

EVALUATION OF AFLATOXIN RESISTANCE IN CORN HYBRIDS OF INBRED LINES FROM TEMPERATE X TROPICAL BACKGROUND

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Introduction

Introgression of genes from exotic germplasm and wild relatives into elite inbred lines is essential to increased genetic variation and continued improvement in yield and stress tolerance.

Aflatoxin, produced by *Aspergillus flavus*, is one of the major diseases in southern United States and other parts of the world under warm climate. Aflatoxin contamination in grains can affect the marketability of the harvested corn and poses serious health problems in human and livestock. Use of resistant germplasm is a most effective and economical approach to reduce aflatoxin contamination.

Objective

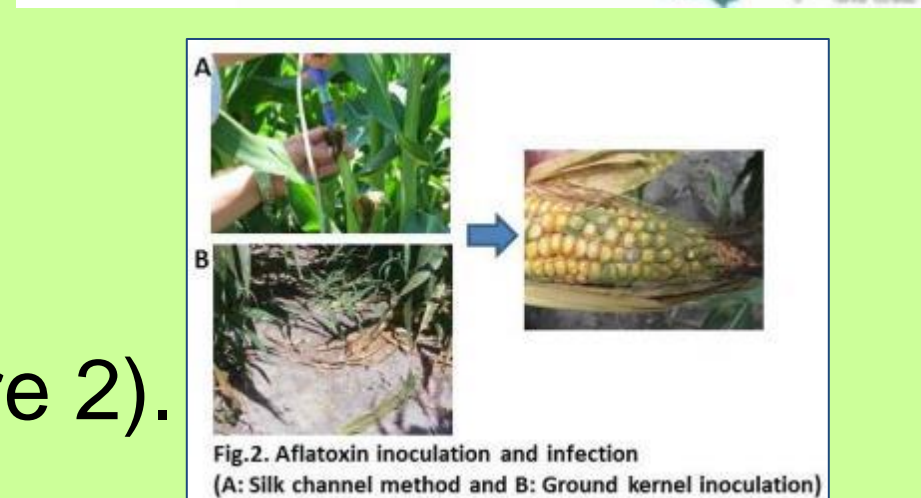
To evaluate aflatoxin resistance and grain yield of the hybrids of the inbred lines selected from tropical x temperate corn and temperate corn x teosinte breeding populations.

Materials & Methods

Agronomic Evaluation:

- Fifty hybrids were evaluated for yield and aflatoxin content in seven locations in 2014 and six in 2015.
- Evaluated hybrids included 43 experimental hybrids and seven commercial hybrids and belong to five groups: Group 1 – ANTIGO, Group 2 – Early hybrids, Group 3 – Mid-full season, Group 4 – Hybrids of the lines from corn x teosinte crosses, and Group 5 – Commercial checks. All hybrids in the first three groups were made by lines developed from tropical x temperate breeding populations.

- Experiment sites were located in northern, central and southern part of Texas (Figure 1).



Aflatoxin Inoculation:

- Plants were inoculated with high toxin-producing strain of *A. flavus* with silk channel method at Halfway and ground kernel inoculation at Corpus Christi (Figure 2).
- In each plot, at least ten inoculated ears were harvested and grain samples were analyzed for aflatoxin.

Results

Figure 3. Average aflatoxin content (top) and grain yield (bottom) reported across diverse locations in Texas during 2015

