

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY15 Final Performance Report
Due date: July 15, 2016**

Cover Page

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Fiscal Year:	2015
USDA-ARS Agreement ID:	59-0206-4-041
USDA-ARS Agreement Title:	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US.
FY15 USDA-ARS Award Amount:	\$ 14,577
Recipient Organization:	University of Idaho Moscow, ID 83844-3020
DUNS Number:	075746271
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Project/Grant Reporting Period:	06/01/15-05/31/16
Reporting Period End Date:	05/31/16

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.	\$ 14,577
	FY15 Total ARS Award Amount	\$ 14,577

Principal Investigator

07/11/2016
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 project?

The overall goal of this project is to develop FHB resistant spring cultivars that have high grain yield and good end-use quality and resistance to other predominant diseases and insects. The specific objectives are: 1) QTL mapping of FHB resistance in spring wheat lines adapted in Pacific North West (PNW); 2) Validate and characterize FHB resistance in greenhouse and field nurseries in spring wheat cultivars and elite lines pyramided *Fhb1* with resistance genes to stripe rust, Hessian Fly, and end-use quality; 3) Advance FHB-related populations pyramided FHB resistance with resistance to stripe rust, stem rust, cereal cyst nematodes, and end-use quality via MAS and field testing.

2. What was accomplished under these goals?

1) Major activities

A. Evaluated FHB resistance in a spring wheat panel of 190 lines in four field FHB screening nurseries, two in University of Minnesota and two in Aberdeen, ID. Extracted DNA of the 190 lines sent to Deven See's lab for GBS genotyping and genotyping of 10 molecular markers associated with FHB1, bread baking quality, Yr15, Yr39, Sr 2, PPD, and Rht. We also sent 32 DNA to Shiaoman for 90 SNP genotyping. 90K SNP data of other 158 lines were downloaded from TCAP T3 database. Except for GBS data all marker data has been used in a preliminary association analysis. A poster was presented at 2015 FHB forum. A manuscript will be submitted after 2016 data combined.

B. Evaluated 630 breeding lines for agronomic performance, end-use quality, and resistance to stripe rust. Extracted DNA of the 630 lines sent to Deven See's Lab for genotyping of 20 molecular markers associated with FHB1, bread baking quality, Yr15, Yr39, Sr 2, PPD, and Rht.

C. Evaluated 50 F4 populations that integrated FHB resistance from known and native resistance sources under natural infection of FHB.

2) Specific objectives

A. QTL mapping of FHB resistance in 190 spring wheat lines adapted in Pacific North West (PNW)

B. Marker-assisted selection of FHB resistance in spring wheat cultivars and elite lines pyramided *Fhb1* with resistance genes to stripe rust, Hessian Fly, and end-use quality

C. Advance FHB-related populations pyramided FHB resistance with resistance to stripe rust, stem rust, cereal cyst nematodes, and end-use quality via field testing.

3) Significant results

We obtained uniform infection in the 190 lines in the association mapping panel grown in two planting dates, normal and late planting, and by two inoculation methods, spray- and point-inoculation in Aberdeen, Idaho. Wet weather and desirable temperature promoted the uniform infection. Based on the data collected from Aberdeen and Minnesota collaborated with Dr. Jim Anderson we identified 25 lines with high level of resistance to FHB in the spring wheat association panel.

Out of 630 breeding lines evaluated we advanced 280 lines that combined desirable marker alleles for *FHB1*, *Yr36*, and *H25*. Three of the 280 lines has potential to release that combined FHB1 marker allele, resistance to stripe rust, and/or resistance to Hessian fly, good agronomic performance, and bread baking quality.

Out of the 50 F4 populations we selected and planted eight thousands of headrows in 2016.

4) Key outcomes or other achievements

In Aberdeen environment two planting dates seems a good strategy in setting up scab nursery to match inoculation time with desirable temperature for infection and colonization. It is necessary to apply this strategy in the future nursery set-up. The association mapping panel contains diverse germplasm that can be useful in developing FHB resistant cultivars in ID and PNW. QTL and markers identified from this panel may be useful in selection of FHB resistant cultivars in the near future. Marker-assisted pyramiding resulted in a few potential releases and new selections from the early generations are coming out in the pipelines.

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

We provided training to one undergraduate student how to do point inoculation and rating of FHB in summer, 2015.

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

We presented our research progress and activities at the Pacific Northwest Wheat Quality Council meeting, Idaho Wheat Commission research review, 2015 field day, the Western Wheat Workers meeting, and Annual FHB Forum.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY15 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 FY15 award period?**

None, because of limited funding

- 2. Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY15 award period?**

None, because of limited funding

- 3. Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

None, because of limited funding

- 4. Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

None, because of limited funding

Release of Germplasm/Cultivars: None in 2015

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY15 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

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Publications, Conference Papers, and Presentations

Refer to the FY15-FPR_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. 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.

J. Chen, J. Zhang , W. Zhao, J. Wheeler, N. Klassen, and J. Anderson. 2015. Assessment of resistance to *Fusarium* head blight in spring wheat lines grown in the Pacific Northwest and CIMMYT. *Proceedings of the 2015 National Fusarium Head Blight Forum*. St. Louis, MO, Dec. 2015.

Status: Abstract Published and poster presented

Acknowledgement of Federal Support: YES