

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

Cover Page

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Fiscal Year:	2009
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Tagging a New FHB Resistance QTL for Spring Wheat and Evaluating New FHB-Resistant Germplasm.
FY09- USDA-ARS Award Amount:	\$ 44,685

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-SPR	Tagging a New FHB Resistance QTL for Spring Wheat and Evaluating New FHB-Resistant Germplasm.	\$ 44,685
	Total Award Amount	\$ 44,685

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 Winter Wheat Region
 SWW – Southern Sinter Wheat Region

Project 1: *Tagging a New FHB Resistance QTL for Spring Wheat and Evaluating New FHB-Resistant Germplasm.*

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

A. The hard red spring wheat region has suffered the greatest economic losses to FHB in the U.S., and improved FHB resistance is desperately needed to mitigate these losses. Many presumptive novel FHB resistance QTLs have been mapped in a diverse range of common wheat genotypes and related species around the world, but have not yet been introgressed into U.S. hard red spring wheat (HRSW) to determine if they have value for FHB resistance improvement for this U.S. market class. We have introgressed many reported FHB resistance QTL into hard red spring wheat by marker-assisted selection to determine if they confer meaningful resistance. Most have no significant effect on disease spread. One promising result emerged from crosses to the soft red winter wheat Freedom, from which significant levels of FHB resistance were transferred. The location of the putative FHB resistance QTL is unknown, but its effect is large and so we are seeking molecular markers to hasten its deployment by breeders in the spring wheat region.

B. The significant environmental effect associated with FHB poses an obstacle for breeding programs seeking to develop more scab-resistant germplasm. Undertaking multisite evaluations across a range of environments is the only way to adequately assess scab resistance in germplasm, and the Uniform Regional Scab Nursery for Spring Wheat Parents (URSN) addresses this need. Interested parties from academia and private companies nominate germplasm for FHB resistance evaluation at field locations in Minnesota, North Dakota, South Dakota, and Canada that provide conditions to enhance FHB development. Location data are supplied to the coordinator, who oversees its collation and statistical analysis, and produces an annual report for the nursery program. An additional aspect of the URSN is to encourage open and free germplasm exchange, in order to foster cooperation among breeders in efforts to develop scab resistant germplasm.

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):

A. Accomplishment:

We have determined that the increased resistance in a HRSW NIL from crosses to Freedom is due to a *de novo* alteration of the recurrent parent genome, and not to introgression of a new FHB resistance QTL from Freedom. This genome alteration increases FHB resistance by approximately 50%, and converts a highly susceptible wheat into one displaying significant resistance.

Impact:

Our findings indicate that we have identified the location of a major gene for FHB susceptibility, or alternatively a FHB resistance suppressor gene. It provides new insights into improving FHB resistance not solely based on pyramiding FHB resistance QTLs but also on manipulation of genes that condition susceptibility.

B. Accomplishment:

The URSN was grown for the 15th year in 2009, at locations in the U.S. and Canada . Entries were contributed by university, industry, and national wheat breeding programs. Scab resistance-related trait data from the locations were compiled and analyzed, and the annual report that was produced provides individual location data summaries, and data summaries and rankings across locations.

Impact:

This nursery program continues to function as an excellent source of data on wheat scab resistance from the field and as a vehicle for exchange of germplasm among spring wheat breeders in the Upper Midwest.

FY09 (approx. May 09 – May 10)

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USDA-ARS Agreement #: NA

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.

No germplasm formally released from this project.

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.

GARVIN, D.F, AND BLANKENHEIM, Z. 2010. Report of the 2009 Uniform Regional Scab Nursery for Spring Wheat Parents. The report is made available at the USWBSI web site (<http://www.scabusa.org/>) and through the Graingenes web site (<http://wheat.pw.usda.gov>).