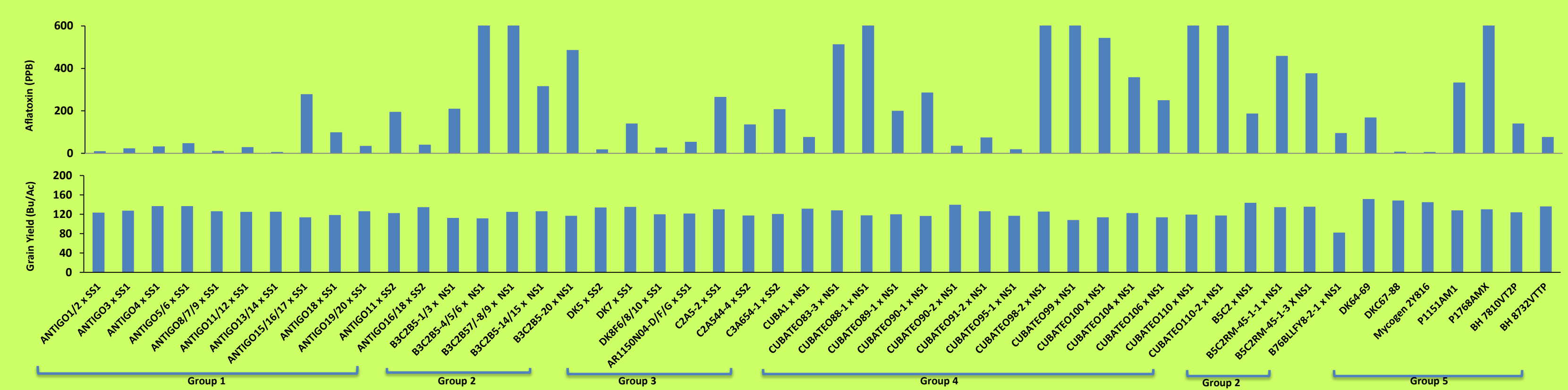


Figure 4. Average aflatoxin content (top) and grain yield (bottom) reported across diverse locations in Texas during 2014

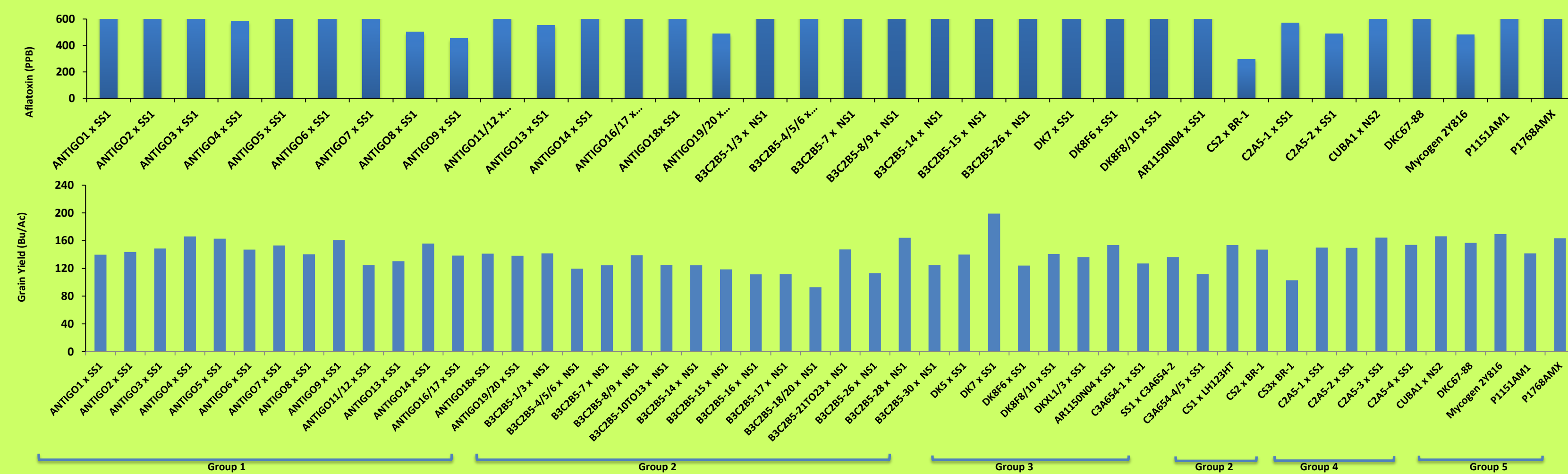


Figure 5. Location-wise grain yield of top 10 experimental hybrids and commercial checks evaluated in 2015 (top) and 2014 (bottom)

