USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
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Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0206-9-079
USDA-ARS Agreement Title:	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.
FY10 USDA-ARS Award Amount:	$ 40,000

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SWW	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.	$ 40,000
	Total ARS Award Amount	**$ 40,000**

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Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: *Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.*

1. **What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

   Fusarium Head Blight (FHB) occurs across the Gulf Coast and can cause significant loss of yield and quality in some environments. Because scab epidemics do not occur on a consistent basis there is not adequate data on variety response to FHB and few adapted varieties exist with good FHB resistance. This raises the likelihood of having toxin-contaminated wheat from the Gulf Region enter the export market through large grain elevators on the Mississippi River. The climate and disease spectrum of the region are unique and most varieties developed outside of the region perform poorly. The LSU AgCenter wheat breeding program and its Sungrains partners (Universities of Arkansas, Florida, Georgia, NC State, and Texas A&M) release high-yielding disease-resistant varieties that account for most of the wheat acreage in the Gulf Coast and Southeastern states. It is important that these programs develop and release highly productive, scab resistant varieties that are embraced and produced by growers. Information on scab reaction of available varieties should be included in performance trial reports so growers can choose those with the most scab resistance for production.

   Objectives will be accomplished by: (1) participating in regional screening nurseries, (2) evaluating entries in statewide variety trials and uniform nurseries for FHB resistance in scab nurseries, (3) conducting a breeding program to develop elite varieties with local adaptation and resistance to FHB, and (4) participating in cooperative mapping studies.

2. **List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):**

   <u>Accomplishment:</u>

   Misted, inoculated FHB screening nurseries were grown in Baton Rouge (south) and Winnsboro (north) Louisiana during the 2010-11 season to evaluate FHB reaction of wheat varieties and germplasm. All entries in the statewide wheat variety trials were screened at both locations. The Uniform Southern Scan Nursery, three FHB Preliminary Yield Trials, and the Uniform Southern Soft Red Winter Wheat Nursery were screened in these nurseries. A third nursery at Crowley (southwest) Louisiana included entries in several other nurseries of advanced breeding lines but this location did not develop scab due to a very dry and windy spring.

   <u>Impact:</u>

   Screening varieties and germplasm in dedicated scab nurseries permits evaluation of the reaction of locally-adapted material to Fusarium Headblight (FHB). Ratings from these trials are used in crossing decisions to combine different resistance genes for development of varieties with greater levels of resistance. The variety trial and regional nursery data is

published on the LSU AgCenter variety trial web site where it is used by growers and consultants when choosing varieties for commercial production.

Accomplishment:

A Jamestown mapping population consisting of 275 lines in two reps was evaluated in a misted, inoculated nursery at two locations as part of a collaborative project to determine the source of resistance in Jamestown and develop appropriate markers to facilitate efficient incorporation of this resistance source into adapted populations.

Impact:

Jamestown has good FHB resistance and is well adapted but does not contain known major genes such as 3BS, 5AS, $2D_W$, $3BS_C$, or $5A_E$. Development of markers for this and similar sources of resistance will greatly simplify development of effective FHB resistance and will allow pyramiding of multiple sources of FHB resistance at levels not possible with simple field screening.

Accomplishment:

The breeding program continued to emphasize FHB resistance in crosses and screening. 309 new wheat crosses were made with many of these involving parents with FHB resistance, including both known genes and uncharacterized resistance mechanisms. Parents included Jamestown, ARS04-1267, LA04041($5A_E$), ARGE97-1042-4-5-20, LA10129 (3BS, 5AS), VA06W-587, NC07-23126, and others. Crosses to combine FHB resistance with stripe rust and Ug99 stem rust resistance were made in a manner to facilitate topcross F_1 population enrichment using markers. Markers assisted selected was used on parents and breeding lines to determine presence/absence of major genes for FHB resistance. LA03131E-1 in the USSN was shown to have excellent FHB resistance and contain Lr_{34} but not contain any of the currently characterized FHB resistance genes.

Impact:

The LSU breeding program is focused on developing productive varieties with good disease-resistance that are adapted to the Gulf Coast region. There are few FHB-resistant varieties currently grown in Louisiana and very little information is available on FHB reaction of varieties that are produced in the region. The development of FHB resistant varieties will positively impact wheat production economics and should allow growers in the distressed rice producing region of southwest Louisiana where FHB is a significant problem to expand wheat production. Such varieties must be high-yielding, well-adapted, resistant to leaf rust, stripe rust, soilborne mosaic virus, and other disease and insect pests of the region or they will not be produced by growers.

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance.

None

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

J. Shoots, M. Guttieri, F. Kolb, J. Lewis, A. McKendry, H. Ohm, C. Sneller, M.E. Sorrells, E. Souza, D. Van Sanford, J. Costa, C. Griffey, S. Harrison, J. Johnson and P. Murphy. 2010. Development and Distribution of Male-Sterile Facilitated Recurrent Selection Populations. Proceeding of the National FHB Forum, Milwaukee, WI.