

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

**Cover Page**

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<b>Fiscal Year:</b>	2018
<b>USDA-ARS Agreement ID:</b>	59-0206-5-004
<b>USDA-ARS Agreement Title:</b>	Fusarium Head Blight Resistance for Montana Spring Wheat.
<b>FY18 USDA-ARS Award Amount:</b>	\$ 15,609
<b>Recipient Organization:</b>	Montana State University Office of Sponsored Programs Montana State University PO Box 172470 Bozeman, MT 59717-2470
<b>DUNS Number:</b>	625447982
<b>EIN:</b>	816010045
<b>Recipient Identifying Number or Account Number:</b>	W5479
<b>Project/Grant Reporting Period:</b>	05/06/18 - 05/05/19
<b>Reporting Period End Date:</b>	05/05/19

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
VDHR-SPR	Fusarium Head Blight Resistance for Montana Spring Wheat.	\$ 15,609
	<b>FY18 Total ARS Award Amount</b>	<b>\$ 15,609</b>

  
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 Principal Investigator

6/21/19  
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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

**Project 1:** *Fusarium Head Blight Resistance for Montana Spring Wheat.*

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

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

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

1) major activities

There were two major activities. First, several experimental lines and varieties with resistance to FHB have been incorporated into the crossing block for the hard red spring wheat breeding program over the past five years. A single seed descent program was used to generate head rows beginning at the F<sub>4</sub> generation. These were incorporated into the general selection program for the spring wheat program. Lines were selected with appropriate height, heading date, grain protein, and stem solidness for two years prior to advancement to replicated yield trials. Advanced lines with an FHB-resistant parent were entered into inoculated nurseries in Sidney Montana and Aberdeen Idaho. The second activity was a backcrossing program conducted by Dr. Jason Cook to incorporate known FHB resistance genes into elite lines.

2) specific objectives

Specific objectives include development of lines through the traditional breeding program for statewide agronomic testing and FHB screening. Additionally, inbred lines have been developed using MAS for *Fhb1* and *Fhb5A*.

3) significant results

Lines selected for use at parents have included ones known to carry *Fhb1* such as Rollag and SD4181, as well as others (Lang, ND819, RB07, Glenn, SD4250, SD4299, Traverse, Faller) that showed resistance in regional screening nurseries. The value of the lines as parents in crosses to Montana parents was variable. Many families tended to be selected against early in the breeding process. Some parents, including Glenn, RB07, ND819, and SD4299 produced several progeny for replicated trials. One line with Glenn as a parent was released as the variety Lanning. Unfortunately, screening nurseries indicate that Lanning does not have FHB resistance. A line derived from RB07, designated MT1716, showed excellent yield in statewide nurseries, and also a high level of FHB resistance based on inoculated nurseries. MT1716 had grain yield statistically the same but numerically higher than the leading Montana variety Vida. Grain protein for MT1716 (14.3%) was higher than Vida (13.8%). Line rows were planted in 2019 for seed purification and increase pending anticipated release. The key question for MT1716 will be in regards to end-use quality. Sufficient data will be able after 2019 to make this determination.

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The second activity involved backcrossing known FHB-resistance genes into elite lines. Parents MN11394-6 and ABG282-290 with *Fhb1* were used as donor parents. The Kasp marker Ta-HRC was employed to develop BC1F5 or BC2F5 head rows for six elite parents. Parents include widely grown varieties Vida, Lanning, and Duclair (solid stem) as well as the Clearfield variety NS Presser CLP. Two experimental lines were also included. Seed will be available for field testing lines for agronomic properties and FHB resistance in 2020. MN11394-6 was also used as the donor for *Fhb5A*. Marker-assisted selection using BARC180 was used to develop a similar set of lines with *Fhb5A*.

#### 4) key outcomes or other achievements

The outcome of the work is that the breeding pipeline for the hard red spring wheat program has FHB-resistant materials at all stages. This includes a progeny of RB07, designated MT1716, which has performed well in statewide yield trials and has shown excellent resistance to FHB. In addition, an MAS backcrossing program has resulted in development of a series of lines with *Fhb1* and *Fhb5A*.

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

Dr. Jason Cook has learned the marker technology for the following the FHB resistance genes.

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

The primary vehicle for dissemination is through the summer field day circuit. The topic of FHB is of special interest in eastern Montana. The plant pathologist at the Eastern Agricultural Research Center, Dr. Frankie Crutcher, has developed a screening nursery which served as an excellent focal point for discussing this research.

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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 (05/06/18 - 05/05/19). 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)

Nothing to report.

**Journal publications.**

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

**Other publications, conference papers and presentations.**