

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
July 15, 2011**

Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0790-8-066
USDA-ARS Agreement Title:	Molecular Characterization and Pyramiding of Novel Scab Resistance Sources Adapted to the Northern Plains Growing Region
FY10 USDA-ARS Award Amount:	\$ 57,060

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HWW-CP	Simultaneously Pyramiding and Validating Multiple FHB Resistance QTLs in Different Hard Winter Wheat Backgrounds.	\$ 31,694
VDHR-SPR	Simultaneously Pyramiding and Validating Multiple FHB Resistance QTLs in Different Spring Wheat Backgrounds.	\$ 25,366
	Total ARS Award Amount	\$ 57,060

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: *Simultaneously Pyramiding and Validating Multiple FHB Resistance QTLs in Different Hard Winter Wheat Backgrounds.*

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

The issue addressed in this project is the need to incorporate additional resistance QTLs to breeding efforts on top of FHB1 and other QTLs from Sumai3. This projects tries to pyramid several QTLs. The early generation material will be made available to breeding programs.

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:

Ten winter wheat lines were selected as founders for pedigree development, including 2 Westley-FHB1 backcross lines (resistant), AL-107-6106 (resistant), Ernie (resistant), Freedom (resistant), Lyman (moderately resistant), Overland (moderately resistant), NE06545 (moderately resistant), NI08708 (moderately susceptible), and McGill (susceptible). Seed from the founder lines was vernalized and planted in the greenhouse in February/March 2011. The founder lines were crossed to develop 37 F1 hybrids. A second round of crosses between these hybrids is underway. 170 genome-wide SSR markers have been selected for to map the segregating QTL based on the phenotypic from both greenhouse and field experiments.

Impact:

The material generated segregates for multiple resistance QTLs. QTL mapping and selection with already confirm markers will allow us to share early generation materials with pyramided resistance QTLs. The material will be made available to breeding programs once marker data is obtained.

Project 2: *Simultaneously Pyramiding and Validating Multiple FHB Resistance QTLs in Different Spring Wheat Backgrounds.*

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

The issue addressed in this project is the need to incorporate additional resistance QTLs to breeding efforts on top of FHB1 and other QTLs from Sumai3. This projects tries to pyramid several QTLs. The early generation material will be made available to breeding programs.

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:

Twenty-one spring wheat lines were used as founders for pedigree development, including 16 resistant experimental lines from the SDSU spring wheat breeding program containing Fhb1 (based UMN10 marker screening and pedigree data), 2 resistant experimental lines from the UMN spring wheat breeding program, 2 recombinant inbred lines from a cross between the resistant Japanese landrace ‘Sapporo Haru Komungi Jugo’ and susceptible line ‘Wheaton’, and the resistant Peruvian line Mult757. The founder lines were crossed in the growth chamber in August 2010 and their F1 hybrids were subsequently intercrossed in the greenhouse in December/January 2011 to develop 82 double-cross F1 families. At least one founder from each family carried Fhb1, such that all double-cross F1 families were segregating for this major QTL. A total of 44 double-cross F1 families were selected (based on the number of segregating QTL and number of seed available) and planted in the greenhouse in March 2011 for selfing and phenotypic evaluation of FHB resistance. The average family size was 22 and the total population size was 964 double-cross F1 individuals. Wheaton was planted as a susceptible check and selected founder lines were planted as resistant checks throughout the study. Approximately 1600 heads were spray inoculated with the aggressive Fg4 strain of *Fusarium graminearum* in May 2011. The heads were evaluated for FHB severity at 14 DAI and 21 DAI by counting the total number of spikelets and the number of infected spikelets. Mean disease severity was 59% and 74% at 14 DAI and 21 DAI, respectively. The frequency distribution at 14 DAI is shown in Figure 1 below. Selfed seed threshed from uninoculated heads from each of the 964 double-cross F1 hybrids is to be collected and field planted in summer 2012 as separate F2 row plots for genotypic evaluation of FHB resistance.

DNA has been extracted from all founder lines and double cross F1 individuals for marker analysis and QTL mapping. 170 genome-wide SSR markers have been selected for to map the segregating QTL based on the phenotypic from both greenhouse and field experiments.

Impact:

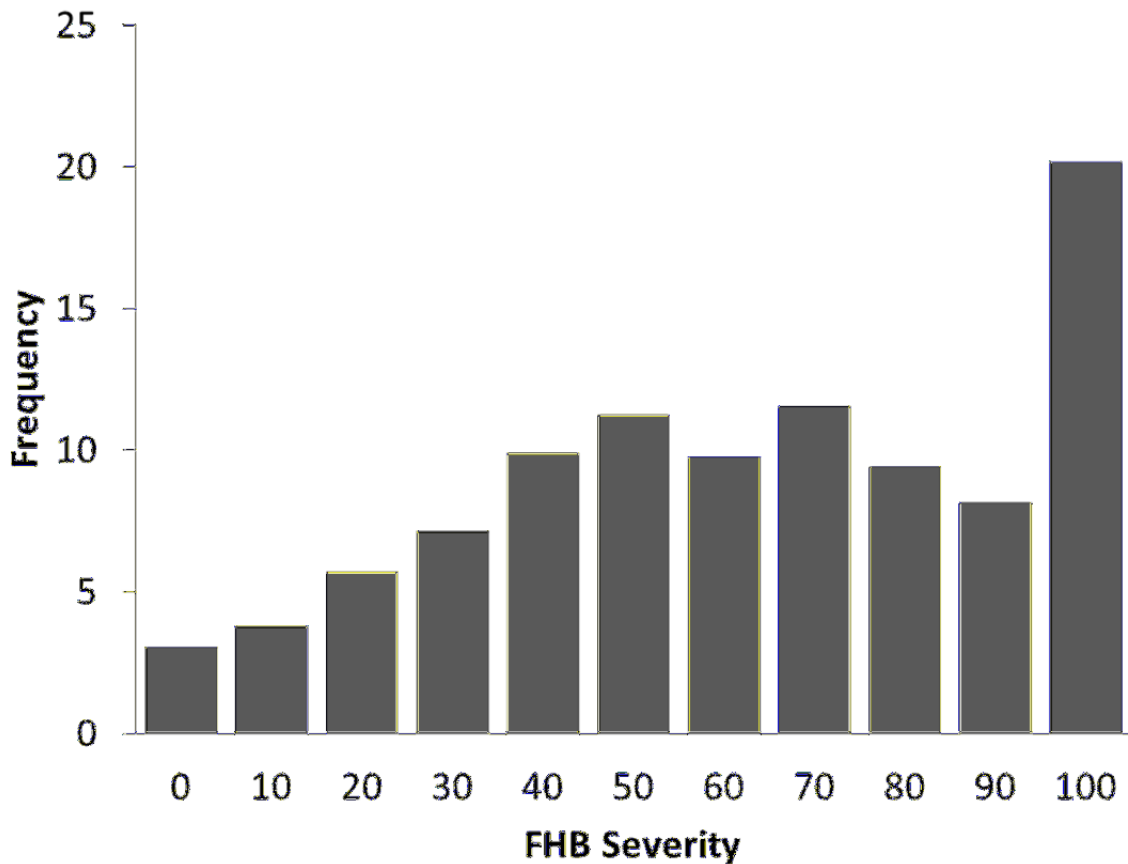
The material generated segregates for multiple resistance QTLs. QTL mapping and selection with already confirm markers will allow us to share early generation materials with pyramided resistance QTLs. The material will be made available to breeding programs once marker data is obtained.

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.

Material will be made available with marker data.

Greenhouse evaluations of spring wheat materials show the following disease severity distribution.



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.

None