


**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY15 Final Performance Report  
Due date: July 15, 2016**

**Cover Page**

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<b>Fiscal Year:</b>	2015
<b>USDA-ARS Agreement ID:</b>	59-0200-3-002
<b>USDA-ARS Agreement Title:</b>	Management and Resistance Sources for Control of FHB in Barley.
<b>FY15 USDA-ARS Award Amount:</b>	\$ 23,798
<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>	FAR0020590
<b>Project/Grant Reporting Period:</b>	05/08/15-05/07/16
<b>Reporting Period End Date:</b>	05/07/16

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
BAR-CP	Coordination of the NABSEN and Collaborative Screening of Western US Barley Germplasm.	\$ 21,077
BAR-CP	Crossing and Field Tests of Transgenic Barley.	\$ 2,721
	<b>FY15 Total ARS Award Amount</b>	<b>\$ 23,798</b>


07-14-16  


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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:** *Coordination of the NABSEN and Collaborative Screening of Western US Barley Germplasm.*

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

The major goal of this project was the continued head-to-head evaluation of elite barley germplasm and cultivars from established FHB breeding programs in the Midwestern US and Prairie Provinces of Canada. We are also collaborating with Western barley breeding programs to screen their materials to expedite the identification and deployment of FHB resistance in elite materials adapted to the west. To accomplish these goals the major objectives of this project were to coordinate the disease screening of the elite germplasm in multiple regional nurseries as well as to establish two misted and irrigated nurseries in ND. These FHB nurseries have been continually established and evaluated for this project for 16 years and is known as the North American Scab Evaluation Nursery (NABSEN).

**2. What was accomplished under these goals?**

1) major activities

Advanced barley lines with FHB resistance were tested in three mist-irrigated sites, as well as under normal rainfall conditions in three nurseries during the 2015 field season. The seed from all cooperators were collected and redistributed in early spring. We established two solar powered mist-irrigated nurseries in Fargo and Langdon, ND. The nurseries were maintained, and inoculated with corn spawn inoculum that was produced in our lab during the spring of 2015. Two applications of inoculum was applied to the nurseries. The other locations established by NABSEN cooperators included Osnabrock, and Casselton, ND, St. Paul and Crookston, MN, and Brandon, Manitoba. The nurseries included breeding lines with putative FHB resistance from the NDSU 2-rowed and 6-rowed breeding programs and lines from the Univ. of Minnesota, Busch Ag, and Agriculture and Agri-Food Canada. FHB parameters, DON, and agronomic factors were recorded, collated and included in the NABSEN report.

Advanced lines and cultivars from three western US barley breeding programs, Montana State University, USDA-ARS Aberdeen Idaho and Washington State University were also evaluated in the NABSEN nurseries established in Fargo and Langdon ND.

2) specific objectives

The specific objectives of this grant manly consists of coordinating, establishing, and collating the NABSEN data.

3) significant results

Disease levels in 2015 were low early in the season at Casselton, Osnabrock and Crookston unmisted nurseries thus no FHB incidence or severity data were taken from these nurseries. FHB disease severity levels were moderate at St. Paul, Crookston and Brandon misted locations; while Fargo and Langdon locations were moderately high. DON levels were highest at Fargo, Langdon, Brandon, and Crookston, while St. Paul was the lowest of the misted trials. The dry land nurseries Osnabrock and Casselton were considered moderate high. These levels on the dry land nurseries were the highest seen over the past few years.

Temperatures were below the 30 year average for May at all locations except Langdon which was average. June temperatures were generally average to above average except for Crookston which was below the 30 year average. All locations were above the 30 year average for July except Langdon and St. Paul. Fargo, Langdon and Casselton had average temperatures in August, while St. Paul and Crookston were below and Brandon was above the 30 year average.

Precipitation was above the 30 year average in May in all locations except Crookston. In June all locations were close to average except Fargo and Brandon which were below the 30 year average. Crookston was above the 30 year average and Brandon was below, while the other locations were close to average in July. In August all locations were below the 30 year average for precipitation except St. Paul

4) key outcomes or other achievements

Significant progress has been made toward developing FHB tolerant and DON accumulation resistant barley cultivars (i.e. cvs Quest and ND-Genesis) through USWBSI funding and these lines had been tested within the NABSEN. The cooperating breeders are able to use the relative performance data to make decisions about continuing or dropping particular breeding lines All North American barley breeders have access to the data collected in this project and. Breeders have: 1) tests of the resistance stability of their breeding lines across a range of environments and disease pressures; 2) a measure of the resistance in their advanced lines compared to those of the other barley breeders in North America; 3) access to unique germplasm with resistance to FHB and DON accumulation.

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

The project has provided training in the lab and field for undergraduate and graduate students.

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

The data and results of the screening have been reported in the annual NABSEN report which is available on the USWBSI website and available to all interested.

**Project 2:** *Crossing and Field Tests of Transgenic Barley.*

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

Commercially accepted barley lines grown in the upper Midwest are susceptible to FHB and have DON accumulation levels exceeding those acceptable by the malting industry. Breeding programs have made consistent progress to bring DON levels down and some of these lines have been approved for malting quality. However, DON accumulation may still be above acceptable industry standards in these new lines when environmental conditions are conducive for a major FHB epidemic. Transgenic barley lines with novel or synthetic sources of resistance may allow for a boost in resistance and lower DON accumulation that is not available through endogenous genes currently available from the primary barley germplasm pool. Thus this project major goal was to test putative transgenic lines in our established transgenic FHB nursery located in Langdon, ND.

This was a collaborative project with the PI Dr. Phil Bregitzer with our focus on establishing the inoculated and misted nursery, reading the the nursery for disease disease severity and harvesting and transporting the transgenic grain to Dr. Paul Schwarz's lab for DON evaluation.

**2. What was accomplished under these goals?**

- 1) major activities  
See Dr. Bregitzer's report on this project.
- 2) specific objectives  
See Dr. Bregitzer's report on this project.
- 3) significant results  
See Dr. Bregitzer's report on this project.
- 4) key outcomes or other achievements  
See Dr. Bregitzer's report on this project.

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

See Dr. Brigitzer's report on this project.

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

See Dr. Brigitzer's report on this project.

### **Training of Next Generation Scientists**

**Instructions:** Please answer the following questions as it pertains to the FY15 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 FY15 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 FY15 award period?**

No

**If yes, how many?**

- 3. Have any post docs who worked for you during the FY15 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 FY15 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 FY15 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

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**

Refer to the FY15-FPR\_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Nothing to Report

**Journal publications.**

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

**Other publications, conference papers and presentations.**