TEXAS A&M PLANT BREEDING BULLETIN

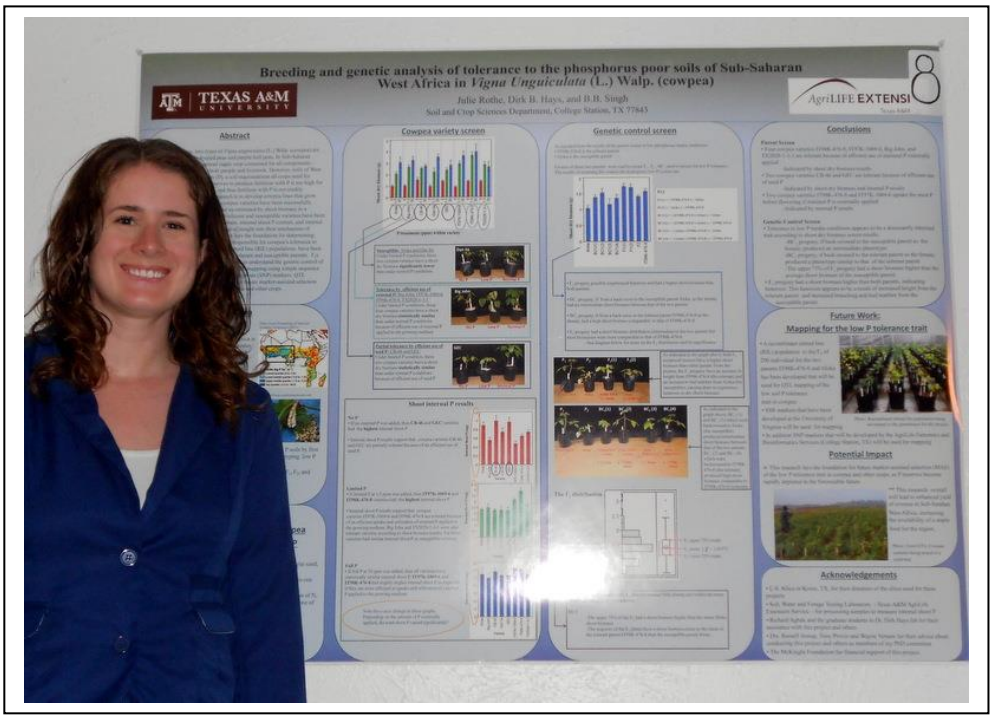
July 2013

Our Mission: **Educate and develop Plant Breeders worldwide.**

Our Vision: **Alleviate hunger and poverty through genetic improvement of plants.**

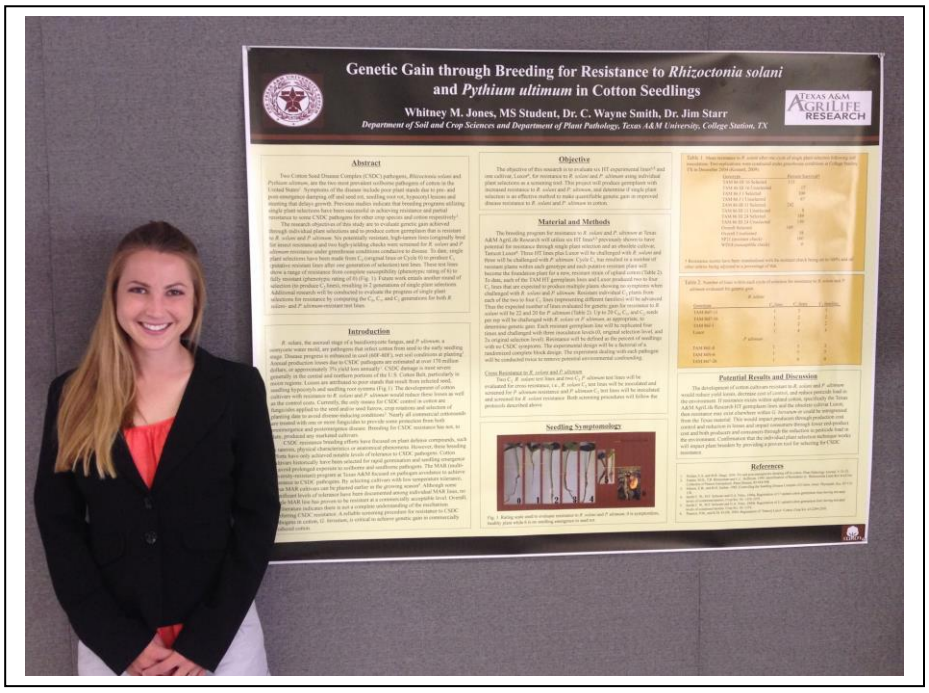
Six graduate students were selected nationwide to participate in Operation Student Connection at the American Seed Trade Association's 130th annual convention in Nashville, TN last month. Two of the six students selected were from Texas A&M University and the Department of Soil and Crop Sciences; Julie Rothe, a Ph.D. plant breeding major under the direction of Dirk Hays, and Whitney Jones, an M.S. agronomy student under the direction of Wayne Smith and Jim Starr. At the convention, students were given the opportunity to present posters and give a 5-8 minute presentation about their research. Julie presented her work on "Breeding and Genetic Analysis of Tolerance to the Phosphorus Poor Soils of Sub-Saharan West Africa in *Vigna unguiculata* (L.) Walp (cowpea)" while Whitney's presented research on "Genetic Gain through Breeding for Resistance to *Rhizoctonia solani* and *Pythium ultimum* in Cotton Seedlings." Their abstracts are presented below.

