USDA-ARS/ U.S. Wheat and Barley Scab Initiative FY09 Final Performance Report July 15, 2010

Cover Page

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|-------------------------------|------------------------------------------------------------------|--|--|
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| Fiscal Year: | 2009 | | |
| USDA-ARS Agreement ID: | 59-0206-9-085 | | |
| USDA-ARS Agreement | ent Enhancement of Scab Resistant Wheat Cultivars Adapted to the | | |
| Title: | Southeast. | | |
| FY09- USDA-ARS Award | 1 \$ 31 457 | | |
| Amount: | | | |

USWBSI Individual Project(s)

| USWBSI Research Category* | Project Title | ARS Adjusted Award Amount |
|---------------------------------|-------------------------------------------------------------------------|------------------------------|
| VDHR- SWW | Enhancement of Scab Resistant Wheat Cultivars Adapted to the Southeast. | \$ 31,457 |
| | Total Award Amount | \$ 31,457 |

| Principal Investigator | Date |
|------------------------|------|

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 Winter Wheat Region

SWW - Southern Sinter Wheat Region

^{*} MGMT – FHB Management

FY09 (approx. May 09 – May 10) PI: Johnson, Jerry

USDA-ARS Agreement #: 59-0206-9-085

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?

The Fusarium head blight (FHB) epidemics occurring in Georgia and the Southeast are resulting in reduced grain yield and in marketing difficulty of grain due to high DON concentrations. We are resolving the problem by: developing and releasing improved soft red winter wheat varieties and germplasm with improved FHB resistance combined with leaf rust and stripe rust resistance and evaluating FHB nurseries and regional nurseries for FHB level of resistance. 113 single, three-and four-way crosses were made involving one or more source of native and exotic FHB resistance (Truman, Neuse, Jamestown, McCormick, IL00-8530, IL00-8641, IL02-18228, IL97-1828, OH02-12678, OH02-12686, MO 050699, MO 050146, B030543) with elite Georgia lines that have moderate resistance to scab. 87 single crosses and 122 three and four-way crosses were also advanced to F2 generation and about 3400 headrows with F2-6 generations were evaluated in misted scab nursery. Over 300 lines from the Uniform Southern FHB nursery, southeastern breeding nurseries, and Georgia State Performance Trials were evaluated in replicated misted, inoculated nursery. Seven experimental lines were entered in the 2009 Uniform Southern FHB nursery. These lines were identified in previous testing as having improved levels of FHB resistance. GA 031454-DH38-7, VA01W-461 / USG 3592 had similar FDK, Index, and DON ratings as Ernie. Data and DON samples from the Uniform Southern FHB nursery grown in Georgia were submitted.

Marker Assisted Selection is also being employed to accelerate the development of adapted FHB resistant cultivars by the assistance in the selections within populations containing 3BS and 5AS in the UGA molecular lab and in cooperation with Gina Brown-Guedira, USDA Genotyping Center. In other cooperation with the Regional Genotyping Center and with breeders within the southern region, backcross populations (BC2F3) from NC (Neuse *2/VA 476) and SS 8641// Neuse*2/VA476) and MD (SS8641//McCormick*2/Ning 7840) were evaluated for both good scab resistance and agronomic type. Several other backcross populations are being developed with Truman, Langdon (3A dic), and Jamestown as source of FHB resistance. 113 single, three-and four-way crosses were made involving one or more source of native and exotic FHB resistance. F2 enrichment for several FHB resistant QTL was used on several of these populations.

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:

Several wheat germplasm from both native and exotic sources with FHB resistance have been transferred into elite lines that are adapted to the Southeast. Breeding lines have been identified with moderate scab resistance with Fhb1 and Truman as source of resistance. These lines will be tested again in two locations in GA with the intention for release. MAS with SSR markers were used to accelerate the development of scab resistance from 3BS and 5AS into elite lines. GA 031454-DH38-7 with Fhb1, VA01W-461 / USG 3592 had similar FDK, Index, and DON ratings as Ernie.

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Impact:

Wheat lines from diverse origin with moderate FHB resistance are available that are adapted to the Southeast. Both native and exotic sources of scab resistance are also being incorporated into adapted lines with good agronomic performance. The crosses of scab resistant lines with high yielding, leaf and stripe resistant elite lines will enhance the development of scab resistant varieties for the region. Baldwin is a GA variety that is being marketed in GA and that has moderate type 2 FHB resistance level of scab resistance.

Include below a list 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.

USG 3120 and DK 9318 was developed and released in 2009 that are moderately susceptible to scab.

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.

Jerry Johnson, Zhenbang Chen, and James Buck. 2009. Development of scab resistance in soft red winter wheat. National FHB Forum, Orlando, FL

J.W. Johnson, L. Miranda, and Z. Chen. 2009. Wheat Coordinated Agricultural Project (CAP). Small Grain and Soybean Expo, Statesboro, GA.