

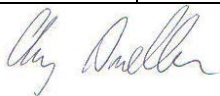
USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY18 Performance Report
Due date: July 12, 2019

Cover Page

Principle Investigator (PI):	Clay Sneller
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Fiscal Year:	2018
USDA-ARS Agreement ID:	59-0206-8-208
USDA-ARS Agreement Title:	Improving SRWW Resistance to FHB using Traditional and Molecular Breeding.
FY18 USDA-ARS Award Amount:	\$ 89,156
Recipient Organization:	The Ohio State University Research Foundation Accounting Dept. 1960 Kenny Road, 4th Floor Columbus, OH 43210
DUNS Number:	07-165-0709
EIN:	31-6401599
Recipient Identifying Number or Account Number:	GRT00052677/60066967
Project/Grant Reporting Period:	7/6/18 - 7/5/19
Reporting Period End Date:	07/05/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-NWW	Utilizing Wheat Genes for FHB Resistance in Ohio.	\$ 65,403
VDHR-NWW	Coordinated Phenotyping of Uniform Nurseries and Official Variety Trials.	\$ 18,024
VDHR-NWW	Use of Genomic Selection to Improve FHB Resistance and Yield in Northern SWW.	\$ 5,729
	FY18 Total ARS Award Amount	\$ 89,156



Principal Investigator

July 12th, 2019

Date

* 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: *Utilizing Wheat Genes for FHB Resistance in Ohio.*

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

The major goal is 1) to screen elite germplasm adapted to Ohio for resistance to FHB. The secondary objective is 2) to make crosses and advance populations designed to develop new cultivars with high yield and good FHB resistance

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

- 1) major activities
 - a. We assessed the FHB resistance of 1,217 OSU wheat lines in a misted and inoculated nursery in June of 2019.
 - b. During the winter of 2018-19 we made 80 crosses involving parents with good FHB resistance.
 - c. We submitted 200 samples from F1 and BC1F1 for genotyping for Fhb1.
- 2) specific objectives
 - a. Screen the FHB resistance of 1200 OSU breeding lines
 - b. Make crosses involving FHB resistant parents and advance populations
 - c. Initiate and advance backcross population for *Fhb1*
- 3) significant results
 - a. Data from the 2019 was collected at the end of June 2019 and has not been summarized at this time. The 2019 Nursery suffered weeks of heavy rains and extensive water logging. This induced severe levels of Stagonospora Glume Blotch which makes rating FHB symptoms difficult. The water logging also induced early senesce. We actually waded through standing water to collect data.
 - b. We made 80 crosses in the Fall of 2018. The F1s were planted in the spring of 2019.
 - c. The 80 crosses include the initial crosses to begin backcrossing Fhb1 into 10 advanced OSU breeding lines. Tissue was collected from each along with some BC1F1 and sent for genotyping.
- 4) key outcomes or other achievements: Data from the 2018-19 trials have not been analyzed.

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

We employ eight undergraduate students in the summer. The project supported (or partially supported), 1 post-doc, 1 visiting scholar, and two graduate students. All are involved in preparing for planting, collecting data and processing samples.

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

Results from the 2018-19 nursery are not yet available.

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Project 2: *Coordinated Phenotyping of Uniform Nurseries and Official Variety Trials.*

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

The objective is to coordinate the phenotyping of advanced breeding lines derived from nine public Universities (NE, MO, IL, IN, MI, OH, NY, KY, VA) and two private companies (KWS, Limagrain) through the USWBSI uniform trials (PNUWWSN, NUWWSN) as well as all lines entered in the 2018-19 OSU Commercial cultivar trial.

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

- 1) major activities: Perform analyses of the 2017-18 test and disseminate the report. Send seed from 2017-18 OSU trials for DON analyses. Prepare entry list for the 2018-19 trials, package seed, ship seed to cooperators. Plant the 2018-19 P+NUWWSN trials in Ohio, layout irrigation, inoculate, collect notes on FHB, foliar diseases, and heading.
- 2) specific objectives
 - a. Distribute seed from 10 cooperators to establish the P+NUWWSN at 10 locations. The trials consisted of a total of 110 lines.
 - b. Prepare the 2017-18 report prior to January of 2018 and distribute to all cooperators and the NFO
 - c. Submit data from the 2017-18 OWPT to the OWPT coordinator
- 3) significant results
 - a. Analyses of BLUPs from 1998 to 2018 show that IND scores are declining while DON has stayed relatively unchanged. This is also true when looking at traits values relative to the checks from 2013 to 2018 (Figure 1.)

