USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY19 Performance Report
Due date: July 24, 2020

Cover Page

Principle Investigator (PI):	Jason Cook
Institution:	Montana State University
E-mail:	jason.cook@montana.edu
Phone:	406-994-7201
Fiscal Year:	2019
USDA-ARS Agreement ID:	59-0206-9-124
USDA-ARS Agreement Title:	Fusarium Head Blight Resistance for Montana Spring Wheat
FY19 USDA-ARS Award Amount:	$ 15,609
Recipient Organization:	Montana State University Office of Sponsored Programs Montana State University PO Box 172470 Bozeman, MT 59717-2470
DUNS Number:	625447982
EIN:	816010045
Recipient Identifying Number or Account Number:	W7921
Project/Grant Reporting Period:	5/6/19 - 5/5/20
Reporting Period End Date:	5/5/2020

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Fusarium Head Blight Resistance for Montana Spring Wheat	$ 15,609
	FY19 Total ARS Award Amount	**$ 15,609**

7/23/2020

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: *Fusarium Head Blight Resistance for Montana Spring Wheat*

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

The goal of this project is to develop hard red spring wheat varieties with resistance to Fusarium head blight for Montana.

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?

There were two major activities. First, several experimental lines and varieties resistant to FHB have been incorporated into the hard red spring wheat crossing block over the past six years. A single seed descent program was used to generate head rows at the F4 generation and were incorporated into the general spring wheat breeding pipeline. Lines were selected with appropriate height, heading date, grain protein content, and stem solidness for two years prior to advancement to replicated yield trials. Advanced lines with an FHB-resistant parent were entered into FHB inoculated nurseries in Sidney, MT and Aberdeen, ID. The second activity was a marker assisted backcrossing (MAB) program used to incorporate known FHB resistance genes into elite lines.

b) What were the significant results?

Fusarium head blight resistant lines were selected as parents for the conventional breeding program including Lang, ND819, RB07, Glenn, Shelley, SD4181, SD4250 and SD4299. The value of the lines in crosses with Montana parents was variable. Selection did not favor these populations in the early generations of variety development. However, some parents, including Glenn, RB07, ND819, and SD4299 produced experimental lines for replicated trials. One of these lines, Lanning, had Glenn as a parent, but unfortunately, FHB screening nurseries indicate Lanning is not resistant to FHB. Another line, MT1716, was derived from RB07 and has good yield potential and FHB resistance. One major concern with MT1716 is that it may not have adequate end-use quality. A final evaluation of MT1716 will take place in 2020 to determine if it is suitable for release.

The second activity involved backcrossing known FHB-resistance genes into elite experimental lines. Parents MN1394-6 and ABG282-290 were used as donor parents for *Fhb1*. MT1394-6 was also the donor for *Fhb5A*. Genetic markers were used to backcross the genes into several elite parents. Several lines have been advanced in the conventional breeding program and have up to two years of field testing. Another set of 55 MAB lines were planted as head rows for the 2020 growing season to increase seed and be evaluated for agronomic attributes.

c) List key outcomes or other achievements.

The outcome of this work is to increase the prevalence of FHB resistant materials at all levels of Montana's hard red spring wheat breeding pipeline. This includes a progeny from RB07, designated MT1716, which has performed well in statewide yield trials and has shown good resistance to FHB. In addition, a MAS backcrossing program has resulted in development of a series of lines with the *Fhbl* and *Fhb5A* FHB resistance genes that are present at multiple stages in the breeding program.

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?

None

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

Fusarium head blight resistance ratings and our work with the USWBSI have been communicated to Montana wheat producers and stakeholders through the use of periodicals, field days and social media. The topic of FHB is of special interest in eastern Montana. Dr. Frankie Crutcher, the plant pathologist at the Eastern Agricultural Research Center, has developed a screening nursery that serves as an excellent focal point for discussing this research. Our efforts to develop Montana adapted FHB resistant spring wheat varieties has received positive responses from the Montana wheat growing community.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY19 award period (5/6/19 - 5/5/20). 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?**
   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 FY19 award period?**
   No

   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?**
   No

   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?**
   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 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**
Dagmar	HRS	S		2019

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 (5/6/19 - 5/5/20**) 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)

Nothing to report.

Journal publications.

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

Other publications, conference papers and presentations.