

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

Cover Page

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Fiscal Year:	2018
USDA-ARS Agreement ID:	59-0206-5-003
USDA-ARS Agreement Title:	Fusarium Head Blight Resistance for Montana Barley.
FY18 USDA-ARS Award Amount:	\$ 32,338
Recipient Organization:	Montana State University Office of Sponsored Programs Montana State University PO Box 172470 Bozeman, MT 59717-2470
DUNS Number:	625447982
EIN:	81-6010045
Recipient Identifying Number or Account Number:	W5477
Project/Grant Reporting Period:	5/6/18 - 5/5/19
Reporting Period End Date:	05/05/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
BAR-CP	Fusarium Head Blight Resistance for Montana Barley.	\$ 32,338
	FY18 Total ARS Award Amount	\$ 32,338



Principal Investigator

7/12/2019

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 Barley.*

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

Objective 1: Continue crossing more resistant barley varieties with elite Montana lines in the greenhouse

Objective 2: Screen progeny in the greenhouse and in the field for resistance to FHB

Objective 3: Collect and identify *Fusarium* isolates from FHB infected barley

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

Objective 1: Continue crossing more resistant barley varieties with elite Montana lines in the greenhouse

1) major activities

Several crosses have been made since this project was initiated and Dr. Sherman continues to cross resistant with elite varieties. Several of these have been evaluated for resistance and DON under field conditions (Table 1). Initially, crosses made with parents from 2-row NAM lines that have shown resistance in previous studies have been completed (Table 2) and approximately 850 progeny are being screened at the EARC in 2019.

Table 1: Crosses screened in 2017, 2018, and 2019

Female	Male	Synonym
Bearpaw	PI592173	NAM115, WC538
Bearpaw	CIHO13135	WC24
MT16M08806	Pinnacle	
MT16M01902	Pinnacle	
Bearpaw	10WA105.33	
Bearpaw	Chevron	
Bearpaw	PI327969	NAM44
Bearpaw	PI384986	NAM74
Bearpaw	PI313908	WC212
Bearpaw	PI467419	WC444
Bearpaw	467450	WC447

Table 2: Crosses screened in 2019

Female	Male	Synonym
Pinnacle	PI412946	WC404

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Pinnacle	PI573611	WC511
Pinnacle	PI639343	
Chevron	PINNACLE	
Bearpaw	DIAMANT	WC246
Bearpaw	Goldie	
Bearpaw	Roxanne	WC416
Bearpaw	WC404	
Bearpaw	WC426	
MT124112	Diamant	
MT124112	Haisa	

2) specific objectives

Cross barley lines that have shown resistance with elite parents to produce Montana adapted varieties.

3) significant results

Initial crosses screened in 2017 and 2018 have been screened for resistance and several lines have consistently shown resistance, thus have promise for the future breeding of Montana adapted varieties.

4) key outcomes or other achievements

We are still early in the project and have not met our key outcomes yet.

Objective 2: Screen progeny in the greenhouse and in the field for resistance to FHB

1) major activities

To date we have put most of our effort into field screening. From May to September 2018, progeny from crosses between resistant varieties and elite lines were screened in the field. In total, 50 lines with three replicates were evaluated in Sidney, MT.

Known resistant and susceptible barley varieties were also screened under greenhouse conditions to determine if screening in the greenhouse could give us accurate results.

2) specific objectives

Our specific objective is to use field and greenhouse screening to select resistant lines established from crossing resistant barley varieties.

3) significant results

We took our data from 2018 and did statistical comparisons to data collected by NDSU in 2017 and 2018. We were able to identify several lines with potential resistance and have included them in the 2019 screening.

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Our greenhouse results were inconclusive because of a great amount of variability and conflicting results when grown in different sized greenhouse containers. We are continuing to explore this and hope to further to optimize a protocol to be used in the off-season.

4) key outcomes or other achievements

We are still early in the project and have not met our key outcomes yet.

Objective 3: Collect and identify Fusarium isolates from FHB infected barley

1) major activities

There was very little disease in Montana in 2018 due to hot, dry weather. We did not receive samples from individuals within Montana, except individuals from Miller-Coors sent seed lots that tested positive for DON amounts higher than 1 ppm. We collect isolates from these, identified them as *F. graminearium*, and used them for inoculation of the screening nursery in 2019.

2) specific objectives

Specific objectives were to collect samples of FHB from around the state to identify what species are in the FHB complex in Montana.

3) significant results

Unfavorable weather conditions in the state prevented the development of FHB in most of the grain growing areas of Montana, preventing the collection of new isolates. However, some from Barley seed lots were collected and used for screening the nursery in 2019.

4) key outcomes or other achievements

We are still early in the project and have not met our key outcomes yet.

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

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

This project has been discussed at Montana field days and grower education events:

June 19, 2018: Impacts of durum variety and planting dates on Fusarium head blight. ARS & EARC Dryland Field Day. Sidney MT

July 17, 2018: A Fusarium head blight nursery to screen varietal resistance and fungicide efficacy. EARC Irrigated field day. Sidney, MT

Jan 8, 2019: Integrated management systems to control Fusarium head blight. Malt Barley and Sugar Beet Symposium. Billings, MT.

Additionally, results have been presented as a poster at the National Fusarium Head Blight Forum in 2018.

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Peluola, C, Sherman, J, Ferda, A, Elmore, L, Brueggeman, R, Schwarz P, and **F Crutcher**.
2018. Varietal response of malt barley to Fusarium head blight in Montana. National
Fusarium Head Blight Forum, St. Louis, MO, Dec 2-4.

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 (5/6/18 - 5/5/19). 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.

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

Other publications, conference papers and presentations.

Peluola, C, Sherman, J, Ferda, A, Elmore, L, Brueggeman, R, Schwarz P, and **F Crutcher**. 2018. Varietal response of malt barley to Fusarium head blight in Montana. National Fusarium Head Blight Forum, St. Louis, MO, Dec 2-4.
Status: Poster presented
Acknowledgement of Federal Support: YES