

Title: Developing and deploying drought and heat tolerant short-season corn hybrids for grain and silage production under limited irrigation in the Texas High Plains

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Project Rational: Depletion of the Ogallala Aquifer threatens sustainability of crop production and economic viability in the Texas High Plains. Corn is the primary grain crop in this region. Massive withdrawal of the aquifer water for agriculture and other uses has caused significant decline of the aquifer water level. To sustain corn production needed for the huge livestock industries in the region, we need to significantly reduce the amount of irrigation water and grow short-season hybrids (relative maturity RM 100 days or less) instead of the current RM 111-115 full-season hybrids. Current commercial short-season hybrids are developed primarily for northern states and are not well adapted to the hot-and dry weather in Texas. Many of them are susceptible to ear rots and fumonisin. The corn breeding program of Texas A&M AgriLife in Lubbock has developed multiple-stress tolerant short-season corn hybrids. These hybrids showed superior drought/heat tolerance, low fumonisin, and strong adaptation to the limited irrigation. However, there is a gap between our research plots and producers' fields. Currently we produce hundreds of experimental hybrids in isolation block or by hand-pollination. We need to produce large quantity of seeds of these hybrids and their parent lines and demonstrate their performance in large more intensive testing and demonstration field. Ideally, we want to produce a minimum of 20,000 seeds per hybrid, 10 times more than we currently produce. This require mechanical harvesting of the ears. Funding of this project can help us to purchase a used ear picker and fill the gap and accelerate the transfer of the new genetic technology to seed industry and eventually to producers.

Project Objectives: (1) to demonstrate the advantages of new drought/heat-tolerant and fumonisin-resistant short-season corn hybrids for sustainable crop production under limited irrigation in the Texas High Plains and (2) to continue the development of new inbred lines and hybrids.

Project Progress: Progress was in 2018 in the following areas.

Progress for Objective 1: We successfully produced a large quantity of seeds for 5 short-season hybrids (over 30,000 seeds per hybrid), one fusarium -resistant mid-season hybrids (175 kg), and two high-yielding silage hybrids (>20 kg per hybrid). In the meantime, increased the seeds of the parent lines for the above mentioned hybrids. With these large amount of seeds, we plan to conduct the field demonstrations at the Texas A&M AgriLife Research Farm at Lubbock, Halfway and Bushland in 2019. In addition, one seed company will test these experimental hybrids along with commercial hybrids in larger plots at multiple locations.

Progress for Objective 2: We have developed new lines from crossing corn with its wild relatives such as teosinte and *Tripsacum* (or gamma grass). These lines were shown to be highly resistant to fall armyworm in the field tests in Lubbock and Puerto Rico. We produced the hybrid seeds of these lines and will these hybrids for yield, fusarium ear rots, and fall armyworm resistance in Lubbock, Halfway, and Corpus Christi this summer.

We are also working closely with seed companies for commercializing these lines and hybrids.