TEXAS A&M PLANT BREEDING BULLETIN

September 2016

Our Mission: **Educate and develop Plant Breeders worldwide**
Our Vision: **Alleviate hunger and poverty through genetic improvement of plants**

Drutdaman (Daman) Bhangu received his M.S. degree in plant breeding in August of this year. Daman emigrated to the U.S. at the age of 14 from Ludhiana, Punjab, India, graduating from Pattonville High School in St. Louis, MO in 2007. After high school, Daman attended St. Louis University (SLU), receiving a B.S. degree in Biological Sciences. Daman worked in Dr. Wenyan Xiao's plant genetics lab as an undergraduate at SLU where he gained experience extracting DNA and conducting tissue culture with *Arabidopsis thaliana*. Following his graduation from SLU, Daman worked for Monsanto in their double haploid corn breeding department until 2014 when he joined the cotton breeding program as an M.S. student under the direction of Wayne Smith. He continues to be an ardent St. Louis Cardinal baseball fan.

Daman has a generational attachment to agriculture education. His great grandfather was an extension agent in Punjab, his grandfather was an entomology professor at Punjab Agriculture University, and his father holds a degree in crop sciences and worked in marketing with Bayer and Cheminova. Daman noted, "my love for agriculture and plants developed from the visits I used to make in the fields with my grandfather."

Daman's M.S. research dealt with the evaluation of a set of chromosome substitution lines (CSL) developed by Dr. David Stelly relative to their combining ability with three unique genotypes from Smith's breeding program. The research was conducted as a Line x Tester

design where the CSL were crossed with each of the three testers, which consisted of Tamcot 73 (PI 662044; a high yielding cultivar), TAM 06WE-621 (PI 671964; an extra strength upland (ESU) germplasm line), and TAM B182-33 ELSU (PI 654362; an extra-long staple upland germplasm line). The CSL were developed by David Stelly and consists of 17 of the possible 26 substitution lines where a chromosome or a portion of a chromosome from *G. barbadense* is substituted for its counterpart in *G. hirsutum* (D. Stelly et al. *Crop Science* 45(6):2663-2665). These CSL are of potential value to upland cotton breeders because they provided an opportunity to introgress alleles from *G. barbadense* by using a parent that contain only 3.6 % of the total *G. barbadense* genome, which reduces the number of undesirable alleles transferred into the *G. hirsutum* parent and their progeny. The three testers were chosen to determine if *G. barbadense* alleles were located on any of the individual 17 *G. barbadense* chromosomes that could improve yield potential, fiber length potential, and/or fiber strength potential.

Daman's results identified five CSL that may be beneficial in upland cotton breeding programs. CSL CS-B-25 and CS-B14sh were the best CSL combiners with TAM B-182-33 ELSU for fiber length; CSL CS-B02 was the best CSL contributing strength alleles, and CS-B11sh was the most desirable CSL if breeding for yield and lint percent. The preponderance of the variance was the result of additive gene action although some of the CSL exhibited dominance gene action for yield, e.g., Tamcot 73 / CS-B01.

Daman plans to obtain a second year of field data before publishing his thesis research. His Ph.D. research will take him in a different direction where he will be conducting a proof of concept study for gene based breeding with Wayne Smith and Hongbin Zhang.

Daman noted that he hopes to work in private industry as a plant breeder but would be open to opportunities in academia. His "dream" job would be a Mango breeding program in Texas in partnership with Texas A&M Agrilife. His goal would be to develop "a Texas Mango variety that is sweet and juicy and tastes like the mangoes I used to eat back in India. It has a lot of potential in the food market, especially with ice cream and smoothies."

Meetings of Interest

Meetings of Interest

The annual meeting American Society of Agronomy-Crop Science Society of America-Soil Science Society of America will be held in Phoenix, AZ, 6-9 November. More information can be found at https://www.acsmeetings.org.

Distance Plant Breeding at Texas A&M

Distance Plant Breeding at Texas A&M

Distance Plant Breeding Program and Continuing Education courses available for Fall 2016 (https://scsdistance.tamu.edu/available-courses)

Continuing Education

Fall Courses: August 29 – December 16, 2016

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
- Google Chrome or Mozilla 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.

Fall 2016

Plant Breeding Fundamentals – Full Course (3 Units) – Cost $679.65

August 29 - December 16, 2016

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

August 29 - December 16, 2016

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
August 29 – September 30, 2016
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
October 3 – November 4, 2016
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
November 7 – December 16, 2016
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.

Advanced Plant Breeding - Full Course (3 Units) - Cost - $679.65

August 29 - December 16, 2016

Expectations of genetic improvement for different plant breeding methods; relative efficiency for crops of different reproductive mechanisms; genetic variances, covariances and genotype-environment interaction components of variance used in planning selection procedures. Advanced 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 - Advanced Genetic Principles in Plant Breeding
August 29 – September 30, 2016
Topics covered include: Hardy Weinberg, means and variances, covariances and heritability, mating designs, genetic diversity.
Cost - $226.55

Unit 2 - Selection: Theory and Practice in Advanced Plant Breeding
October 3 – November 4, 2016
Topics covered include: recurrent selection, inbred line selection and testcrossing, selection environments, indirect selection, multiple trait selection, QTL MAS, heterosis and hybrid prediction.
Cost - $226.55

Unit 3 - Statistical Tools in Advanced Plant Breeding
November 7 – December 16, 2016
Topics covered include: statistical concepts review, expected mean squares and combined analysis, GxE interactions and stability analysis, polyploidy.
Cost - $226.55

Experimental Designs in Agronomic Research - Full Course (3 Units) - Cost - $679.65
August 29 - December 16, 2016

Teaches fundamental principles and procedures of experimental designs in agricultural sciences. Emphasis includes factorial designs, predicting outputs, use of covariance, and balanced and unbalanced experimental designs as related to common agricultural research projects under field, greenhouse or growth chamber culture. Students will become familiarized with computer programming of common statistical software. Experimental Designs in Agronomic Research 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 - Factorial Experimental Designs in Agronomic Research
August 29 – September 30, 2016
Topics covered include: Fundamentals of agricultural research methodology and methodology, basic statistical concepts for testing of hypothesis, introduction to simple computer statistical software programs and applications, complete randomized design, randomized complete block design, and Latin square design.
Cost - $226.55

Unit 2 - Factorial and Unbalanced Designs in Agronomic Research
October 3 – November 4, 2016
Topics covered include: Split-plot and split-split plot designs, nested designs, variance analyses, interactions with years and locations, comparisons of paired and grouped mean, estimation of missing values, the general linear model, and planned incomplete block design.
Cost - $226.55

Unit 3 - Correlation, Regression, Covariance, and Biplot Analysis in Agronomic Research
November 7 – December 16, 2016

Topics covered include: Correlation, regression, path coefficient analysis, covariance analysis, nearest neighbor analysis, augmented designs and moving means and analysis, database management, biplot analyses.
Cost - $226.55

This is a "self-paced" course and is available for viewing for a limited time. Time commitment is individual student driven. 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 voiced over PowerPoint video lectures.

Other Academic and Continuing Education courses in plant breeding and related disciplines that will be available during other semesters include Host Plant Resistance; Crop Production; Selection Theory; Marker Assisted Selection; Genomic Analysis; Field Crop Diseases; Field Insects; Essential Nutrients in Crop Growth; and others. 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.

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.