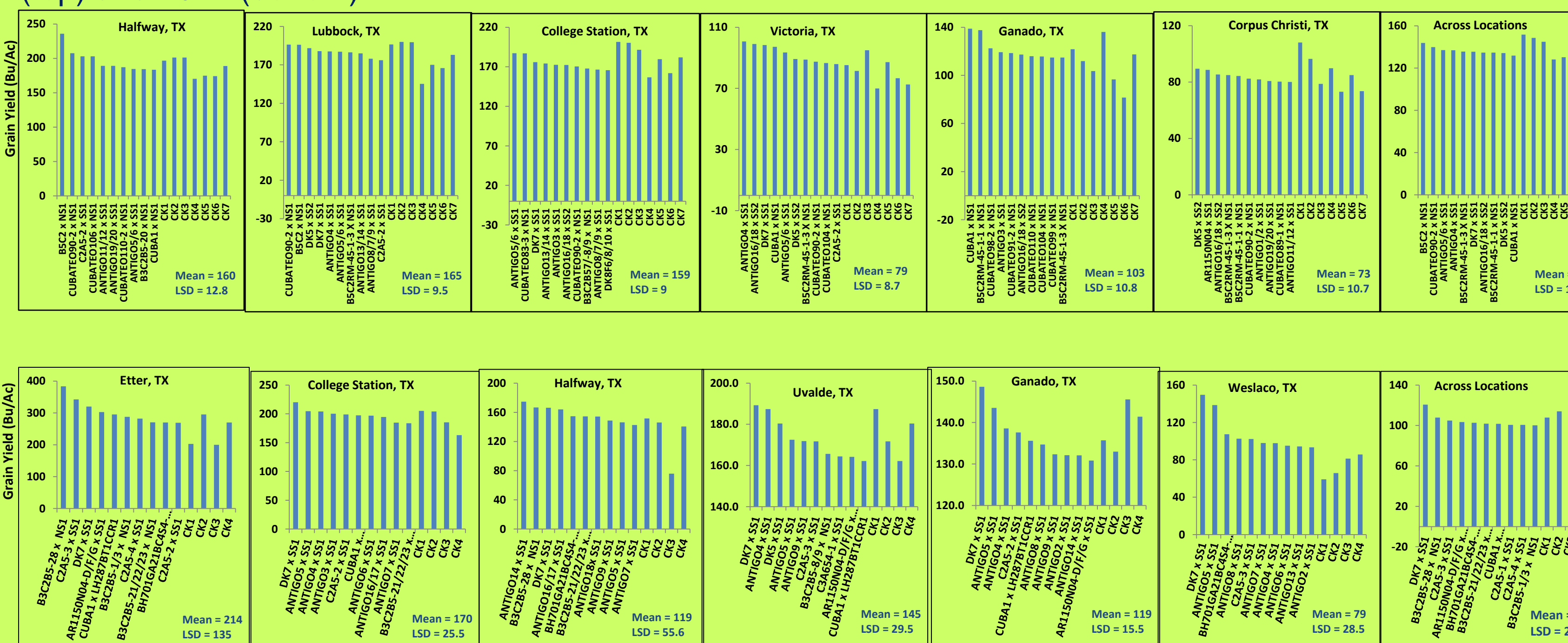


Table 1. Yield comparisons of ANTIGO hybrids and commercial checks evaluated during 2014 (left) and 2015 (right)

