**Project Title:** Improving Drought Tolerance and Aflatoxin Resistance in Maize; Education, Extension, and Translational Breeding via Altered Lipid Metabolism

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**Project website (URL):** [http://aflatoxin.tamu.edu](http://aflatoxin.tamu.edu)

**Objectives and Accomplishments**

**Research** In this project period we tested 470 hybrids from an association panel that had been crossed to one of two isogenic versions of Tx714, one with knockout mutations for the *LOX4* gene (242) and one with knockout mutation in the *LOX5* gene (228). These mutants have been shown to condition quantitative variation in drought tolerance (*lox4*) and in aflatoxin resistance (*lox5*). Two water regimes, full season stress and well watered, were used along with inoculation of *Aspergillus flavus*. Yield and yield components (kernel row number, thousand seed weight, etc.), agronomic traits (height, flowering time, etc.), composition via near infrared spectroscopy, and aflatoxin content were measured. Significant differences were observed for the genotypes in aflatoxin accumulation and yield under drought. Summer and winter nurseries were grown to increase seed for additional hybrid testing in 2013 to be followed with association mapping.

As a separate objective of the study, *lox4* and *lox5* mutant alleles continued to be backcrossed into eight elite Texas adapted maize lines. Many of these lines are in the BC3F2 stage now and hybrids will be produced in the 2012 summer nursery for 2013 small plot and on-farm trials.

**Education** We continued to develop, refine and integrate our graduate level classes in Quantitative Genetics in Plant Breeding (Murray) and Molecular Plant Pathology (Kolomiets) to fit to a web based format for distance/ web-based education.

**Extension** We continued to develop and deliver extension programming to producers both through extension educational materials and presentations.

**Broad Impacts**

*Research:* Both the *LOX4* and *LOX5* genes appear to have alleles with disrupted reading frames and others that are potentially absent. These may be used as a source of null alleles and easily selected in breeding programs for quantitative reduction in drought and aflatoxin stress. Multiple graduate students are being trained and producers educated.

**Deliverables**

Publications: three additional publications are in preparation from project by students  


Oral/Poster Presentations:


Extension presentations:

“Aflatoxin in Corn” to over 500 growers at Bell County Expo, Belton, TX. Jan. 25th, 2011;

“Aflatoxin in Corn” to 40 growers at Row Crop Update Navarro County Expo Center. Jan. 28th;

“Aflatoxin in Corn” to over 120 growers at Blacklands Income Growth Expo. Feb 8th, 2011;


“2011 plant disease outlook, including aflatoxin”. Fort Bend County Crops Tour, Rosenberg, TX. June 23, 2011. 25 attended.
“Afla-Guard timing trial. 2011 Ellis County Crop Tour”. Avalon, TX. July 1, 2011. 40 attended.

Community Resources Generated:
“Evaluation of atoxigenic strains of *Aspergillus flavus* for aflatoxin control in corn on commercial farms in Texas -2011” Extension publication
“Prevention of aflatoxin contamination of corn using AF-36 or Afla-Guard” Extension publication PLPA-FC009-2011
Sequences for *LOX 4* and *LOX 5* will be uploaded to NCBI after submission of the accompanying manuscript.

Other products/ outcomes:

**Training**

*Directly trained this period through independent leadership in project objectives:*
Ivan Barrero: PhD student – led aspects of hybrid seed production, and phenotyping
Gerald De La Fuente: MS student – led aspects of project yield trial, and sequencing
Yuanxin Yan: Postdoc – assisted with southern blotting

*Assisted in achieving field and lab objectives in this period for this project:*
Graduate students: Adam Mahan, Jim Wilborn; Undergraduate students: Ryan McHugh, Andrew Beamsley, Joeseph Beard; High school students: Travis Rooney and David Rooney

TAMU, PLPA 613 (Advanced Plant Pathology). Laboratory on aflatoxin analysis of corn, November 8, 2011. Six plant pathology graduate students.

**Collaborations:**
Collaboration with CIMMYT in Mexico resulted in a test being grown last year. In part from this project, PI Murray was invited to participate in the Crop Science Climate Change Working Group, whose recommendations were published