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

Cover Page

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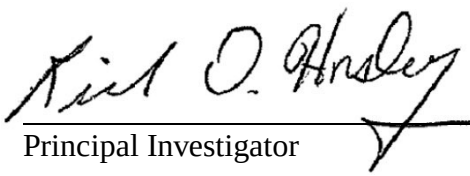
Fiscal Year:	FY11
USDA-ARS Agreement ID:	59-0206-9-062
USDA-ARS Agreement Title:	An Integrated Approach for Developing Scab Resistant Barley.
FY11 USDA-ARS Award Amount:	$ 194,379

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
BAR-CP	Developing 6- and 2-rowed Malting Barley Cultivars with Enhanced FHB Resistance.	$ 177,535
BAR-CP	Testing of Barley for FHB Resistance in China.	$ 16,844
	Total ARS Award Amount	**$ 194,379**



Principal Investigator July 12, 2013
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: *Developing 6- and 2-rowed Malting Barley Cultivars with Enhanced FHB Resistance.*

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

   Fusarium head blight (FHB), primarily incited by *Fusarium graminearum*, has adversely affected the quality of barley grown in most areas of North Dakota and northwestern Minnesota annually since 1993. Quality of harvested grain is reduced because of blighted kernels and the presence of deoxynivalenol (DON), a mycotoxin produced by the pathogen. Seeding resistant cultivars is the only promising method of controlling FHB in barley because cultural and chemical controls of FHB have been unsuccessful. My breeding program is incorporating FHB resistance from exotic and US barley germplasm into our elite six- and two-rowed malting barley germplasm. Marker-assisted selection for FHB-resistance and DON accumulation genes on chromosome 6H is being done on six-rowed lines in the USDA-ARS-CCRU molecular marker laboratory in Fargo. Winter nurseries in Arizona, New Zealand and China are being used to accelerate the development of improved varieties.

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:

   In the 2011 fall greenhouse, 100% of the six- and two-rowed crosses made had a least one parent with improved FHB resistance and lower DON accumulation. In 2011, four of the five six-rowed lines and two of the three NDSU two-rowed lines submitted for AMBA Pilot Scale evaluation came from our FHB-resistance breeding program. Over the next few years, our goal is to increase the frequency of lines with improved resistance to 100% from both programs.

   Impact:

   New malting barley varieties with improved FHB resistance and reduced DON accumulation would allow our Midwest barley producers to more consistently to meet the DON specifications of the malting and brewing industry and thus sell their crop at a higher price.

Project 2: *Testing of Barley for FHB Resistance in China.*

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

   This project falls under the Variety Development and Host Resistance of the Barley CP. Specifically, research from this project will assist us in satisfying objectives number 1) screen available Hordeum germplasm for novel sources of resistance, 2) map novel QTL for resistance to FHB in barley, 3) validate and fine map FHB resistance QTL, and 4) develop improved varieties. Researchers collaborating in this project are from the University of Minnesota, North Dakota State University, Washington State University, ICARDA, and Busch Agricultural Resources, LLC. The 2010-2011 nursery in Hangzhou was the final one in this long collaborative program. The first nursery in Hangzhou was established in Fall 1994.

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:

   Screening of advanced breeding lines from the University of Minnesota, North Dakota State University, Virginia Tech. University, and Busch Agricultural Resources for FHB resistance. Use of the ZU nursery allows us to screen for FHB in the field twice per year.

   Impact:

   Ability to screen for Type I resistance twice a year, the ability to screen spring and winter growth habit barley lines at the same time, and the ability to screen for FHB resistance without the presence of other spike diseases that can confound results. This single nursery allowed breeders to see how their best materials matched up against lines from other breeding programs.

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

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

Massman, J., B. Cooper, R. Horsley, S. Neate, R. Dill-Macky, S. Chao, Y. Dong, P.Schwarz, G.J. Muehlbauer, and K.P. Smith. 2011. Genome-wide association mapping of Fusarium head blight in contemporary barley breeding germplasm. Molecular breeding 27(4):439-454.