USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY11 Final Performance Report
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Cover Page

PI:	Stephen Harrison
Institution:	Louisiana State University
Address:	Agronomy Department 104 Sturgis Hall Baton Rouge, LA 70803-2110
E-mail:	sharrison@agctr.lsu.edu
Phone:	225-578-2110
Fax:	225-578-1403
Fiscal Year:	FY11
USDA-ARS Agreement ID:	59-0206-9-079
USDA-ARS Agreement Title:	Development of FHB Resistant Wheat Genotypes Adapted to the Gulf Coast.
FY11 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?

This project addresses the need for Fusarium Head Blight (FHB) resistance in varieties adapted to the Gulf Coast. FHB occurs across the Gulf Coast and can cause significant loss of yield and quality in some environments. Louisiana wheat goes into large Mississippi River elevators which raises the possibility of having toxin-contaminated wheat from the Gulf Region enter the export channels. 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) 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 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):

Accomplishment (1):
A Jamestown mapping population consisting of 275 lines in two reps was evaluated in a misted, inoculated nursery at Baton Rouge as part of a collaborative project to map that resistance source. Data was collected on incidence and severity with samples submitted for ISK and DON.

Impact (1):
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 (2):
Fourteen advanced breeding lines and two check varieties were evaluated in replicated yields trials and misted nurseries at two LA and one AR location. Four lines were chosen for advance based on FHB reaction, and performance in yield trials.

Impact (2):
Development of FHB resistant varieties adapted to the Gulf Coast is crucial as there is currently only one moderately resistant variety (Jamestown) that is adapted to the region.

Accomplishment (3):
Breeding lines in the Gulf-Atlantic Wheat Nursery, Uniform Southern Scab Nursery, FHB Observation Prelims, Wheat Variety Trials, and several preliminary yield trials were evaluated in misted, inoculated FHB screening nurseries in Baton Rouge (south) and Winnsboro (north) Louisiana.

Impact (3):
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 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 (4):
The breeding program continued to emphasize FHB resistance in crosses. We added 289 crosses with over half of these involving FHB resistant parents that included major known genes and effective, non-characterized resistance sources. Parents included Jamestown, IL02-18228, ARGE97-1042-4-5-20, NC09-2986, LA04041($5A_E$), VA08W-176, LA06146E-P05, and numerous others. Crosses were made in manner to facilitate topcrossing and F_1 population enrichment using markers for FHB and other diseases. Additional crosses, advanced lines, and parents were obtained from Sungrains partners. This included a set of doubled haploids from Paul Murphy. Markers assisted selected was used on over 1400 F_1 plants for FHB, stem rust, and stripe rust 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. A male-sterile based recurrent selection program for FHB resistance was initiated.

Impact (4):
These populations contain a diversity of resistance to FHB and other important diseases of the Gulf Coast. 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.

Accomplishment (5):
Made a cross with ARGE97-1042-4-5-20, the Catbird source of resistance and submitted F_1 seed to the heartland Institute for development of a DH mapping population.

Impact (5):

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.

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.

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 and N. McMaster. Family Based Mapping of Fusarium Head Blight Resistance in Soft Wheat Cultivars Roane and Jamestown. Proceeding of the National FHB Forum, St. Louis, MO.