their soft or personal skills. We hope that this too will be a private industry activity associated with future NAPB annual meeting.

Two students from Texas A&M University, Department of Soil and Crop Sciences, participated in the Soft Skills Workshop and are highlighted below. Nathalia Penna Cruzato (Ph.D. with Seth Murray, corn breeding) and Jorge Valenzuela-Antelo (Ph.D. with Amir Ibrahim, wheat breeding) participated in the Soft Skills Workshop and other activities during the NAPB annual meeting. Nathalia also presented a poster and her abstract is below.

Jorge Luis Valenzuela-Antelo: Impressions from the 2018 National Association of Plant Breeders Meeting and Associated Workshops (Guelph, Canada)

Attending the National Association of Plant Breeders (NAPB) annual meeting at the University of Guelph, Canada, was an outstanding opportunity to meet colleagues and expand my contacts network, and to build leadership skills through the Corteva and Monsanto sponsored Soft Skills Workshop. This workshop was for graduated students only and was led by Dr. Harsch-Porter from PorterBay Insight. She introduced us to the DISC ® Assessment tool that is designed to strengthen working relationships and support professional growth by helping individuals to understand themselves and others. With this assessment procedure, Dr. Harsch-Portor categorized us into different

behavioral profiles, namely dominance, influence, conscientiousness, and steadiness. Groups were created with people from each profile and we discussed how different work situations could motivate us or stress us. For example, some people find it completely normal to push others for deadlines, while for others is a complicated task. Dr. Harsch-Porter also pointed out the role played and the value from each profile in a team; for example people with an influence profile tend to value collaboration, generate enthusiasm and give support. She noted the importance of understanding how to react to each style based on motivators and stressors. The rest of the time was spent on how we can take advantage of our profile by identifying our strengths and weaknesses, and how to apply that knowledge in order to interact successfully and succeed.

Following the workshop, the NAPB sessions were composed of presentations from faculty and students from Guelph University and other breeding programs in Canada who spoke about their breeding schemes and the traits for which they were breeding in crops such as wheat, dry bean, and maize. Representatives from different companies emphasized that they are interested in plant breeders with experience in genomic selection and gene editing. What I enjoyed most from the meeting was the interaction with other graduate students. I learned from their experiences, especially from those who share the same interests. I look forward to collaborating with those colleagues in the future given the strong collaborative network in wheat breeding.

Nathalia Penna Cruzato: Genetic Components of Unmanned Aerial Systems Phenotyping Variability for Maize Breeding

Poster Abstract: Variability is a key factor in genetic improvement and valuable in studies of environmental effects in genotypic expression.

However, taking phenotypic measurements manually in the field is a laborious and time-consuming task. During the last decade, remote sensing techniques have been applied to crop sciences that decrease time and labor, and improve precision in crop monitoring. Lately, with the advent of high-resolution sensors and unmanned aerial systems (UAS, i.e., drones), remote sensing is proving to be an efficient tool for high-throughput field phenotyping (HTFP). In this context, the present research aims to explore the capability of six phenotypic metrics obtained temporally through HTFP (from multispectral imagery; NDVI from RGB imagery; Excess Green and Excess Red difference; and plant height and canopy cover from both multispectral and RGB) in expressing the genetic variability of hybrid maize (*Zea mays* L.) genotypes; all metrics have been shown to correlate with grain yield. Two hundred and fifty hybrid maize genotypes were established in three treatment regimes (optimal dryland, optimal irrigated, late planted heat stress), each with two replications. This project was a part of the Genome to Fields (G2F) GxE project established at College Station, TX. The plots were flown weekly through the growing season and twice a week during the flowering period. An Unmanned Aerial System (UAS) composed by a Tuffwing fixed-wing drone, a Sony high resolution RGB camera and a MicaSense RedEgde multispectral camera, were used in the acquisition of the aerial images. An analysis of variance components showed that the phenotypic variance explained by the genotypes fluctuates throughout the growing season, reaching its maximum around 60 days after planting (DAP) for vegetation indices and canopy cover, and around 114 DAP for plant height. The results indicated that the studied metrics have a significant potential in supporting breeding decisions.

Authors: Nathália Penna Cruzato, Seth C. Murray, Dale Cope, Anjin Chang, Jinha Jung

Meetings of Interest

Meetings of Interest

National Association of Plant Breeders, NAPB will hold their annual meeting at the University of Georgia, August 25-29, 2019. More information will be available soon at https://www.plantbreeding.org.

American Society of Agronomy and the Crop Science Society of America's annual meeting will be in Baltimore, MD, November 4 – 7. More information at https://www.acsmeetings.org/.

Distance Plant Breeding at Texas A&M

Distance Plant Breeding at Texas A&M

Available Courses

Spring Courses: January 14 – April 30, 2019

To fully participate in our continuing education courses, students should have:

- **High speed internet connection and updated browsers, including Internet Explorer and either Chrome of Firefox**
- **Common plug-ins (e.g. Adobe Reader, Flash Player, Virus Protection, Java, etc.)**
- **Speakers and Webcam with microphone**
- **Skype**
- **Ability to either scan or fax course documents to the instructor**

Spring 2019

Plant Breeding Fundamentals – Full Course (3 Units) – Cost $679.65
January 14 – April 30, 2019

Introduction to the field of plant breeding for students without a plant breeding background. Includes common plant breeding terminology and introduction of concepts. Genetic improvement of crops by hybridization and selection; special breeding methods and techniques applicable to naturally self-pollinated, cross-pollinated and asexually reproduced plants.