Hybrid	Uvalde	Ganado	Weslaco	College Station	Etter	Halfway	Across Locations	Hybrid	Victoria	Ganado	College Station	Corpus Christi	Halfway	Lubbock	Across Locations
ANTIGO1 x SS1	143.5	127.2	63.4	182.5	191.7	129.7	140	ANTIGO1/2 x SS1	81	97	147	82	170	163	123
ANTIGO2 x SS1	141.6	132.1	93.3	179	185	130.6	144	ANTIGO3 x SS1	82	119	173	75	146	172	128
ANTIGO3 x SS1	143.5	127.5	69	200.4	218.2	133.8	149	ANTIGO4 x SS1	101	109	163	79	182	187	137
ANTIGO4 x SS1	172.5	138.6	97.9	204.1	247.4	136.4	166	ANTIGO5/6 x SS1	94	93	187	76	185	187	137
ANTIGO5 x SS1	165.6	143.5	138.6	204.6	178.4	146.2	163	ANTIGO8/7/9 x SS1	69	90	166	80	174	178	126
ANTIGO6 x SS1	136.1	114.9	95.2	197	203.2	136.7	147	ANTIGO11/12 x SS1	69	91	151	80	189	169	125
ANTIGO7 x SS1	141.6	119.2	98	184.7	232.2	142.6	153	ANTIGO13/14 x SS1	76	70	174	77	171	185	125
ANTIGO8 x SS1	151.9	134.7	102.7	176	157.2	120.1	140	ANTIGO15/16/17 x SS1	77	81	156	70	167	131	114
ANTIGO9 x SS1	164.4	132.3	84.1	181.4	254.7	148.8	161	ANTIGO18 x SS1	84	103	145	54	159	164	118
ANTIGO11/12 x SS1	120.9	125.5	89.3	171.3	108	134	125	ANTIGO19/20 x SS1	74	106	158	81	189	150	126
ANTIGO13 x SS1	143.3	117.3	94.3	170.5	155.4	101.4	130	ANTIGO11 x SS2	75	104	153	65	169	169	122
ANTIGO14 x SS1	147.3	132.1	89	181.6	210.9	174.5	156	ANTIGO16/18 x SS2	99	117	172	85	178	156	135
ANTIGO16/17 x SS1	116.6	106.5	76.9	194.7	171.7	163.9	138	CK1	85	122	201	108	197	196	152
ANTIGO18x SS1	141.3	129.5	74.7	169.1	179.5	154.1	141	CK2	81	112	200	96	201	200	149
ANTIGO19/20 x SS1	153.1	127.6	60.1	169.1	177.4	142.4	138	CK3	95	104	191	79	201	199	145
CK1	187.4	135.7	59.2	205.2	161.6	151.5	150	CK4	70	136	157	90	170	145	128
CK2	171.7	133	65.9	204.1	152.4	146	146	CK5	87	97	180	73	175	170	130
CK3	162.1	145.6	81.3	185.4	153.9	75.8	134	CK6	77	82	162	85	174	166	124
CK4	180.4	141.4	85.8	163	160.9	140.6	145	CK7	73	117	182	74	189	183	136
Test Mean	145	119	79	170	214	119	141	Test Mean	79	103	159	73	160	165	119
LSD _{0.05}	29.5	15.3	28.5	25.5	138	55.6	25.8	LSD _{0.05}	8.7	10.8	9.0	10.7	12.8	9.5	11.1

Results and Discussion

- Hybrids of the inbred lines derived from tropical x temperate corn or temperate corn x teosinte breeding population showed a wide range of maturity, variable level of aflatoxin and yield.
- Several hybrids including those made with ANTIGO-lines had good grain yield and insect resistance, and low aflatoxin level as compared to checks.
- The ANTIGO-lines were developed from the breeding cross ANTIGO:N16 and can be a useful source of aflatoxin resistance and high grain yield. ANTIGO01:N16 was developed by crossing elite temperate line with ANTIGO1, (a yellow semi-dent tropical Criollo race from Antigua).
- Early hybrids performed well in north and central Texas but not well adapted to south Texas.
- Grain yield reported from north and central region was higher than the southern part of the state and it is mainly due to presence of diverse climatic conditions across the state which affects the yield.

Table 2. ANOVA of grain yield and aflatoxin (LogA+1) evaluated in 2014 (left top and bottom) and 2015 (right top and bottom)

Source	DF	MSS	F Value	Source	DF	MSS	F Value
Eno.	49	4751.1	4.59***	Eno.	49	1717.3	10.4***
Rep	1	2481.5	2.40	Rep	1	716.1	4.32***
Loc	5	219309.8	212***	Loc	5	236067	1423***
Eno*Loc	245	1670.4	1.62***	Eno*Loc	245	470.4	2.84***

Source	DF	MSS	F Value	Source	DF	MSS	F Value
Entry	33	0.1228	2.73***	Entry	49	7.24	6.28***
Rep	1	1.016	22.5***	Rep	2	0.63	0.55

Acknowledgement

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