Research Report – January 1– December 18, 2014

A. Title: Short- and full-season corn germplasm for grain and silage production in Texas

B. Principal Investigator: Wenwei Xu, Professor and Corn Breeder, Texas A&M AgriLife Research, 1102 East FM 1294, Lubbock, TX 79403. Tel.: 806-746-4015. Email: we-xu@tamu.edu.

Co-PI: Thomas Marek, Irrigation Engineer, Texas A&M AgriLife Research-Amarillo; Junping Chen, Plant Molecular Geneticist, USDA-ARS, and Lubbock, TX.

Cooperators: Gary Odvody (Plant Pathologist) and Mike Brewer (Entomologist), Texas A&M AgriLife Research-Corpus Christi; Seth Murray (Quantitative Geneticist), TAMU- College Station.

C. Objectives:

Specific objectives are: : (1) to develop short- and full-season inbred lines that are tolerant to drought/heat stress and resistant to earworms and mites through introgression of tropical and exotic germplasm; (2) to develop high yielding and water-efficient silage corn lines and hybrids; and (3) to develop molecular techniques for identifying drought and heat tolerant genotypes. Aflatoxin resistance remains a major breeding objective and is covered in a separate AMCOE proposal.

D. Research Accomplishments:

Experiments: Approximately 500 experimental hybrids and over 2000 breeding lines were tested in 2014 at Etter, Halfway, Lubbock, College Station, Corpus Christi, Ganado, Wharton, Uvalde, and Weslaco. One experiment involving 50 hybrids was inoculated with A. *flavus* in Corpus Christi and Lubbock to identify aflatoxin resistant lines and hybrids. The weather in the High Plains was strange in 2014. Due to little precipitation from November 2013 to the end of May and strong wind in the spring, we started with low soil moisture profile in Etter and Halfway fields. The Halfway pivot had below average stand establishment and from planting the first rain on May 28. At Etter site, the well supplying water to the pivot was broken in June and was not repaired quickly, as a result, most of the test plots for grain and all silage test plots at Etter site were lost. Test plots in other sites were good and quality data were collected.

Technology transfer: The hybrid(s) made with our inbred lines are still on the market and continue to generate royalty. In 2014 we signed the following four Material Evaluation Agreements:

- With B-H Genetics for 5 brown midrib inbred lines and three white inbred lines;
- With Trimble Genetics for three white inbred lines;
- With Seed Asia for 40 non-GMO experimental hybrids.

Currently, we are negotiating licensing agreement with three seed companies for them to evaluate or inbred lines and hybrids for potential commercialization.

Leveraging Resources: We received a total of $190,650 from the USDA-ARS Ogallala Aquifer Program, specifically:

- $60,000 for Wenwei Xu (PI), Thomas Marek (co-PI), and Bridget Guerrero (co-PI): "Grain yield of corn hybrids with different plant architectures";
- $70,650 for Thomas Marek (PI), Qingwu Xue (co-PI), and Wenwei Xu (co-PI): "Commercial corn hybrids yields by planting densities and ET";
- $60,000 for Qingwu Xue (PI), Wenwei Xu (co-PI) and Thomas Marek (co-PI): "Rooting characters and water depletion in drought-tolerant corn".

