

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:	59-0206-4-034
USDA-ARS Agreement Title:	Discovering, Understanding, and Utilizing Wheat Genes for FHB Resistance in Ohio.
FY17 USDA-ARS Award Amount:	\$ 85,271
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:	GRT00034867 BG001
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.	\$ 60,077
VDHR-NWW	Coordinated Phenotyping of Uniform Nurseries and Official Variety Trials.	\$ 17,442
VDHR-NWW	Implementing Genomic Selection for FHB Resistance in Soft Winter Wheat (SWW).	\$ 7,752
	FY17 Total ARS Award Amount	\$ 85,271



Principal Investigator

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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

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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

Objective 1: Package seed, plant nurseries, layout irrigation, inoculate nursery, collect notes on FHB, heading, and foliar diseases, and collate data.

Objective 2: Make crosses and grow F1s in greenhouse, advance F2, F3, F4, and F4:5 population in the field.

2) specific objectives

Objective 1: Screen 1,121 OSU breeding lines for FHB resistance

Objective 2: Make crosses and grow F1s in greenhouse, advance F2, F3, F4, and F4:5 population in the field

Summarize data from the 2017-18 FHB nursery.

3) significant results (in the NCE)

Objective 1: We screened 1,121 OSU breeding lines for FHB Index in the 2018-18 season. This included 92 advanced lines (e.g. already screened at 2x for FHB resistance), 252 middle stage lines, and 775 first stage lines. High levels of FHB resistance were noted in s=each of these three sets (Fig. 1). All stages of OSU testing show a higher percentage of Truman-like resistance than in the commercial cultivar trials (OWPT) and a higher percentage of lines with Freedom-like resistance than the USWBSI Uniform trial: this is true even in the stage 1 lines that have never been screened for FHB resistance prior to his test.

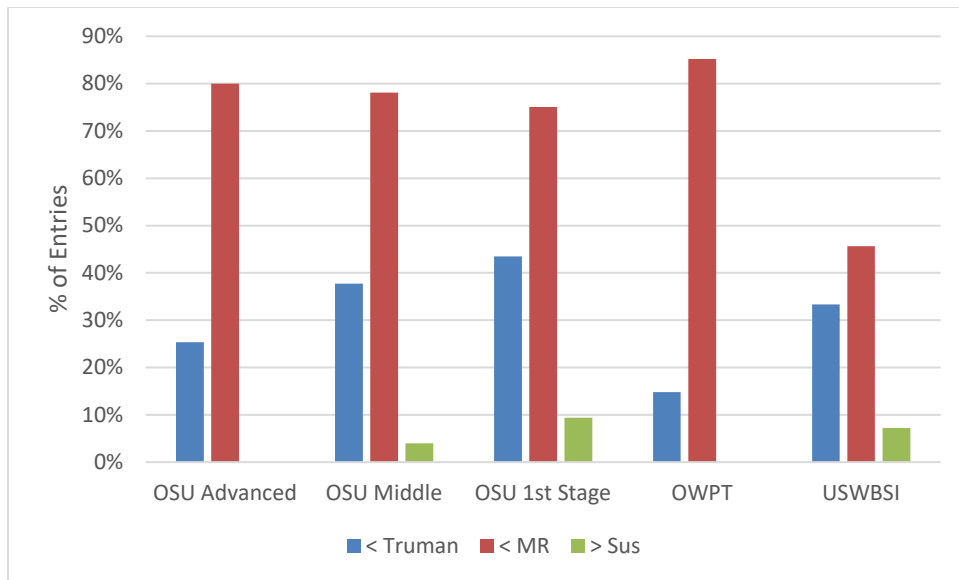


Figure 1. Percentage of lines with FHB index < Truman (“R” check), < moderate resistance check (MR,=Freedom), and > susceptible check (Pioneer 2545). Summary is shown for three classes of OSU breeding lines, the OSU commercial cultivar test (OWPT) and the USWBSI uniform trials.

