USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY12 Final Performance Report
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Cover Page

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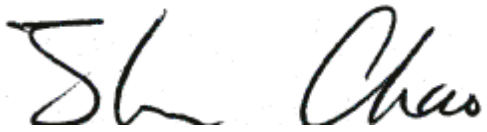
Fiscal Year:	FY12
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Genetic Characterization of Fusarium Head Blight Resistance in Two Elite Spring Wheat Cultivars.
FY12 USDA-ARS Award Amount:	$ 3,150

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**



7/15/2013

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?**

   Decades of breeding of HRSW for FHB resistance at NDSU, U of MN, and SDSU and other breeding programs in the spring wheat region, many cultivars with FHB resistance have been released and are being grown on a large scale to replace the susceptible cultivars. Most of the resistant cultivars released from NDSU can trace their resistances to the Chinese sources, particularly Sumai 3. This is true for cultivars such as Alsen and supposedly Glenn, both NDSU releases that have dominated the spring wheat area since 2002. However, recent marker data indicated that Glenn does not carry the main 3B FHB resistance gene, *Fhb1*, from Sumai 3, and was independently confirmed by other labs, despite of the common belief of the presence of the *Fhb1* gene in Glenn based on pedigree. This has raised a major question, *Does Glenn have a new combination of FHB resistant genes from it diverse pedigree tracing to Chinese, US, and wild type wheat origin?* or *have breeders at NDSU who developed this cultivar have 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. Its parentage didn't 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. In this study we will use a couple of RIL populations crossed with Glenn and Parshall to map the FHB resistance QTL and use other RIL populations for validating our results.

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:

   Field and greenhouse evaluations: In 2012, RILs, their parents along with the checks for FHB reactions were evaluated under ND field and greenhouse conditions. Data for some agronomic traits including heading date, plant height, and FHB diseases notes, including incidence and severity visually estimated, were recorded for each plot approximately 21 days after anthesis. Plots were harvested and seed were sampled for determination of TDK and DON levels. In 2013, samples were grown in the greenhouse and harvested for DON testing. Field evaluations were also carried out in Minnesota and South Dakota in summer 2012. Data collected from all locations between 2010 and 2013 were compiled for analysis.

Marker genotyping: In 2012, DNA prepared from the RILs, their parents, and checks was genotyped using wheat 9K SNP array. Linkage mapping analysis is currently being carried out to merge SNP markers with DArT markers generated in 2011. Identification of FHB resistance QTL will be followed after genetic maps are developed.

Impact:

The potential impact of this research on breeding for FHB resistance would be substantial. Identification of new and novel FHB resistance QTL present in Glenn and Parshall will provide spring wheat breeders with additional resistance sources for FHB improvement. Closely linked DNA markers when identified 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.

Ahmed ElFatih ElDoliefy, James A. Anderson, Karl D. Glover, Shiaoman Chao, and Mohamed Mergoum. 2013. Molecular mapping of Fusarium Head Blight resistance in two adapted spring wheat cultivars. *In* ASA-CSSA-SSSA-CSSS Abstracts 2013 [CD-ROM], Tampa, FL, USA.