Referred papers: 7 published

1. J E C Teixeira, T Weldekidan, N de Leon, S Flint-Garcia, J B Holland, N Lauter, S C Murray, W Xu, D A Hessel, A E Kleintop, J A Hawk, A Hallauer and R J Wisser. 2014. Hallauer's Tusón: a decade of selection for tropical-to-temperate phenological adaptation in maize. Heredity advance online publication, November 5, 2014; doi:10.1038/hdy.2014.90.
2. Charlene A. Farias, Michael J. Brewer, Darwin J. Anderson, Gary N. Odvody, Wenwei Xu and Mamoudou Sétamou. 2014. Native Maize Resistance to Corn Earworm, Helicoverpa zea, and Fall Armyworm, Spodoptera frugiperda, with Notes on Aflatoxin Content. Source: Southwestern Entomologist, 39(2):411-426. 2014. DOI: http://dx.doi.org/10.3958/059.039.0303.
3. Shoulin Jiang, Zongchao Zhao, Junsheng Li, Jinglan He, Yingen Xue, Wenwei Xu, Limin Zhang, and Fajun Chen. 2014. Damage of Maize Borer and Maize Weevil on the Yield of Transgenic Phytase Maize. Agronomy Journal Vol. 107:1-8. Doi:10.2134/agronj14.0366.
4. Xinzhi Ni, Wenwei Xu, Michael H. Blanco and W. Paul Williams. 2014. Evaluation of fall armyworm resistance in maize germplasm lines using visual leaf injury rating and predator survey. Insect Science 21:541-555. DOI 10.1111/1744-7917.12093.
5. Xinzhi Ni, Zhongren Lei, Kanglai He, Xin Li, Xianchun Li and Wenwei Xu. 2014. Integrated pest management is the lucrative bridge connecting the ever emerging knowledge islands of genetics and ecology. Insect Science (2014) 00, 1–4, DOI 10.1111/1744-7917.12151.

6. Marilyn L. Warburton, W. Paul Williams, Gary L. Windham, Seth C. Murray, Wenwei Xu, Leigh K. Hawkins and Jorge Franco Duran. 2013. Phenotypic and Genetic Characterization of a Maize Association Mapping Panel Developed for the Identification of New Sources of Resistance to Aspergillus flavus and Aflatoxin Accumulation. Crop Science 2013 53: 6: 2374-2383.
7. Marilyn L. Warburton, Juliet D. Tang, Gary L. Windham, Leigh K. Hawkins, Seth C. Murray, Wenwei Xu, Debbie Boykin, Andy Perkins, and W. Paul Williams 2014.Genome-wide association mapping of *Aspergillus flavus* and aflatoxin accumulation resistance in maize (Crop Science, accepted).

Technical reports: 1

1. Wenwei Xu, Thomas Marek, Zhizhai Liu, Traci Bland, Casey Hardin, and Dennis Pietsch. 2014. 2014 State Silage Corn Performance Test on the Texas High Plains. Texas AgriLife Research and Extension-Lubbock Center Technical Report No.12-4. pp.16.

Abstracts for National and International Meetings: 6

1. M. L. Warburton, W. P. Williams, G. Windham, S. Murray, W. Xu, A. Perkins, J. Tang, L. Hawkins. 2014. Genetics and next-generation sequencing in identifying marker for aflatoxin resistance in maize. 2014 APS-CPS Joint Meeting, August 9-13, 2014. Minneapolis, MN, (https://www.apsnet.org/meetings/Documents/2014_meeting_abstracts/aps2014abS78.htm).
2. Baozhu Hao, Qingwu Xue, Kirk Kessup, Thomas Marek, Wenwei Xu, Ed Bynum, and Brent Bean. 2014. Water use and grain yield in drought-tolerant maize in the Texas High Plans. 2014 ASA-CSSA-SSSA International Annual Meeting. November 2-5, 2014. Long Beach, CA. 28-12.
3. Barlie Hendon, Cynthia Lowery, Dick Auld, Mark Burrow, Wenwei Xu, and Ian Ray. 2014. The mutation station. 2014 ASA-CSSA-SSSA International Annual Meeting. November 2-5, 2014. Long Beach, CA. 108-5.
4. Karl Brauer, Wenwei Xu, Traci Bland, Thomas Marek, and John Zwonitzer. 2014. Water use efficiency in maize by maturity and evapotranspiration potential. 2014 ASA-CSSA-SSSA International Annual Meeting. November 2-5, 2014. Long Beach, CA. 241-7.
5. Wenwei Xu, Thomas Marek, Traci Bland, and Steve Amosson. 2014. Short-season hybrids for corn production in the Texas High Plains. USDA Ogallala Aquifer Program annual meeting. March 24-25, 2014. Lubbock, Texas.
6. Zhang M, Zhi H, Chang F, Zhang Y, Liu Y-H, Zhu J, Xu W, Murray SC, Zhang H-B. 2014. Large-scale cloning and characterization of genes controlling grain yield for deciphering of the molecular basis of grain yield and development of a gene-based breeding system in maize. International Plant & Animal Genome Conference XXII. P875 (http://www.intlpag.org/).