

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

**Cover Page**

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<b>Fiscal Year:</b>	FY10
<b>USDA-ARS Agreement ID:</b>	59-0206-9-062
<b>USDA-ARS Agreement Title:</b>	An Integrated Approach for Developing Scab Resistant Barley.
<b>FY10 USDA-ARS Award Amount:</b>	\$ 194,574

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
BAR-CP	Developing 6- and 2-rowed Malting Barley Cultivars with Enhanced FHB Resistance.	\$ 177,730
BAR-CP	Testing of Barley for FHB Resistance in China.	\$ 16,844
	<b>Total ARS Award Amount</b>	<b>\$ 194,574</b>

  
Principal Investigator

13 July 2011  
SDate

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\* 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

PI: Horsley, Richard

USDA-ARS Agreement #: 59-0206-9-062

**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 2010, two of the four six-rowed lines and one of the four two-rowed lines we submitted for AMBA Pilot Scale evaluation came from our FHB-resistance breeding program. Over the next few years, the frequency of lines with improved resistance can be expected to increase.

**Impact:**

New malting barley varieties with improved FHB resistance and reduced DON accumulation would allow our Midwest barley producers to more consistently 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.

**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.

**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 in FY10

**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 articles:

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.

Non-refereed Proceedings:

Boyd, C, R. Horsley, and A. Kleinhofs. 2010. Sequencing and preliminary analysis of chromosome 2H Bin 10 predicted genes. p. 9-11. *In* S.M. Canty, A. Clark, A. Anderson-Scully, D. Ellis, and D. Van Sanford (eds.) Proc of the 2010 National Fusarium Head Blight Forum, Milwaukee, WI 7-9 Dec 2010. Michigan State University, East Lansing, MI.

Presentations:

Developing barleys for North Dakota's future. Presentation at the North Dakota Barley Show, Osnabrock, ND, March 2011.

Update on six-rowed barley varieties at the Agronomy Seed Farm and the Hettinger, Dickinson, Williston, North Central, Carrington, and Langdon Research Extension Centers. July 2010.