

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY09 Final Performance Report
July 15, 2010**

Cover Page

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Fiscal Year:	2009
USDA-ARS Agreement ID:	59-0206-9-062
USDA-ARS Agreement Title:	An Integrated Approach for Developing Scab Resistant Barley.
FY09- USDA-ARS Award Amount:	\$ 213,163

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
BAR-CP	An Integrated Approach for Developing Scab Resistant Barley.	\$ 213,163
	Total Award Amount	\$ 213,163

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 Winter Wheat Region
 SWW – Southern Sinter Wheat Region

Project 1: *An Integrated Approach for Developing Scab Resistant Barley.*

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 malting barley germplasm. Marker assisted selection for FHB-resistance and DON accumulation genes on chromosome 6H is being done 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 (1):

In FY09 we submitted for the first time six-rowed breeding lines to the USDA-ARS molecular marker laboratory of Dr. Shiaoman Chao. The markers are on chromosome 6H and were identified by Dr. Kevin Smith at the University of Minnesota.

Impact (1):

The markers on chromosome 6H are associated with reductions in DON accumulation of 25-35%. Use of the chromosome 6H markers should allow us to efficiently incorporate these QTL into all our six-rowed lines. We were able to reduce the number of F2 populations for screening from approximately 90 down to 12.

Accomplishment (2):

The six-rowed lines ND20448 is in the American Malting Barley Association's (AMBA) Plant Scale evaluation program. This testing is the last step needed before a line can be recommended as a "malting" barley and ND20448 is the first NDSU line to reach this level of testing. ND20448 accumulates about 35% less DON than the cultivar Robust. ND20448 was found satisfactory in its first year of Plant Scale evaluation. The second year's results are expected in late fall 2010. Two additional six-rowed (ND23497 and ND23898) and two-rowed (2ND24263 and 2ND24388) lines with improved FHB-resistance were advanced to the AMBA' Pilot Scale Evaluation Program.

Impact (2):

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.

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.

No cultivars or germplasm were released in FY09.

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.

Refereed Publications

Yu, G.T., J.D. Franckowiak, S.M. Neate, and R.D. Horsley. 2010. A native QTL for Fusarium head blight resistance in North American barley (*Hordeum vulgare* L.) independent of height, maturity, and spike type loci. *Genome* 53(2):111-118.

Non-refereed Proceedings

Halley, S., G. Van Ee, V. Hofman, R. Horsley, and K. Misek. 2009. Integrating resistance, best application timing, and best fungicide delivery technique for improved efficacy on barley, Langdon 2008. p. 50-55. *In* S.M. Canty and D. Van Sanford (eds.) Proc of the 2009 National Fusarium Head Blight Forum, Orlando, FL 7-9 Dec 2009. Michigan State University, East Lansing, MI.

Presentations

Field day presentations in July 2009 at the Carrington, Dickinson, Hettinger, Langdon, North Central, and Williston Research Extension Centers in North Dakota.

Update on barley varieties and breeding progress at the North Dakota Barley Show in Osnabrock, ND in March 2010.