USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY16 Final Performance Report
Due date: July 28, 2017

Cover Page

Principle Investigator (PI):	Luther Talbert
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Fiscal Year:	2016
USDA-ARS Agreement ID:	59-0206-5-004
USDA-ARS Agreement Title:	Fusarium Head Blight Resistance for Montana Spring Wheat.
FY16 USDA-ARS Award Amount:	$ 14,563
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:	W5479
Project/Grant Reporting Period:	5/6/16 - 5/5/17
Reporting Period End Date:	05/05/17

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Fusarium Head Blight Resistance for Montana Spring Wheat.	$ 14,563
	FY16 Total ARS Award Amount	**$ 14,563**

Principal Investigator — Date: 7/25/17

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

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

The goal of this proposal is to incorporate resistance to Fusarium head blight into hard red spring wheat varieties grown in Montana. We are concentrating on the *Fhb1* allele for resistance derived from Sumai3.

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

1) major activities

The primary activities for this objective have been to make crosses of elite Montana lines with lines from regional programs that contain *Fhb1*. Inbred lines have been derived for several crosses, and are under derivation for other crosses, by single seed descent.

2) specific objectives

Our specific objective is to increase the number of FHB-resistant lines in our statewide yield trials. Selection for agronomic traits has been accomplished for a set of approximately 30 lines that were tested as members of an F_6 augmented design breeding nursery in 2016.

3) significant results

Seven lines, with putative FHB-resistance based on marker analysis, have been advanced to a yield trial being grown in four sites across Montana in 2017.

An interesting observation regarding *Fhb1* in the Montana experiments has shown that the gene may help provide resistance to the primary insect pest in our state – the wheat stem sawfly. Some of metabolites identified by other authors as being related to FHB resistance due to *Fhb1* are also known to be involved in resistance to insects. Based on this observation, we developed the specific objective of determining the impact of *Fhb1* on wheat stem sawfly resistance. We obtained near-isogenic lines (NILs) for *Fhb1* from Dr. Dave Garvin (USDA-ARS) in 2015. These included two NIL for *Fhb1* developed by MAS into Norm and two *Fhb1* NIL developed by MAS in Wheaton. These were tested in a trial in Montana. There was a statistically significant effect of the *Fhb1* allele or chromosome segment on amount of cutting due to the wheat stem sawfly ($P < .001$). The susceptible allele resulted in 15% cutting, while the NIL with the resistant allele had 6% cutting. These experiments were repeated in 2016 with additional NIL obtained from Dr. Jim Anderson. Overall, the amount of cutting in the lines with the resistant allele was 16%, versus 24% in lines with the susceptible allele ($P < 0.05$). These experiments are being repeated at two sites in 2017. This suggests that *Fhb1* may be useful for augmenting other forms of resistance to the wheat stem sawfly. In addition, the

importance of wheat stem sawfly in Montana will provide extra incentive to growers to choose lines with *Fhb1* for planting.

4) key outcomes or other achievements

The key outcome of this work has been advancement of several lines with FHB resistance to statewide yield trials and regional FHB screening nurseries. In addition, a possible impact of FHB resistance on the wheat stem sawfly has been observed.

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

This work has primarily been conducted by a research associate. However, lab meetings which include post-doctoral associates and graduate students include the FHB results, and thus help to broaden all of our knowledge.

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

The FHB issue is mentioned at most of the field days around the state by the PI. In certain areas FHB has become a point of interest to many growers. This is especially true in eastern Montana, where Dr. Frankie Crutcher has included our potentially resistant lines in an inoculated screening nursery.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY16 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 FY16 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 FY16 award period?** No.

   If yes, how many?

3. **Have any post docs who worked for you during the FY16 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 FY16 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

   Yes.

   If yes, how many?

   One. The post-doc who led the *Fhb1* research related to the wheat stem sawfly has accepted a job with a private company as a wheat breeder.

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 FY16 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *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 FY16-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY16 grant. Only include citations for publications submitted or presentations given during your award period (5/6/16 - 5/5/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Nothing to report.

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

Nothing to report.

Other publications, conference papers and presentations.

Nothing to report.