USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY14 Final Performance Report
July 15, 2015

Cover Page

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Fiscal Year:	FY14
USDA-ARS Agreement ID:	59-0206-4-009
USDA-ARS Agreement Title:	Developing 6- and 2-rowed Malting Barley Cultivars with Enhanced FHB Resistance and Reduced DON Accumulation.
FY14 USDA-ARS Award Amount:	$ 185,885

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 and Reduced DON Accumulation.	$ 185,885
	FY14 Total ARS Award Amount	**$ 185,885**

Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
EC-HQ – Executive Committee-Headquarters
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
WES-CP – Western 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 and Reduced DON Accumulation.*

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. We assist others in the CP working to achieve this goal by growing the North American Barley Scab Evaluation Nursery (NABSEN) at one location, growing and evaluating advanced breeding lines from the University of Minnesota and Busch Agricultural Resources (BAR) breeding programs in yield trial experiments at seven sites in ND and eastern MT, and collecting data on cultivars and advanced breeding lines grown in FHB nurseries in Langdon and Osnabrock. Each year about 1,200 lines are evaluated in replicated yield trials. Finally, data from our work will allow for identification of SNP markers associated with improved FHB resistance and reduced DON accumulation.

2. **List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:**

   Accomplishment:

   - We grew, evaluated, and harvested advanced breeding lines from the University of Minnesota, Busch Ag, and NDSU breeding programs in our FHB nurseries in Langdon, ND.

   - Grew and harvested the NABSEN trial in Osnabrock, ND.

   - Evaluated and harvested advanced breeding lines from the NDSU breeding program with improved FHB resistance in replicated yield trials at six locations in North Dakota (Fargo, Carrington, McVille, Minot, Ray, and Williston.

   - Candidates for the American Malting Barley Association's (AMBA) Pilot Scale Evaluation Program with improved FHB resistance were grown at two locations in North Dakota. All of the six-rowed candidates accumulated at least 10% less DON than Robust and all of the two-rowed candidates accumulated DON less than Pinnacle

   The two-rowed line 2ND25276 was released in January 2015 as ND Genesis. ND Genesis accumulates 20% less DON than Pinnacle and was rated as satisfactory in it's first year of AMBA Plant Scale evaluation. Rahr Malting is in the process of receiving grain of ND Genesis from the 2014 crop year for the second year of AMBA Plant Scale evaluation. Compared to Pinnacle, ND Genesis has a higher yield potential, better resistance to foliar diseases, and lower malt ß-glucan concentration. Pinnacle currently is the most widely grown two-rowed cultivar in North Dakota.

Impact:

- Nearly 80% of the two-rowed barley acres sown in North Dakota are done using NDSU barley cultivars. Two-rowed barley has a lower likelihood of being rejected for malting barley compared to six-rowed barley due to its plumper kernels, and lower grain protein and DON accumulation. The new cultivar ND Genesis is expected to quickly replace the acreage of Pinnacle if it is accepted by the malting and brewing industry. If accepted by the malting and brewing industries, this cultivar will increase the number of acres in North Dakota and the region sown with cultivars having improved FHB resistance and lower levels of DON accumulation.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY14 award period. The term "support" below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student's stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY14 award period?** NO

   If yes, how many?

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY14 award period?** NO

   If yes, how many?

3. **Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?** NO

   If yes, how many?

4. **Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?** NO

   If yes, how many?

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY14 award period. List the release notice or publication. Briefly describe the level of FHB resistance. *If not applicable because your grant did NOT include any VDHR-related projects, enter N/A below.*

ND Genesis: This two-rowed barley cultivar accumulates about 20% less DON than Pinnacle, which is the most widely grown two-rowed cultivar in North Dakota.

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 FY14 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Refereed

Schwarz, P.B., S.Y. Qian, B.Zhou, Yi Xu, J.M Barr, R.D. Horsley, and J. Gillespie. 2014. Occurrence of deoxynivalenol-3-glucoside on barley from the upper Midwestern United States. J. Am. Soc. Brew. Chem. 72(3):208-213.

Presentations

- Presented an invited talk at the Hettinger Research Extension field day in July 2014.
- Presented an invited talk at the NDSU Agronomy Seed Farm field day in July 2014.
- Presented an invited talk at the Carrington Research Extension field day in July 2014.
- Co-hosted and provided multiple lectures at the 2014 Craft brewer/maltster field class in July 2014.
- Presented an invited talk at the 2014 Plant Breeding and Genetics Conference at the Universidade Estadual do Norte Fluminense in Campos do Goytacazes, Brazil.
- Presented an invited talk at the 2014 Prairie Grains Conference in December 2014 in Grand Forks, ND.
- Presented an invited talk at the 2015 North Dakota Barley Day in March 2015 in Osnabrock, ND.