USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY19 Performance Report
Due date: July 24, 2020

Cover Page

Principle Investigator (PI):	Rich Horsley
Institution:	North Dakota State University
E-mail:	Richard.Horsley@ndsu.edu
Phone:	701-231-8142
Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-8-197
USDA-ARS Agreement Title:	Developing 6- and 2-rowed Malting Barley Cultivars with Reduced FHB and DON
FY19 USDA-ARS Award Amount:	$ 209,623
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:	FAR0028531
Project/Grant Reporting Period:	5/3/19 - 5/2/20
Reporting Period End Date:	5/2/2020

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	$ 209,623
	FY19 Total ARS Award Amount	**$ 209,623**

Kirk O. Horsley

7/8/2020

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

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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 research project?

The overall goal of this project is to develop two-rowed malting barley cultivars with enhanced resistance to FHB and reduced DON accumulation. In FY19, our goals were: 1) continued development and screening of 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 or objectives? *(For each major goal/objective, address items a-b) below.)*

a) What were the major activities?
- Made 125 crosses to incorporate improved agronomic performance, end-use quality, and reduced DON accumulation.
- Evaluated 1,190 experimental barley lines in replicated yield trials at six locations in North Dakota.
- Nearly 7,500 F_3 and F_4 head rows were grown that included material that had at least one parent in its pedigree that had reduced DON accumulation.

b) What were the significant results?
- We grew the NABSEN trial at our Osnabrock research site and submitted harvested grain samples to Dr. Paul Schwarz's lab for DON determination.
- The two-rowed lines 2ND34697, 2ND34954, 2ND34962, 2ND35415, and 2ND35693 were submitted to the AMBA's Pilot Scale evaluation system. Lines found satisfactory in Pilot Scale evaluation are eligible for Plant Scale evaluation. DON levels of these lines were similar to that of ND Genesis.

c) List key outcomes or other achievements.
- The two-rowed lines 2ND32529 and 2ND32657 are in the AMBA Plant Scale evaluation program. This is the final testing done before a line is considered for release. Both lines have had DON levels similar to less than ND Genesis.

3. Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.

- We planted our second FHB nursery in Fargo instead of Osnabrock, ND research site.
- The yield trials typically grown in Osnabrock were moved to our Prosper, ND research site.

- We did not plant yield trials at our Minot, Nesson Valley, or Williston research sites in western ND.
- Our head rows were planted at our Casselton, ND research site instead of Osnabrock.

4. What opportunities for training and professional development has the project provided?

- José Rivera, a PhD student from Puerto Rico, completed 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 MS 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.
- Makenson Maisonneuve, an MS student from Haiti, is conducting research to update our genomic selection model for DON accumulation.
- Ela Jusino Montalvo, an MS student from Puerto Rico, is conducting research to identify SNP markers associated with preharvest sprouting.

5. 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. Most 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 FY19 award period (5/3/19 - 5/2/20). 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 FY19 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 FY19 award period?**
   No

   If yes, how many?

3. **Have any post docs who worked for you during the FY19 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 FY19 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 FY19 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

NOTE: 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**

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 FY19-FPR_Instructions for detailed more instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY19 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period (5/3/19 - 5/2/20**) should be included. If you did not publish/submit or present anything, state 'Nothing to Report' directly above the Journal publications section.

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

> De Wolf, E., D. Shah, P. Paul, L. Madden, S. Crawford, D. Hane, S. Canty, R. Dill-Macky, D. Van Sanford, K. Imhoff and D. Miller. 2019. "Impact of Prediction Tools for Fusarium Head Blight in the US, 2009-2019." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum*, Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY. p. 12.
> Status: Abstract Published and Poster Presented
> Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

Huerta-Zurita, R., J. Barr, R.D. Horsley, and P.B. Schwarz. 2019. Predicting malt fermentability in malting barley breeding lines. JASBC 78(1):1-13.
Status: Published
Acknowledgement of Federal Support: No

Tamang, P., J. Richards, A. Albashel, R.S. Poudel, R.D. Horsley, T.L. Friesen, and R.S. Brueggeman. 2019. Mapping of barley susceptibility/resistance QTL against spot form net blotch caused by Pyrenophora teres f. maculata using RIL populations. TAG (In print).
Status: Published
Acknowledgement of Federal Support: No

Herta-Zurita, R., R.D. Horsley, ad P.B. Schwarz. 2019. Is the apparent degree of fermentation a reliable estimator of fermentability? JASBC 77(1):1-9.
Status: Published
Acknowledgement of Federal Support: No

Daba, S., R.D. Horsley, R.S. Brueggeman, S. Chao, and M. Mohammadi. 2019. Genome-wide association studies and candidate gene identification for leaf scald and net blotch in barley (*Hordeum vulgare* L.). Plant Disease 103(5).
Status: Published
Acknowledgement of Federal Support: No

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

Nothing to report

Other publications, conference papers and presentations.

Presented an invited talk on organic barley production in North Dakota.
Status: Presented
Acknowledgement of Federal Support: NO

Presented an invited talk on two-rowed barley varieties for the Midwest at the 2019 Prairie Plains Conference in Grand Forks, ND in December 2018.
Status: Presented
Acknowledgement of Federal Support: NO