This ASTA program was designed for the students to observe and learn about the seed industry in which many will participate once they complete their education. Whitney and Julie networked with representatives and directors from the seed industry, learning about the many positions and responsibilities within a seed company as well as research and breeding activities. Both noted that it was an enlightening experience and one that they would recommend for other students interested in plant breeding and the seed industry.



Breeding and genetic analysis of tolerance to the phosphorus poor soils of Sub-Saharan West Africa in *Vigna unguiculata* (L.) Walp. (cowpea). -- Julie Rothe

In the United States, two types of *Vigna unguiculata* (L.) Walp. (cowpea) are consumed as seed: black-eyed peas and purple hull peas. In Sub-Saharan Africa, cowpea is a widespread staple crop consumed for all components – leaves, pods, and seed – by both people and livestock. However, soils of West Africa are poor in phosphorus (P), a soil macronutrient all crops need for growth. The cost of using P reserves to produce fertilizer with P is too high for developing countries in Africa, and thus fertilizer with P is not readily available. The purpose of this research is to start breeding and genetic work for the development of cowpea lines that grow well in low P soils. At least three cowpea varieties have been successfully identified with measurable tolerance as estimated by shoot biomass in a hydroponic screening method. Both tolerant and susceptible varieties have been further analyzed for seed P, root biomass, internal shoot P content, and internal root P content to gain basic physiological insight into cowpea varieties' tolerance to P deficiency. This research lays the foundation for determining genes or quantitative trait loci (QTL) responsible for cowpea's tolerance to low P soils. F_2, BC_1 and recombinant inbred line (RIL) populations have been developed from 'high x low' crosses of lines for their tolerance to low P soils. F_2s and BC_1s have been screened for tolerance to understand the genetic control of the trait. The RILs will be used to begin QTL mapping using simple sequence repeat (SSR) and single nucleotide polymorphism (SNP) markers. QTL mapping will give a potential foundation for future marker-assisted selection (MAS) of the low P tolerance trait in cowpea and other crops.



Genetic Gain through Breeding for Resistance to *Rhizoctonia solani* and *Pythium ultimum* in Cotton Seedlings. --Whitney Jones

Two Cotton Seed Disease Complex (CSDC) pathogens, *Rhizoctonia solani* and *Pythium ultimum*, are the most significant soil borne pathogens of cotton in the United States. Symptoms of the disease include poor plant stands due to pre- and post-emergence damping off and seed rot, seedling root rot, hypocotyl lesions, and stunting that delays growth. Previous studies indicate that breeding programs utilizing single plant selections have been successful in achieving resistance and partial resistance to some CSDC pathogens for other crop species and cotton. This study aims to evaluate genetic gain achieved through individual plant selections and to produce cotton germplasm that is resistant to *R. solani* and *P. ultimum*. Six potentially resistant, high-tannin lines (originally bred for insect resistance) and two high-yielding checks were screened for *R. solani* and *P. ultimum* resistance under greenhouse conditions conducive to disease development. To date, single plant selections have been made from C_0 (original lines or Cycle 0) to produce C_1 (putative resistant lines after one generation of selection) test lines. These test lines show a range of resistance from complete susceptibility to fully resistant (Fig. 1). Future work entails another round of selection (to produce C_2 lines), resulting in two generations of single plant selections. A final experiment will be conducted to evaluate the progress of single plant selections for resistance by comparing the C_0, C_1, and C_2 generations for both *R. solani*- and *P. ultimum*-resistant test lines.

Distance Education in Plant Breeding at Texas A&M University

This program is an extension of the existing Plant Breeding programs offered by the Department of Soil and Crop Sciences and the Department of Horticultural Science at Texas A&M University. We offer a non-thesis option M.S., thesis option M.S., and Ph.D. in Plant Breeding completely at a distance to students unable to study on-campus in a traditional setting. This program is designed for individuals employed in private industry, CGIAR centers, government agencies, non-government organizations, and other agriculture professionals who need and desire additional knowledge and training in plant breeding but cannot relocate to a university campus. Distance Education students will take advantage of the same curriculum available to on-campus students with identical course content and professors. Our unique program is designed to deliver a high quality plant breeding education to students across the globe. No campus visit is required. For more information visit https://scsdistance.tamu.edu/ or contact LeAnn Hague, Distance Education Coordinator at leann.hague@tamu.edu or (979)845-6148.

Continuing Education in Plant Breeding at Texas A&M University

Continuing education course modules in plant breeding and genetics, and related disciplines are available from Texas A&M University to clientele interested in gaining new information in plant breeding or simply seeking refresher courses. This program is designed for individuals employed in private industry, CGIAR centers, government agencies, non-government organizations, and other agriculture professionals who need and desire additional knowledge and training in plant breeding but who are not interested in an additional academic degree. A professional certificate can be a part of this program. No campus visit is required. Course modules include Introduction to Plant Breeding; Breeding Self-Pollinated Crops; Breeding Cross Pollinated Crops; Host Plant Resistance; Advanced Plant Breeding; Selection Theory; Marker Assisted Selection; Genomic Analysis; Factorial Designs in Experimentation; Unbalanced Designs; BiPlot 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.

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