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

USWBSI Individual Project(s)

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

July 7, 2019
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: *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_4 derived breeding lines.

Goal 3 - Data were accumulated for approximately 300 F_2 and 250 F_4 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?

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

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.