Objective 2: In the 2017-2018 season we made 98 crosses for FHB resistance where all parents have high yield potential and at least one of the parents has strong FHB resistance. 15 crosses were advanced for MAS for Fhb1. Approximately 100 F2, F3, F4 and F4:5 populations were advanced to the next stage.

4) key outcomes or other achievements:

Objective 1: Of the 94 advanced OSU in the screening, 11 will be advanced to the next stage of testing due to having < FHB than Freedom and yields greater than that of the high yield checks. One line (OH13-88-61) is likely to be released due to sustained yield superiority over three seasons, desired agronomics and resistance to FHB and other diseases.

Objective 2: New populations are initiated and others advanced. The parentage of all populations is elite SRWW which is essential to attain the needed yield levels. High levels of FHB resistance should be obtained as each cross is derived from at least one parent with strong FHB resistance.

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

In 2017-18 the project provided training opportunities in breeding and plant, pathology to two graduate students (1 MS, 1 PhD), one post-doc, and five undergraduates

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

Results have been presented at a field day in Wooster Ohio and at one grower meeting.

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 2017-18 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 2016-17 test and disseminate the report. Send seed from 2016-17 OSU trials for DON analyses. Prepare entry list for the 2017-18 trials, package seed, ship seed to cooperators. Plant the P+NUWWSN trials in Ohio, layout irrigation, inoculate, and collect notes on FHB, foliar diseases, and heading.
- 2) specific objectives: Test all lines in the P+NUWWSN and the OWPT
- 3) significant results: High levels of resistance were noted in the OWPT (Fig. 1). This data was included in the final report of the OSU Commercial Cultivar trials and disseminated to growers via printed material and the OSU Extension service web site. Data from the 2016-17 P+NUWWSN trials were summarized, a report prepared, and disseminated to all cooperators and placed on the USWBSI website
- 4) key outcomes or other achievements: Ohio growers were informed of the FHB resistance of all commercially available SRWW cultivars prior to making selections. A very important conclusion is that Ohio growers have many cultivars with strong FHB resistance to choose from. This is the message we deliver to them: good levels of FHB resistance can be found in high yield cultivars so pick the right ones.

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

In 2017-18 the project provided training opportunities in breeding and plant, pathology to two graduate students (1 MS, 1 PhD), one post-doc, and five undergraduates

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

The results of the OSU OWPT is disseminated to growers via printed material, the OSU Extension website, and through a field day. Results of the USWBSI P+NUWWSN is disseminated electronically and via the USWBSI web site.

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Project 3: *Implementing Genomic Selection for FHB Resistance in Soft Winter Wheat (SWW).*

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

1) Inbreed lines derived from three cycles of GS and evaluate the FHB resistance of lines derived from the first two cycles of GS. 2) Use genotyping-by-sequencing to genotype 1,800 lines from the OSU breeding program.

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

1) major activities: Package seed for field nurseries and for the FHB nurseries, plant seed, set up irrigation and inoculate, collect data on FHB, heading, and foliar diseases. Organize seed from lines entered in OSU FHB and yield trials from 2015 through 2018 (4 seasons), isolate DNA from 1800 lines. send DNA to Michigan State for genotyping using GBS.

2) specific objectives: Inbreed lines from past cycles of GS and screen lines derived from cycles 1 and 2 of GS. Genotype lines from past OSU trials and use the genotypic and phenotypic data to build GS models that will then be used assists in selection, especially for lines in stage 1 of testing.

3) significant results: Results are presented in FY18 report

4) key outcomes or other achievements: Results are presented in FY18 report

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

In 2017-18 the project provided training opportunities in breeding and plant, pathology to two graduate students (1 MS, 1 PhD), one post-doc, and five undergraduates

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

Two manuscripts have been prepared for objective 1.

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

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-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 (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 presented at the FHB Forum:

Conley, E.J., and J.A. Anderson. 2017. 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.

Sarinelli, J, JP Murphy, R Acharya, C Sneller, and G Brown-Guedira. A regional approach to genomic selection for scab resistance. Proceeding of the 2017 Scab Forum, St Louis MO, 3-5 December 2017.

Status: Abstract Published and Poster Presented

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