

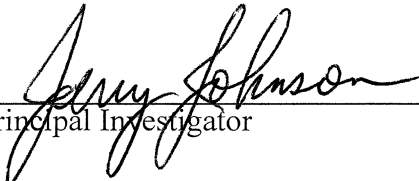
**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY11 Final Performance Report
July 13, 2012**

Cover Page

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| PI: | Jerry Johnson |
| Institution: | University of Georgia |
| Address: | Department of Crop and Soil Sciences Redding Bldg 1109 Experiment St. CAES Griffin Campus Griffin, GA 30224 |
| E-mail: | jjohnso@griffin.uga.edu |
| Phone: | 770-228-7321 |
| Fax: | 770-229-3215 |
| Fiscal Year: | FY11 |
| USDA-ARS Agreement ID: | 59-0206-9-085 |
| USDA-ARS Agreement Title: | Enhancement of Scab Resistant Wheat Cultivars Adapted to the Southeast. |
| FY11 USDA-ARS Award Amount: | \$ 40,000 |

USWBSI Individual Project(s)

| USWBSI Research Category* | Project Title | ARS Award Amount |
|----------------------------------|---|-------------------------|
| VDHR-SWW | Enhancement of Scab Resistant Wheat Cultivars Adapted to the Southeast. | \$ 40,000 |
| | Total ARS Award Amount | \$ 40,000 |


Principal Investigator

7/2/2012
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: *Enhancement of Scab Resistant Wheat Cultivars Adapted to the Southeast.*

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

Severe epidemics of FHB have caused significant economic losses to Georgia's wheat producers for both grain yield and quality (high DON concentration). The development of resistant varieties with the level of FHB resistance from native resistance (Truman or Bess) and exotic (Fhb1) is needed without compromising grain yield. Crosses between local broadly adaptive cultivars or their derivatives with both exotic (Fhb1) and native resistant sources (Truman, Jamestown, IL02-18228, IL02-1828, INW 0411) have been made to introduce FHB resistant QTLs into our widely local adaptive genetic background. Phenotyping and marker assisted selection (MAS) are both being employed to identify and incorporate resistant germplasm that combine improved FHB resistance with leaf and stripe rust and wheat soil-borne mosaic virus and Hessian fly resistance.

Marker Assisted Selection was employed to accelerate the development of adapted FHB resistant cultivars by the selections within populations containing Fhb1, 2DL, 5AS, 3BSc, and 2BERnie in the UGA molecular lab and in cooperation with Gina Brown-Guedira, USDA Genotyping Center. Data and DON samples from the Uniform Southern FHB nursery grown in Georgia were submitted.

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:

Eight elite lines, GA04496-S6, GA041273-S14, GA041273-S15, GA04496-S5, GA04496-S8, GA051173W-S11, GA051173W-S12, GA051173W-S13, were identified in the field with FHB resistance and good agronomic performances. Elite lines, GA051173W-S11, GA051173W-S12, and GA051173W-S13, which were selected from the cross of Truman and AGS 2010, showed a high level of FHB resistance which was similar to the resistant controls, Bess and Jamestown. These three elite lines also included important resistant genes for Hessian fly (*H13*) and leaf rust (*Lr37/Yr17/Sr38*). GA051173W-S11 produced higher yield and test weight than the check AGS2035.

SSR markers were also used to detect the resistant QTLs for FHB and other critical diseases. GA04496-S5, GA04496-S6, and GA04496-S8 maintained the *Fhb1* from the resistant donor, VA01W476.

In cooperation with Carl Griffey, VPI, FHB phenotypic data, along with DON and FDK samples were collected on 275RILs derived from Jamestown / LA97113UC-124 and FG95195 / Jamestown in Georgia at two reps under misted, inoculated nursery. At

Georgia, a Jamestown of 175 RIL population (F_{5:6}) for mapping validation was advanced for seed increase and will be available for phenotyping by southern CP collaborators. In cooperation with Paul Murphy, NCSU and the Genotyping Lab., FHB double haploid lines (NC03-11458 / Bess // SS8641); (NC05-21937(Fhb1) // P26R31 / Jamestown); (NC05-21937 / GA991209-6E32); (MD01W233-06-1 / SS8641); (NC04-15460 / Oglethorpe // NC05-21937) were identified and selected for adaptation. In collaboration with the Genotyping Lab., selected lines with Type II resistance from populations (SS8641*2/ Neuse), (Neuse*3/ VA476), (McCormick*3/ Ning7849) were identified in the field for agronomic and disease resistance (Lr and Yr).

Over 100 crosses were made that involved two different FHB resistance sources and about 300 lines and 6000 headrows were evaluated in an inoculated, irrigated nursery. Wheat samples were also collected and sent to lab for DON analysis.

Impact:

The variety, AGS 2038, that was developed and release by University of Georgia, has moderate Type II FHB resistance and is being marketed in GA. Several breeding lines with moderate scab resistance were advanced to regional nurseries.

Marker assisted selection allowed for the identification of a large number of lines with the *Fhb1* resistance.

Data collected on mapping population will allow for the identification of new QTL and markers for sources of FHB resistance adapted to the Southeast. This project should accelerate the breeding progress and benefit other breeding programs.

Crosses with two scab resistant parents will generate populations with high level and diverse resistance. Identification of wheat breeding lines with moderate FHB resistance and low DON level that are adapted to the Southeast will provide additional choices for producers.

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.

GA 031238-7E34 was developed and released in 2011 that is moderately resistant to scab and has the 2B_{Ernie}. Three lines (GA051173W-(Truman/AGS 2010)) in the Uniform Southern Wheat Scab Nursery had very low FHB index.

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. Johnson, D. Bland, Y.F. Hao and Z.B. Chen. 2011. Pyramiding QTLs in Soft Red Winter Wheat for Enhancing FHB Resistance in Southeast US. Proceedings of the 2011 National Fusarium Head Blight Forum Poster , St. Louis, Missouri, pp: 32.