

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY13 Final Performance Report  
July 15, 2014**

**Cover Page**

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<b>Fiscal Year:</b>	FY13
<b>USDA-ARS Agreement ID:</b>	59-0206-9-079
<b>USDA-ARS Agreement Title:</b>	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.
<b>FY13 USDA-ARS Award Amount:</b>	\$ 42,648

**USWBSI Individual Project(s)**

<b>USWBSI Research Category *</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
VDHR-SWW	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.	\$ 36,514
VDHR-SWW	Developing Double Haploids to Expedite Mapping and Enhance FHB Resistance in SRWW.	\$ 6,134
	<b>FY13 Total ARS Award Amount</b>	<b>\$ 42,648</b>



Principal Investigator

July 15, 2014

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?**

This project addresses the need for Fusarium Head Blight (FHB) resistant varieties adapted to the Gulf Coast. FHB was a fairly significant problem across the region in 2014 and most of the varieties grown in the region are highly susceptible to FHB. Wheat from this region goes into large Mississippi River elevators and toxin-contaminated wheat will enter the export channels. FHB can cause significant loss of yield and quality in the region. The unique climate and disease spectrum of the region limits the number of adapted varieties. The LSU AgCenter and Sungrains partners (Universities of Arkansas, Florida, Georgia, NC State, and Texas A&M) release high-yielding disease-resistant varieties that account for much 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. Scab reaction of commercial varieties should be included in variety trial reports so growers can choose the most resistant ones for production.

Objectives will be accomplished by: (1) participating in regional screening nurseries, (2) evaluating breeding lines, entries in statewide variety trials and uniform nurseries for FHB resistance in scab nurseries, (3) incorporating known resistance genes into adapted germplasm through crossing and marker-assisted selection to develop elite varieties with local adaptation and (4) participating in cooperative mapping studies to develop new markers.

**2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:**

**Accomplishment (1):**

Five breeding lines were entered in the Uniform Southern Fusarium Headblight Nursery for 2013-14. Four of those lines had significantly better FHB resistance than the susceptible check (Coker 9835) and equivalent to the resistant check (Jamestown) based on data across three locations in Louisiana. Many other advanced breeding lines tested in preliminary and regional yield trials were developed as result of the FHB breeding effort. LA6146E-P4 was had excellent yield and disease resistance in the seven-state Gulf-Atlantic Wheat Nursery and statewide wheat performance trial, along with good FHB ratings. This line has ‘Jamestown’ FHB resistance and is scheduled for variety release.

**Impact (1):**

Development of high-yielding, FHB resistant varieties adapted to the Gulf Coast is essential to convince growers to safeguard wheat exports by producing FHB resistant wheat. LSU wheat varieties are widely grown in the region and these are the first LSU advanced breeding lines with a significant level of FHB resistance and variety release potential.

**Accomplishment (2):**

Breeding lines in the Gulf-Atlantic Wheat Nursery, Uniform Southern Fusarium Headblight Nursery, Uniform Southern Soft Red Winter Wheat, FHB Observation Prelims, Wheat Variety Trials, and several preliminary yield trials were evaluated in misted, inoculated FHB screening nurseries in Baton Rouge, Crowley (south), and Winnsboro (north) Louisiana.

**Impact (2):**

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 along with marker data are used in crossing decisions to combine different resistance genes and permits breeders to make informed decisions on advancement of breeding lines. 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 (3):**

Many of the 280 new crosses added in 2014 contained a FHB resistant parent, which included: Bagette 11, Va11W-FHB60, Everest, LA05102C-8-8, ARGE97-1042-4-5-2 (Catbird), LA6146E-P04 (Jamestown), NC09-20986 (Fhb1), IL04-4415, Ba VA08W-176, MD08-26-H2-7-12-21, LA5145D-21, sources of Fhb1, Fhb5As, and native resistance. Wheat prelim-F with ~500 entries was screened in FHB nurseries at three locations and in yield plots at Baton Rouge. A number of breeding lines in the 186 entry FHB Obs yield trial out-yielded all of the checks, showed good FHB resistance, and will be advanced to replicated yield trials this fall. Marker- assisted selection was used for parental selection for FHB, stem rust, and stripe rust resistance. A field-based male-sterile based recurrent selection program for FHB resistance was expanded with addition of new FHB lines as pollen parents.

**Impact (3):**

These populations contain a diversity of resistance to FHB and other important diseases of the Gulf Coast. Many of the FHB resistance sources also have excellent yield potential and agronomic characteristics. They will produce elite advanced lines with FHB resistance that can be released as varieties and used as parents in breeding programs across the region.

The Catbird source of resistance, incorporated into soft wheat by Gene Milus, has produced several highly resistant lines in the Uniform Southern Scab Nursery but the nature of this resistance has not been characterized. This population will allow mapping and effective utilization of the Catbird resistance source.

**Project 2:** *Developing Double Haploids to Expedite Mapping and Enhance FHB Resistance in SRWW.*

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

This project addresses the need for Fusarium Head Blight (FHB) resistant varieties adapted to the Gulf Coast. The development of new varieties of FHB resistant winter wheat is slow because it takes about five generations to develop pure lines for yield testing and only one generation can be grown per year. Unlike spring wheat, winter varieties are not suited for production of several generations per year in a greenhouse so it normally takes about six years from initial cross to the yield testing phase. A rapid system of pure line development is greatly needed for winter wheat.

**2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:**

**Accomplishment:**

The LSU program coordinated and grew a Sungrains summer F1 nursery in Idaho for rapid generation advancement of FHB crosses for the southern VDHR group including: LSUAC, NC State Univ, Univ. of Georgia, Univ. of Arkansas, UNIV. OF Florida, and Texas A&M Univ. The nursery includes F1 of many FHB crosses and a FHB mapping population that is being increased for regional testing. Several additional crosses were submitted to the Heartland Institute for DH development so permit rapid development of FHB resistant varieties with new combinations of genes.

**Impact:**

The summer nursery saves a year in the variety development programs of the collaborating universities and makes the programs more efficient. The Catbird DH marker project should lead to useful molecular markers and may directly lead to release of a FHB resistant variety since the background is adapted and high-yielding.

FY13 (approx. May 13 – May 14)  
PI: Harrison, Steven  
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**Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY13 award period. 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 FY13 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.**

E. Wright, C. Griffey, S. Malla, D. Van Sanford, S. Harrison, J.P. Murphy, J. Costa, G. Milus, J. Johnson, A. McKendry, D. Schmale III, A. Clark and N. McMaster. 2013. "Characterization of FHB Resistance in SRW Roane and Jamestown NAM Populations." In: S. Canty, A. Clark, Y. Salat, and D. Van Sanford (Eds.), *Proceedings of the 2013 National Fusarium Head Blight Forum*. East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 45.