Basic Plant Breeding - Full Course (3 Units) - Cost - $679.65
January 14—April 30, 2019

Basic Plant Breeding can be taken as an entire course (all three units) or each unit can be taken individually. For participants in our Professional Certificate in Plant Breeding and Genetics, completion of all three units is required.

Unit 1 - Introduction to Basic Plant Breeding Cost - $226.55
January 14 – February 18, 2019

Introduction to Basic Plant Breeding provides a review of plant reproduction, genetic variation, gene banks, germplasm preservation, gene segregation, the power of selection and its role in plant breeding, and an introduction to intellectual property and its role in the life of a plant breeder. This unit is

designed to prepare the participant to explore the genetics and methodologies employed by plant breeders of self and cross pollinated crop species in units two and three of Basic Plant Breeding.

Unit 2 - Breeding Self Pollinated Crops Cost - $226.55
February 19 – March 29, 2019
The frequency of any specific heterozygous locus will be reduced by 50% for every generation of selfing, resulting in a mixture of homozygous lines within any natural population. Phenotypic selection within heterozygous generations will lead to homozygous or near homozygous germplasm lines or cultivars under self-pollination. This unit is designed to communicate plant breeding methodologies that take advantage of the genetic consequences of natural or forced self-pollination in agronomic crops. Topics will include: [1] the basics of segregation, [2] breeding methodologies, [3] the grain sorghum conversion program-an example of backcrossing in a different direction, [4] review of a commercial soybean cultivar development program, and [5] a review of the types of genetic releases from Texas A&M AgriLife Research.

Unit 3 - Breeding Cross Pollinated Crops Cost - $226.55
April 1 – April 30, 2019
Topics covered include: quantitative genetics and plant breeding, effects of selection on Hardy Weinberg Equilibrium, mating designs with cross pollinated crops, breeding methods for cross pollinated crops, deviations from Mendelian ratios, genetic male sterility and hybrid seed production, seed certification and types of release.

Recommended textbooks are "Breeding Field Crops" by J.M. Poehlman and D.A. Sleper, and "Principles of Cultivar Development" by W.F. Fehr. A final exam will allow the participant to assess their grasp of topics covered. Participants in the Plant Breeding and Genetic Certificate Program must score 70% on the final exam for each unit.

This is a "self-paced" course and is available for viewing for a limited time. Time commitment is individual student driven. Few outside assignments are made. Students should view each lecture, review all previous lectures and be prepared to discuss any issues that are unclear. Each unit has a printable note set and most units have a set of review questions that can be used as a tool to check your comprehension and grasp of unit concepts. Feel free to contact the instructor, Dr. Wayne Smith, by e-mail (cwsmith@tamu.edu) or phone (979-845-3450) with any questions you have or if you need additional information.

Analysis of Complex Genomes – Full Course (3 Units) – Cost - $679.65
January 14 – April 30, 2019

Genome structure, organization and function of model organisms and higher eukaryotes; theory and methodology of genetic and physical mapping, comparative genomics, sequencing, sequence analysis and annotation; emphasis on understanding the function of complex genomes, genome-wide expression analysis, genetic and epigenetic mechanisms; X-inactivation, imprinting, gene silencing, transposons, genome duplication and evaluation. Requires an in-depth and working knowledge of basic and advanced plant breeding concepts.

Unit 1 – DNA Marker Technology and Genetic Mapping ***Cost - $226.55***
January 14 – February 18, 2019

Unit 2 – Recombinant DNA and Cloning ***Cost - $226.55***
February 19 – March 29, 2019

Unit 3 – Sequencing Genomes and Other Genomic Tools ***Cost - $226.55***
April 1 – April 30, 2019

Quantitative Genetics and Plant Breeding - Full Course (3 Units) - Cost - $679.65

January 14 – April 30, 2019

Applied aspects of quantitative genetics in plant breeding; examination of methodologies to analyze quantitative variation in crop species; genetic phenomena (inbreeding, heterosis and epistasis); quantitative trait loci (QTL) mapping and marker-assisted selection (MAS); genotype by environment interaction, heritability multiple traits and selection theory with implications in plant breeding. Requires an in-depth and working knowledge of basic and advanced plant breeding concepts.

Introduction to Host Plant Resistance (1 Unit) - Cost - $226.55

January 14 – February 18, 2019

Refresher course in host plant resistance breeding and selections.

For more information visit https://scsdistance.tamu.edu/ or contact LeAnn Hague, Distance Education Coordinator in Soil and Crop Sciences at leann.hague@tamu.edu or (979) 845-6148.

Other Academic and Continuing Education courses in plant breeding and related disciplines that will be available during other semesters include Advanced Plant Breeding; Crop Production; Selection Theory.

Distance Degrees in Plant Breeding

M.S. and Ph.D. degree programs at Texas A&M.

Visit https://scsdistance.tamu.edu/plant-breeding-distance-education/

for details.

Please direct comments concerning this bulletin to Wayne Smith, cwsmith@tamu.edu or 979.845.3450.