USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY17 Preliminary Final Performance Report
Due date: July 31, 2018

Cover Page

Principle Investigator (PI):	Richard Horsley
Institution:	North Dakota State University
E-mail:	Richard.Horsley@ndsu.edu
Phone:	701-231-8142
Fiscal Year:	2017
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.
FY17 USDA-ARS Award Amount:	$ 185,193
Recipient Organization:	North Dakota State University Office of Grant & Contract Accouting NDSU Dept 3130, PO Box 6050 Fargo, ND 58108-0650
DUNS Number:	80-388-2299
EIN:	45-6002439
Recipient Identifying Number or Account Number:	FAR0022042
Project/Grant Reporting Period:	5/3/17 - 5/2/18
Reporting Period End Date:	5/2/2018

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
BAR-CP	Developing 6- and 2-rowed Malting Barley Cultivars with Reduced FHB and DON.	$ 185,193
	FY17 Total ARS Award Amount	$ 185,193

Principal Investigator Date

* MGMT – FHB Management
FST – Food Safety & Toxicology
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
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

FY17 Preliminary Final Performance Report
PI: Horsley, Richard
USDA-ARS Agreement #: 59-0206-4-009
Reporting Period: 5/3/17 - 5/2/18

Project 1: *Developing 6- and 2-rowed Malting Barley Cultivars with Reduced FHB and DON.*

1. What are the major goals and objectives of the project?

The overall goal of this project is to develop two- and six-rowed malting barley cultivars with enhanced resistance to FHB and reduced DON accumulation. In FY17, our goals were: 1) continued development and screening of six- and two-rowed barley lines in our breeding program for reduced FHB and DON, 2) growing the North American Barley Scab Evaluation Nursery (NABSEN) at our Osnabrock, ND research site, and 3) collect FHB and DON data on cultivars and advanced breeding lines that can be used by growers for making decisions on what cultivar(s) to grow.

2. What was accomplished under these goals? *Address items 1-4) below for each goal or objective.*

1) major activities
- Made 109 crosses to incorporate improved agronomic performance, end-use quality, and reduced DON accumulation.
- Evaluated over 1,400 experimental barley lines in replicated yield trials at up to seven locations in North Dakota.
- Grew over 13,000 F_4 head rows that included material that had at least one parent in its pedigree that had reduced DON accumulation.

2) specific objectives
- We identified breeding lines with reduced DON accumulation that were submitted to the American Malting Barley Association's (AMBA) Pilot Scale evaluation program.
- We grew the NABSEN trial at our Osnabrock research site and submitted harvested grain samples to Dr. Paul Schwarz's lab for DON determination.

3) significant results
- Four lines were rated satisfactory in the 2017 AMBA Pilot Scale evaluation program and are candidates for Plant Scale evaluation in 2019. The two-rowed lines 2ND32529 and 2ND32829 had DON accumulation similar to or lower than the two-rowed resistant check, Conlon.

4) key outcomes or other achievements
- The two-rowed line 2ND28065 is in its second year of AMBA Plant Scale evaluation. It has DON accumulation similar to that of Conlon.

3. What opportunities for training and professional development has the project provided?
- José Rivera, a PhD student from Puerto Rico, is conducting research to validate genomic selection for traits related to agronomic performance, malt quality, and disease resistance in two-rowed barley germplasm developed by the NDSU barley breeding program.

- Brian Kisely, an M.S. student from South Dakota, is conducting research to validate marker assisted selection for traits related to agronomic performance, malt quality, and disease resistance in two-rowed barley germplasm developed by the NDSU barley breeding program.

4. How have the results been disseminated to communities of interest?

- Results are disseminated via articles in peer-reviewed journals and popular press, field day presentations, and presentations to stakeholder groups at local and regional meetings. All phenotype and genotype data for NDSU lines tested in replicated yield trials are uploaded to T3.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY17 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 FY17 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 FY17 award period?** No

   If yes, how many?

3. **Have any post docs who worked for you during the FY17 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 FY17 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?

Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY17 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.*

Name of Germplasm/Cultivar	**Grain Class**	**FHB Resistance** (S, MS, MR, R, where R represents your most resistant check)	**FHB Rating** (0-9)	**Year Released**
ND Genesis	BAR	MR	3	2015

Add rows if needed.

NOTE: List the associated release notice or publication under the appropriate sub-section in the 'Publications' section of the FPR.

Abbreviations for Grain Classes

Barley - BAR
Durum - DUR
Hard Red Winter - HRW
Hard White Winter - HWW
Hard Red Spring - HRS
Soft Red Winter - SRW
Soft White Winter - SWW

Publications, Conference Papers, and Presentations

Instructions: Refer to the FY17-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY17 grant. Only include citations for publications submitted or presentations given during your award period (5/3/17 - 5/2/18). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each reference/citation, you must indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in publication/ presentation. See example below for a poster presented at the FHB Forum:

> Conley, E.J., and J.A. Anderson. 2017. Accuracy of Genome-Wide Prediction for Fusarium Head Blight Associated Traits in a Spring Wheat Breeding Program. In: Proceedings of the XXIV International Plant & Animal Genome Conference, San Diego, CA.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (poster), NO (abstract)

Journal publications.

Nothing to report

Books or other non-periodical, one-time publications.

Nothing to report

Other publications, conference papers and presentations.

- Presented an invited talk at the Carrington Research Extension field day in July 2017. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.
  Status: Presented
  Acknowledgement of Federal Support: No.
- Co-hosted the Barley Field School in July 2017. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.
  Status: Presented
  Acknowledgement of Federal Support: No.
- Presented an invited talk on barley breeding at the NDSU-NCI Barley and Malt Short Course, October 2017. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.
  Status: Presented
  Acknowledgement of Federal Support: No.

- Presented an invited talk at the Prairie Grains Conference on development of malting barley varieties for the craft malting and brewing industries in Grand Forks, ND, December 2018. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.
  Status: Presented
  Acknowledgement of Federal Support: No
- Presented an invited talk at the 2017 Scab Forum in Milwaukee, WI, December 2017.
  Status: Presented
  Acknowledgement of Federal Support: No