Corn Breeding (Field 1)
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Objective: The objectives are to develop multiple stress tolerant corn germplasm (lines and hybrids) by transferring desirable genes from tropical corn into temperate lines and to determine the genetic and physiological mechanisms of stress tolerance.

Methodology: Helms Farm is one of our primary test sites for field evaluation of drought tolerance, heat tolerance, insect resistance, yield and other agronomic traits. The subsurface drip irrigation system enables us to create uniform soil moisture across the field and to control the timing, intensity, and duration of drought stress. In 2004, a total of 450 experimental hybrids and 181 lines were grown under 100% ET, 50% ET and V-12 drought stress conditions. The 100% ET, 50% ET and post-tassel drought water treatments received 13.7, 8.0 and 9.2 acre-inch water respectively. The plants under 100% ET and 50% ET were watered throughout the growing season. For V-12 drought stress, irrigation was withheld on June 14 to July 6. The relatively cool and above-average and well-distributed rainfall in 2004 were ideal for corn growth and development. We received a total of 19.7 inch rainfall from planting on April 29 to the physiological maturity on August 30. Data were collected for early vigor, flowering date, plant height, stay green, earworm feeding to ears, grain mold and yield.

Results:

- The average yield in 100% and 50% ET irrigation treatments was 200 and 172 bu/a.
- Two inbred lines Tx204 and Tx205 were officially released in 2004. These lines have excellent heat tolerance, improved drought tolerance, and moderate corn earworm and grain mold resistance. Their hybrids perform well.
- New lines and good hybrids were developed. For example, C3A654-4 x B110 is an early hybrid (64 days from planting to flower), but it yielded like the 4-day later hybrids, which indicated a savings of one irrigation event. Moreover, this hybrid has 50% less ear damage by earworms. The earworm damage reduces grain yield and quality and elevates mycotoxin contamination.
- Four of the TAES hybrids (S1WC3, S2B73 x NC300, Tx205 x B100 and C2A554 x B110) had a 69-92% lower aflatoxin level than existing commercial hybrids. The low-aflatoxin TAES hybrids yielded equally or significantly higher in comparison to the checks from Corpus Christi to the High Plains.I
- S1WC3 is a non-transgenic hybrid with a relative maturity of 120 days. It is resistant to corn earworm, gain mold, and aflatoxin. A large amount of seeds were produced for on-farm test.

Expectations: Based on our preliminary data, adoption of new corn germplasm and accompanied strategies for irrigation and crop management can save 5-10% of the irrigation water requirements, reduce mycotoxin contamination by 50%, cut at least one pesticide application for earworm control, and retain corn as a viable crop in cotton rotations and for livestock industry.

Fig. 1 Mika Wyatt looking at one of the drought tolerant corn hybrids during the corn breeding field day in August, 2004.