

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

Cover Page

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Fiscal Year:	FY11
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Genetic Characterization of Fusarium Head Blight Resistance in Two Elite Spring Wheat Cultivars.
FY11 USDA-ARS Award Amount:	\$ 3,150

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Genetic Characterization of Fusarium Head Blight Resistance in Two Elite Spring Wheat Cultivars.	\$ 3,150
	Total ARS Award Amount	\$ 3,150

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: *Genetic Characterization of Fusarium Head Blight Resistance in Two Elite Spring Wheat Cultivars.*

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

After decades of breeding hard red spring wheat (HRSW) for FHB resistance at NDSU, U of MN, and SDSU and other breeding programs in the spring region, many cultivars with FHB resistance have been released and are being grown on a large scale replacing the most susceptible cultivars. However, according to the wheat breeders in our region, most of these cultivars trace their resistances to the Chinese sources, particularly Sumai3. This is true for cultivars such as Alsen and supposedly Glenn, both NDSU releases that have dominated the spring wheat area since 2002. However, recently collected data by the spring wheat breeding team at Fargo led by Dr M. Mergoum (the PI of this project) showed that Glenn does not show the presence of the closest markers to the main FHB resistance gene *Fhb1* from Sumai 3. These results have been confirmed by many labs including U of MN, USDA-ARS at Fargo, etc. The results from haplotyping Glenn is consistent with the wheat breeding data that Glenn may not have *Fhb1* as they previously believed based on Glenn pedigree. This has raised a major question to the wheat breeding team involved in this project. Does Glenn have a new combination of FHB resistant genes from its diverse pedigree tracing to Chinese, US, and wild type wheat origin? or have the breeders at NDSU who developed this cultivar broken the linkage between the *Fhb1* and the new flanking markers? To confirm either case, more research is needed to elucidate this assumption. Similarly, among the most popular grown cultivar developed by NDSU, Parshall was grown on significant acreages in the spring wheat region for many years because it has showed consistently good tolerance to FHB. Parshall parentage do not trace to any exotic origin such as Chinese germplasm. We believe Parshall has an indigenous source of resistance that may be of great interest to the wheat breeders. To address both topics indicated above and to clarify the genetics of FHB resistance of both Glenn and Parshall, several Recombinant Inbred Lines (RILs) populations involving these two sources or resistances and susceptible parents from MN (MN00261-4), SD (SD3870), and ND (Reeder) were developed.

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:

The field evaluations of the mapping populations have been carried out at locations in MN, ND, and SD, and the phenotype data were collected. Genetic mapping was initially achieved using the DArT marker system. To improve the overall genomic coverage, we plan to map SNP markers using the recently developed wheat 9K SNP platform. The SNP genotyping assay will be conducted at the Fargo genotyping lab upon receiving the assay reagent. The DNA samples are available from the RIL populations along with their parents and checks. We expect to merge the DArT data with the SNP data to construct linkage maps and identify

important QTL regions. The polymorphic SSR markers will be used to correspond linkage maps to chromosomes where the QTL are located.

Impact:

The potential impact of this research on breeding for FHB resistance would be substantial. Once the genetic mechanism underlying the FHB resistance present in Glenn and Parshall is evaluated, wheat breeders will benefit from having additional and much needed novel resistance sources for disease improvement. Closely linked DNA markers when found will be used in the marker-assisted breeding applications to facilitate deployment of the resistance genes. Therefore, we expect the outcome of this research will have a direct impact on wheat production at the state and regional (northern Great Plains), and national levels.

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.