

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY16 Final Performance Report  
Due date: July 28, 2017**

**Cover Page**

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<b>Fiscal Year:</b>	2016
<b>USDA-ARS Agreement ID:</b>	59-0206-4-009
<b>USDA-ARS Agreement Title:</b>	Developing 6- and 2-rowed Malting Barley Cultivars with Enhanced FHB Resistance and Reduced DON Accumulation.
<b>FY16 USDA-ARS Award Amount:</b>	\$ 185,552
<b>Recipient Organization:</b>	North Dakota State University Office of Grant & Contract Accounting NDSU Dept 3130, PO Box 6050 Fargo, ND 58108-0650
<b>DUNS Number:</b>	80-388-2299
<b>EIN:</b>	45-6002439
<b>Recipient Identifying Number or Account Number:</b>	FAR0022042
<b>Project/Grant Reporting Period:</b>	5/3/16 - 5/2/17
<b>Reporting Period End Date:</b>	05/02/17

**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.	\$ 185,552
	<b>FY16 Total ARS Award Amount</b>	<b>\$ 185,552</b>


7/28/17  
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 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

**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 six- and two-rowed malting barley cultivars with enhanced resistance to FHB and reduced DON accumulation. In FY2016, 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, 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 over 150 crosses to incorporate improved agronomic performance, end-use quality, and reduced DON accumulation.
- Evaluated over 1,500 experimental barley lines in replicated yield trials at up to seven locations in North Dakota.
- Grew over 13,000 F<sub>4</sub> 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 of seven lines found acceptable in the 2016 AMBA Pilot Scale evaluation program had DON similar to their respective check resistant varieties. ND32898 and ND32920 six-rowed barley had DON accumulation similar to Quest. The two-rowed lines 2ND32529 and 2ND32829 had DON accumulation similar to Conlon

4) key outcomes or other achievements

- The two-rowed variety ND Genesis, released in 2015, continues to occupy a higher percentage of the two-rowed acreage sown in North Dakota. ND Genesis accumulates about 20% less DON than Pinnacle.

**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.

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- 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 for NDSU lines tested in replicated yield trials is being uploaded to T3.

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## **Training of Next Generation Scientists**

**Instructions:** Please answer the following questions as it pertains to the FY16 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 FY16 award period?** Yes

**If yes, how many?** 1

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY16 award period?** No

**If yes, how many?**

3. **Have any post docs who worked for you during the FY16 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 FY16 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 FY16 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

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## **Publications, Conference Papers, and Presentations**

**Instructions:** Refer to the FY16-FPR\_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY16 grant. Only include citations for publications submitted or presentations given during your award period (5/3/16 - 5/2/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

### **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 Hettinger Research Extension field day in July 2016.  
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 Williston Research Extension field day in July 2016.  
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 2016. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.

Presented an invited talk on barley variety quality characteristics of Midwest barley varieties to a Mexican trade team hosted by the US Grains Council and the ND Barley Council in September August 2016. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different barley lines.

Status: Presented

Acknowledgement of Federal Support: No.

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Presented an invited talk on barley breeding at the NDSU-NCI Barley and Malt Short Course, October 2016. 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 a conference hosted by the University of Vermont on development of malting barley varieties locally produced for the craft malting and brewing industries, March 2017.

Status: Presented

Acknowledgement of Federal Support: No.

Presented an invited talk at the annual Craft Brewer Conference on development of malting barley varieties locally produced for the craft malting and brewing industries, April 2017.

Status: Presented

Acknowledgement of Federal Support: No.