USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY19 Final Performance Report
Due date: September 30, 2020

Cover Page

Cooperating Principle Investigator (CPI):	Mike Pumphrey
Institution:	Washington State University
E-mail:	m.pumphrey@wsu.edu
Phone:	509-335-0509
Fiscal Year:	2019
USDA-ARS Agreement ID:	58-2090-9-027
USDA-ARS Agreement Title:	Developing FHB Resistant Wheat Cultivars for Washington and the Western US
FY19 USDA-ARS Award Amount:	$ 18,260
Recipient Organization:	Washington State Univ. Office of Research Support and Operations Lighty Student Services Building, Room 280 PO Box 641060 Pullman, WA 99164-1060
DUNS Number:	04-148-5301
EIN:	91-6001108
Recipient Identifying Number or Account Number:	
Agency PI:	Deven See
Project/Grant Reporting Period:	8/1/19 - 7/31/20
Reporting Period End Date:	7/31/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US	$ 18,260
	FY19 Total ARS Award Amount	**$ 18,260**

9/21/20

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: *Developing FHB Resistant Wheat Cultivars for Idaho and the Western US*

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

The major goal of this project is to introgress FHB resistance into elite variety candidates suitable for production in irrigated areas of the Pacific Northwest that are at risk for and currently experience damage due to FHB. WSU spring wheat varieties have significant market share in these irrigated areas but have not been screened for FHB resistance. Our annual objective was to develop backcross populations each year enriched for *Fhb1* in laboratory and greenhouse efforts, and the resulting BC1F2 populations advanced through normal field selection practices under irrigated conditions. We also support the management of an inoculated and misted FHB nursery that we have helped establish in Pullman, WA.

2. What was accomplished under these goals or objectives? *(For each major goal/objective, address items a-b) below.)*

a) What were the major activities?
BC1-derived *Fhb1* populations were advanced after quality evaluation and selection through irrigated field nurseries with stripe rust and FHB pressure in 2020. Approximately 300 paired rows were evaluated as BC1F4:5's. Selections in the field in 2020 were completed in July 2020 and harvested in August 2020. These selections will enter yield trials in 2021, under irrigated conditions with FHB pressure. New *Fhb1* crosses initiated in 2018 and 2019 were advanced and selected in 2020. These will be advanced to routine F3/4 selection nurseries in the field in 2021.

Our field screening nursery managed in collaboration with Dr. Deven See of USDA-ARS was again higher quality in 2020, with reasonable FHB pressure that was sufficiently uniform across the nursery. This nursery has become reliable in Pullman, WA, using both grain-spawn inoculum and macrocondia preparations at flowering time.

b) What were the significant results?
We have 100 advanced generation breeding lines derived from 32 populations that are homozygous for *Fhb1* entering yield trials in 2021. Each line has been selected to have excellent rust resistance, acceptable height, maturity, and acceptable end-use quality based on early generation testing and selection. Two additional years of breeding populations are following these in this annual pipeline. These lines form the foundation of our breeding effort for PNW irrigated hard red spring wheat with good FHB tolerance, which we will continue without USWBSI support.

c) List key outcomes or other achievements.
We have established a reliable FHB screening nursery in collaboration with USDA-ARS scientist Deven See, and will continue annual evaluation.

3. Was this research impacted by the COVID-19 pandemic (i.e. university shutdowns, reduced or lack of support personnel, etc.)? If yes, please explain how this research was impacted or is continuing to be impacted.

No.

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

Graduate students, technicians, and undergraduate students have built expertise in DNA marker analysis, crossing and population development, selection processes and considerations, and plant disease experimentation and management. Only minimal partial technician funding was provided through this project, but 3 graduate students and 4 undergraduates contributed and gained experience.

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

We have presented the importance of FHB resistance to growers through field days, popular press newspaper articles, and industry meetings.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (8/1/19 - 7/31/20). 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 FY19 award period?**
   NA

   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 FY19 award period?**
   NA

   If yes, how many?

3. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   NA

   If yes, how many?

4. **Have any post docs who worked for you during the FY19 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   NA

   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 FY19 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

Publications, Conference Papers, and Presentations

Instructions: Refer to the FY19-FPR_Instructions for detailed more instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY19 grant award. Only citations for publications published (submitted or accepted) or presentations presented during the **award period (8/1/19 - 7/31/20**) should be included. If you did not publish/submit or present anything, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each citation, you **must** indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in the publication/ presentation. See example below for a poster presentation with an abstract:

De Wolf, E., D. Shah, P. Paul, L. Madden, S. Crawford, D. Hane, S. Canty, R. Dill-Macky, D. Van Sanford, K. Imhoff and D. Miller. 2019. "Impact of Prediction Tools for Fusarium Head Blight in the US, 2009-2019." In: S. Canty, A. Hoffstetter, H. Campbell and R. Dill-Macky (Eds.), *Proceedings of the 2019 National Fusarium Head Blight Forum* (p. 12), Milwaukee, WI; December 8-10. University of Kentucky, Lexington, KY.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (Abstract and Poster)

Journal publications.

None

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

None

Other publications, conference papers and presentations.

None