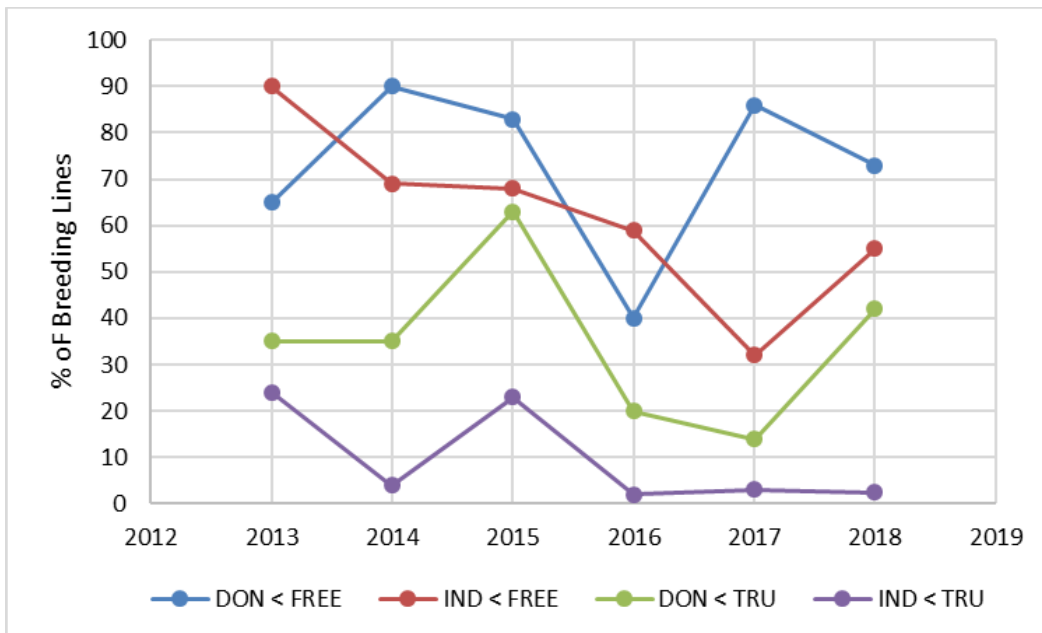


Figure 1. The percentage of P+NUWWSN breeding lines with IND or DON values that are less than that of Truman (TRU, the resistant check) or less than that of r Freedom (FREE, the moderately resistant check)

4) key outcomes or other achievements

We have shown that the level for FHB resistance in NWW CP germplasm, as compared to checks, continues to increase when assessed with FHB index, though DON levels have not greatly changed.

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

We employ eight undergraduate students in the summer. The project supported (or partially supported), 1 post-doc, 1 visiting scholar, and two graduate students. All are involved in preparing for planting, collecting data and processing samples.

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

The report on the P+NUWWSN are sent to all collaborators and posted on the USWBSI website.

The report on the commercial lines in the OWPT is submitted to the OWPT coordinator. She presents that information in the final OWPT with is posted on the OSU extension website, is published, and is used in many extension presentations.

Project 3: *Use of Genomic Selection to Improve FHB Resistance and Yield in Northern SWW.*

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

Assess the correlation of observed phenotypes and predicted value of lines derived from cycles of genomic selection

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

1) major activities:

- a. We assessed the FHB resistance of 173 lines derived from two cycles of GS. Seed of additional lines were increased for testing in 2019-20.

2) specific objectives

3) significant results

Results from the 2018 FHB screening in Ohio produced a correlation of 0.61 between the predict Index value of 173 cycle 1 and 2 families and their observed phenotype (Figure 2). This correlation is actually a bit higher than we anticipated based on the prediction accuracy estimate using cross-validation and data from the training population.

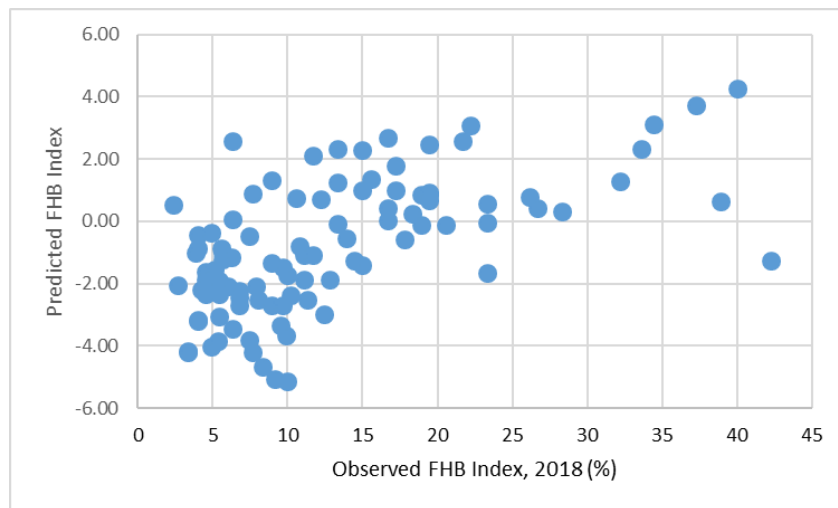


Figure 2. Graph of the observed FHB index and the predicted value of 173 wheat lines derived from two cycles of genomic selection.

4) key outcomes or other achievements

Two manuscripts have been prepared for publication.

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

We employ eight undergraduate students in the summer. The project supported (or partially supported), 1 post-doc, 1 visiting scholar, and two graduate students. All are involved in preparing for planting, collecting data and processing samples.

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

The results have not been disseminated pending analysis of data from other years.

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Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY18 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 FY18 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 FY18 award period?**

no

If yes, how many?

- 3. Have any post docs who worked for you during the FY18 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 FY18 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?

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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 FY18 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

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Publications, Conference Papers, and Presentations

Instructions: Refer to the FY18-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY18 grant. Only include citations for publications submitted or presentations given during your award period (7/6/18 - 7/5/19). 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 presentation with an abstract:

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.

None to report

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

None to report

Other publications, conference papers and presentations.

Arguello-Blanco, N, D Borrenpohl, M Huang and C Sneller. 2018. Correlation between Genomic Estimated Breeding Values and Observed Phenotypic Values in Wheat Breeding. Proceeding of the 2018 Scab Forum, St Louis MO, 2-4 December 2018

Status: Abstract Published and Poster Presented

Acknowledgement of Federal Support: YES (poster), NO (abstract)

Borrenpohl, D, M Huang, N Arguello-Blanco and C Sneller. 2018. Implementing Genomic Selection in Preliminary Yield Trials. Proceeding of the 2018 Scab Forum, St Louis MO, 2-4 December 2018

Status: Abstract Published and Poster Presented

Acknowledgement of Federal Support: YES (poster), NO (abstract)