

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 exotic germplasm into temperate lines and to determine the genetic and physiological mechanisms of stress tolerance.

Methodology: Helms Farm is a primary test site for field evaluation of drought tolerance, heat tolerance, insect resistance, yield and other agronomic traits. In 2005, a total of 500 experimental hybrids and 200 lines were grown under 100% ET, 50% ET and V-12 drought stress conditions. The plants under 100% ET and 50% ET were watered throughout the growing season. The drought intensity in 50% ET was 40% yield reduction as compared to 100% ET. The V-12 drought stress was primarily for evaluating inbred lines. For V-12 drought stress, irrigation was withheld from V-10 to flowering. In addition, this field was used to evaluate the drought tolerant transgenic corn hybrids in collaboration with Monsanto Company.

Results: The average yield in 100% and 50% ET irrigation was 123 and 68 bu/a (Table 1). The yield was much lower due to heavy hail damage on June 15 when plants were at V-10 stage.

Several experiment hybrids yield equally or higher than commercial checks. For example, in a test involving 21 TAES hybrids and four commercial hybrids, the average yield of C3A654-1-1 x B100, S2B73BC x NC300, LH200 x SPG3 was 137 to 146 bu/a in six environments at Halfway, Lubbock, Etter, and College Station, in comparison to 133 to 159 bu/a of commercial checks.

The aflatoxin level at the Halfway was low, highly variable among replications, and insignificant among genotypes. However, the aflatoxin in S2B72BC x NC300 and S1WC3 was significantly lower at Corpus Christi, Beeville, and Mississippi State under inoculated condition. The aflatoxin in these three hybrids was only 13.2 and 27.9% of the average aflatoxin in commercial hybrids, respectively (Table 1). S1WC3 is a white hybrid. Usually white hybrids have lower yield than yellow hybrids.

The results at Helms farm help to released two inbred lines Tx204 and Tx205. We signed material transfer agreement with eight seed companies in 2005. The results in 2005 will help us to released new lines and develop new hybrids.

Expectations: Adoption of new corn germplasm and accompanied strategies for irrigation and crop management can save 5-10% of the irrigation water requirements, reduce aflatoxin by 50%.

Table 1. Yield and agronomic traits of selected TAES hybrids and check hybrids in 2005.

Entry	DTP	PHT	CEW		Yield (bu/a)							Aflatoxin (ppb)	
			HFFI	HF50	LBFI	LB50	Etter	CS	All	% CK	Mean	% CK	
C3A654-3-1 x B110	60	200	5.7	135	80	205	51	170	205	137	95.9	2196.4 efg	57.7
S2B73BC x NC300	62	233	5.2	136	81	196	78	198	204	146	101.6	501.1 h	13.2
LH200 x SGP3	63	249	6.5	123	59	209	65	198	201	139	97.1	2817.8 abcdef	74.0
S1W x CML343	69	236	3.2	124	53	183	40	175	191	124	86.5	1060.0 gh	27.9
P31B13 (CK1)	62	225	5.4	148	104	210	86	171	241	159	110.7	3015.6 abcdef	79.2
Garst 8285 (CK2)	62	229	7.1	138	81	183	78	187	200	141	98.6	2880.0 bcdefg	75.7
Triumph 1416 (CK3)	58	222	8.4	139	69	202	35	179	199	133	93.1	6504.4 abc	170.9
DKC66-80 (CK4)	62	234	7.7	150	74	170	83	186	195	140	97.7	2822.9 defg	74.2
Mean	62	223	6.6	123	65	181	57	175	189	129	90.0	4154.7	
CV%	2	6	15.1	9	18	8	16	10	10	11		38.6	
LSD 0.05	2	21	1.6	18	19	24	15	27	38	22		2595.4	

DTP = days to pollen shedding, PHT = plant height in cm, CEW = corn earworm damages to ears in cm. HFFI = Halfway 100% ET, HF50 = Halfway 50% ET, LBFI = Lubbock 100% ET, LB50 = Lubbock 50% ET, CS = College Station. % CK = percentage of four check means. Aflatoxin is the mean at Corpus Christi and Beeville in TX and Mississippi State, MS.