

**USDA-ARS**  
**U.S. Wheat and Barley Scab Initiative**  
**FY17 Final Performance Report – NCE for FY18**  
**Due date: July 12, 2019**

**Cover Page**

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<b>Fiscal Year:</b>	2017 (NCE for FY18)
<b>USDA-ARS Agreement ID:</b>	59-0206-4-003
<b>USDA-ARS Agreement Title:</b>	Spring Wheat Breeding for Scab Resistance in South Dakota.
<b>FY17 USDA-ARS Award Amount:</b>	\$ 78,008
<b>Recipient Organization:</b>	South Dakota State University SAD 133, Box 2201 Brookings, SD 57007
<b>DUNS Number:</b>	929929743
<b>EIN:</b>	46-6000364
<b>Recipient Identifying Number or Account Number:</b>	SA1400626
<b>Project/Grant Reporting Period:</b>	4/6/18 - 4/5/19
<b>Reporting Period End Date:</b>	04/05/19

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
VDHR-SPR	Spring Wheat Breeding for Scab Resistance in South Dakota.	\$ 78,008
	<b>FY17 Total ARS Award Amount</b>	<b>\$ 78,008</b>

  
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 Principal Investigator

July 7, 2019  
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 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:** *Spring Wheat Breeding for Scab Resistance in South Dakota.*

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

The broad objective was to successfully address USWBSI -VDHR priorities 1, 2, and 3 as goals. VDHR priority 1 was to increase acreage planted with varieties with improved FHB resistance to reduce DON in the US grain supply. Priorities 2 and 3 were to increase efficiency of coordinated project breeding programs to develop and release FHB resistant varieties, and develop new breeding technologies and germplasm to further enhance short term and long term improvement of FHB resistance and to efficiently introgress effective resistance genes into breeding germplasm.

Briefly, and in terms of this research, goal 1 sought to accumulate various forms of FHB resistance data for dissemination to regional growers and breeders to enable more informed decisions maximizing the prevalence of productive varieties with enhanced resistance. Goals 2 and 3 were focused on accumulation of various forms of FHB resistance data primarily used within this and other breeding programs for choosing the best experimental lines for consideration as future cultivar releases and for use as parents in population development activities.

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

1) major activities

Goal 1 - Participation with multi-location regional screening efforts (i.e., Uniform Regional Scab Nursery, as well as phenotyping of released cultivars, mapping, and other experimental populations created by colleagues, etc).

Goal 2 - Combined utilization of USDA-ARS genotyping center in Fargo, ND, our own mist-irrigated and inoculated FHB screening nurseries, and submission of samples for DON testing.

Goal 3 - Utilization of FHB resistance phenotypes collected from our screening nurseries, and molecular marker data, to identify sources of FHB / DON resistance.

2) specific objectives

Goal 1 - Accumulation of disease resistance phenotypic data for screened genotypes.

Goal 2 - Gather and combine molecular marker, FHB resistance phenotype, and DON concentration data into a dataset that included agronomic performance as well as end-use quality data to be used in identifying experimental lines that best meet all breeding objectives for potential cultivar release and for use as parents within the breeding program.

Goal 3 - Utilize FHB resistance phenotype and molecular marker data to select desirable genotypes from within segregating early-generation populations.

3) significant results

Goal 1 - Phenotypic data was collected for entries within the Uniform Regional Scab Nursery, for released cultivars available to South Dakota producers, and for a colleague at North Dakota State University.

Goal 2 - Data were accumulated for 48 Advanced and 72 Preliminary yield trial entries as well as approximately 300 F<sub>4</sub> derived breeding lines.

Goal 3 - Data were accumulated for approximately 300 F<sub>2</sub> and 250 F<sub>4</sub> segregating populations.

4) key outcomes or other achievements

Goal 1 - Phenotypic data was utilized within this breeding program, shared with colleagues, and data pertaining to released cultivars was made available to regional producers.

Goal 2 - Data were used to identify experimental lines which possessed the highest levels of FHB resistance, best agronomic potential, and also had the highest levels of end-use quality for further consideration as future cultivar releases and selection as parents in population development activities.

Goal 3 - A greater number of selections were made from within segregating populations with the highest levels of resistance which, in future years, should increase the frequency and resistance levels of lines available in the breeding program for consideration as cultivar releases as well as their use as parents for population development.

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

Both undergraduate and graduate students routinely assist with collection of FHB resistance data from screening nurseries. Additionally, the same students assist with collecting *Fusarium* damaged kernel scores and help prepare samples for DON analysis.

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

FHB resistance data collected on released cultivars are made available to growers as a part of the annual South Dakota Crop Performance Testing Hard Red Spring Wheat report and selection guide. This document is made available online as well as in print. Additionally, abridged copies from the previous crop year are available at producer field days each year and FHB resistance levels are routinely points of discussion at the same field days. Data collected for breeding program colleagues, such as Uniform Regional Scab Nursery observations, are provided in the annual report to the nursery coordinator, Dr. David Garvin, who then makes data available to all participants. Likewise, data collected for other colleagues are emailed once completed.

## **Training of Next Generation Scientists**

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

**If yes, how many?**

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

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### 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-NCE 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
SD4691	HRS	R	2	2017
SD4705	HRS	R	2	2017
SD4710	HRS	R	2	2017
SD4724	HRS	R	2	2017
SD4741	HRS	R	2	2017
ND2710 (CHECK)	HRS	R	2	1999

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 FY17-NCE\_FPR-Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY17-NCE grant period. Only include citations for publications submitted or presentations given during your award period (4/6/18 - 4/5/19). 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. 2018. 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.**

Eldakak, Moustafa, Aayudh Das, Yongbin Zhuang, Jai S. Rohila, Karl Glover, and Yang Yen. 2018. A Quantitative Proteomics View on the Function of Qfhb1, a Major QTL for Fusarium Head Blight Resistance in Wheat. *Pathogens*. 7(3), 58;

<https://doi.org/10.3390/pathogens7030058>

Status: Published

Acknowledgement of Federal Support: YES

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

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