USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
July 15, 2009

Cover Page

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Fiscal Year:	2008
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Mapping Novel QTL in Chinese Landraces and Deploying FHB-resistance QTL in Hard Winter Wheat.
FY08 USDA-ARS Award Amount:	$ 55,608

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
HWW-CP	Mapping Novel QTL in Chinese Landraces and Deploying FHB-resistance QTL in Hard Winter Wheat.	$55,608
	Total Award Amount	**$ 55,608**

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
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: *Mapping Novel QTL in Chinese Landraces and Deploying FHB-resistance QTL in Hard Winter Wheat.*

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

Effective utilization of FHB resistant resources relies on identification of new sources of resistance and understanding inheritance of their resistance to FHB and to DON accumulation in wheat grain. A major FHB resistance QTL from Sumai 3 has been mapped and widely used in breeding programs. Identification of resistance genes from new sources may enrich FHB resistance gene diversity and provide new sources of resistance genes to enhance FHB resistance levels through gene pyramiding. We identified new resistant sources that might be different from Sumai 3 after screening a collection of Asian wheat cultivars and landraces. We evaluated FHB resistance in mapping populations with new Chinese landraces Haiyanzhong and Huangfangzhu as resistant parents. The QTLs from these sources of resistance have not been mapped previously and markers for 3BS QTL in these parents showed different haplotypes from that of Sumai 3. We will elucidate genetic effects of these QTLs by mapping the populations for FHB resistance and DON content based on data from greenhouse and field experiments. The results are also expected to provide breeders with quality markers for breeding wheat cultivars with low DON and high levels of FHB resistance to speed up breeding process. Meanwhile, we are using marker-assisted backcross method to transfer major FHB resistance QTL FHB1 and other QTL from Asian sources into adopted hard winter wheat cultivars to quickly release hard winter wheat germplasm and cultivars with FHB1 and other QTL for FHB resistance.

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:

1. Two F6 RIL populations from the crosses between two Chinese landraces, Haiyanzhong and Huangfangzhu, and Wheaton (a highly susceptible parent) were evaluated for FHB resistance in a greenhouse experiment in Manhattan, KS and KSU FHB Nursery for FHB resistance. Marker data were collected for QTL mapping in the populations.

2. A new RIL mapping population with local source of FHB resistance was developed between Heyne/Trego. Heyne is a local HWW cultivar with moderate resistance to FHB. The F5 population was tested for FHB segregation in a KSU greenhouse in Spring 2009. The population was further increased for further QTL mapping

3. About 80 backcross progenies with FHB1 in Wesley background were tested in Lincoln NE. Selected 15 lines were tested in Manhattan KS. Although FHB was not severe enough to distinguish FHB resistance between backcross lines and control, most lines

showed similar agronomic performance as the recurrent parent. The materials in Manhattan had very good FHB infection and backcross progenies showed significant lower FHB infection than the recurrent parent.

4. In another MAS project, FHB1 and several other FHB resistant QTLs were transferred into HWW Jagger (KS), Overland (NE) and Overley (KS). About 200 crosses were made between marker-assisted plants and recurrent parents.

Impact:

Haiyanzhong and Huangfangzhu are two highly resistant landraces from China. The FHB resistance QTL from both accessions has not been reported before. The knowledge of similarity and difference of QTLs between these accessions and Sumai 3 will help breeders to select right resistant parents and develop new breeding strategy for pyramiding FHB resistance QTLs from diverse origins. The germplasm or cultivars from marker-assisted backcross will be important for breeding programs in NE, SD and KS to use as parents. Some selected lines can be further tested and released as a cultivar to quickly relieve FHB damage in HWW growing region where FHB resistant cultivar currently is not available. In addition, this is first time to demonstrate that marker-assistant backcross can a powerful tool to quickly deploy FHB QTL when breeding programs closely collaborate with USDA genotyping lab.

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.

Peer-reviewed journal

Amy Bernardo P.J. Bradbury, H-X. Ma, S-W. Hu, R.L. Bowden, E.S. Buckler and G-H. Bai. 2009. Discovery and Mapping of Single Feature Polymorphisms in Wheat (*Triticum aestivum L.*) Using Affymetrix Arrays. BMC Genomics 10:251

Meeting abstract

1. A Bernardo, G-H Bai H-X Ma. 2008. Single nucleotide polymorphim markers for fusarium head blight resistance in wheat. ASA-CSSA-SSSA 2008 International Annual Meeting, Oct 5-9, Houston, TX.
2. Tao Li and Guihua Bai. 2008. HR-like lesion mimic contributes to improved resistance to Fusarium graminearum in wheat. 2008 National Fusarium Head Blight Forum, December 2 - 4, 2008. Indianapolis, IN.
3. Amy Bernardo, PJ Bradbury, H Ma, SW Hu, RL Bowden, ES Buckler and Guihua Bai. 2008. Discover and mapping of SNP in wheat using Affymetrix Arrays. 2008 National Fusarium Head Blight Forum, December 2 - 4, 2008. Indianapolis, IN.
4. A Bernardo, G-H Bai, H-X Ma. 2008. Single nucleotide polymorphism markers for Fusarium head blight resistance in wheat. 2008 National Fusarium Head Blight Forum, December 2 - 4, 2008. Indianapolis, IN.

If your FY08 USDA-ARS Grant contained a VDHR-related project, 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. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

Not Applicable