

USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY17 Preliminary Final Performance Report
Due date: July 31, 2018

Cover Page

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Fiscal Year:	2017
USDA-ARS Agreement ID:	59-0206-4-041
USDA-ARS Agreement Title:	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US.
FY17 USDA-ARS Award Amount:	\$ 39,344
Recipient Organization:	University of Idaho Moscow, ID 83844-3020
DUNS Number:	075746271
EIN:	82-6000945
Recipient Identifying Number or Account Number:	BJKN10
Project/Grant Reporting Period:	6/1/17 - 5/31/18
Reporting Period End Date:	5/31/2018

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.	\$ 39,344
	FY17 Total ARS Award Amount	\$ 39,344

Jianli Chen

Principal Investigator

07/28/2018

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 predominant diseases and insects. The specific objectives are: 1) Increase and document acreage planted for UI Stone, FHB tolerant soft white spring wheat cultivar; 2) Assess FHB resistance for breeding materials in local scab nursery and via molecular marker assisted selection (MAS); 3) Validate QTL identified from PNW association mapping panel and collect data for training population of future genomic selection;

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

Objective 1: Increase and document acreage planted for UI Stone, FHB tolerant soft white spring wheat cultivar

1) major activities

- UI Stone, FHB tolerant cultivar was planted in State Variety Trials in ID and WA and presented to growers at all field days. End-use quality of UI Stone was also presented to industry meetings.

2) significant results

- UI Stone is in the Idaho preferred cultivar list.

3) key outcomes or other achievements

- UI Stone has been recognized as a FHB tolerant cultivar with excellent end-use quality and yield. UI Stone planted acres has increased significantly.

Objective 2: Assess FHB resistance for breeding materials in local scab nursery and via molecular marker assisted selection (MAS)

1) major activities

- We planted four trials in two planting dates in FHB nursery in Aberdeen in 2018: a) 170 elite lines developed from our program; b) advanced lines (80 lines) derived from known Chinese source 'W14' and 'Ning9016'; c) elite lines (169) from a GWAS panel; d) 100 elite lines from WSU program.

- Eighty advanced lines included in b) were assessed via floret inoculation in greenhouse in early spring of 2018.

- Marker-assisted selection: 249 lines included in b) and c) were genotyped for PFT Fhb1 gene under collaboration with Dr. Nidhi Rawat; 80 lines in b) were also genotyped for UMN10 and other known function markers.

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2) significant results

- We got good infection in the nursery although the infection showed late. We selected some breeding lines with good FHB resistance and combined with good yield and resistance to other diseases.

3) key outcomes or other achievements

- Some elite lines have potential to be released by FY20.

Objective 3: Validate QTL identified from PNW association mapping panel and collect data for training population of future genomic selection

1) major activities

- This objective was not approved by the EC. However, the activities conducted in other objectives can still support the need of this objective in phenotyping.

2) significant results

- FHB severity data from the four trials described in Objective 2 were collected and will be used in data analysis. DON samples will be tested this winter. The selected lines can be genotyped and add to the original training population to refine the GS model.

3) key outcomes or other achievements

- One paper related to Genomic Selection was published in *Frontier in Plant Science*.
- The breeding program used other source of funding for this objective.

Objective 4: Develop and release new spring wheat cultivars pyramided *Fhb1* with resistance genes to stripe rust, stem rust, cereal cyst nematodes, Hessian Fly, and end-use quality via MAS and field testing in local disease nurseries.

1) major activities

- Advanced lines derived from known Chinese source 'W14' and 'Ning9016' were assessed for FHB resistance in the local FHB nursery and greenhouse, for markers of FHB1, and for yield and end-use quality in field trials.

2) significant results

- Based on the mean severity data, lines with FHB 1 have smaller severity than that without FHB1. The complete results will be presented at 2018 FHB forum.

3) key outcomes or other achievements

- A few lines with PFT *Fhb1* marker allele has good performance on yield and resistance to stripe rust and these lines have been used in crossing parents
- One manuscript was submitted, which is related to the use of PFT *Fhb1* gene.

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

One MS. Student was trained in summer of 2017 on nursery-set up and disease assessment, and marker-assisted selection in spring of 2018. The postdoc was trained on genomic selection in spring of 2018.

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

One poster was presented at 2017 FHB forum. Two oral talks were presented, one at the Western FHB workshop in Bozeman, MT in April 2018, another at the Western Wheat Workers meeting in Idaho Falls in June 2018. FHB research work was presented at three field day events to growers.

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Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY17 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 FY17 award period?**

NA

- 2. Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY17 award period?**

NA

- 3. Have any post docs who worked for you during the FY17 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

No

- 4. Have any post docs who worked for you during the FY17 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

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 FY17 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

Instructions: Refer to the FY17-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY17 grant. Only include citations for publications submitted or presentations given during your award period (6/1/17 - 5/31/18). 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.

Journal publications.

Dong, H., R. Wang, Y. Yuan, J. Anderson, M. Pumphrey, Zh. Zhang, and **J. Chen***. 2018. Evaluation of the Potential for Genomic Selection to Improve Spring Wheat Resistance to Fusarium Head Blight in the Pacific Northwest. *Frontiers in Plant Science*.

<https://doi.org/10.3389/fpls.2018.00911>

Status: Published with open access

Acknowledgement of Federal Support: YES

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

Nothing to report

Other publications, conference papers and presentations.

Chen, J., R. Wang, W. Zhao, J. Wheeler, and N. Klassen. 2017. Update on Fusarium Head Blight Research and Breeding in Spring Wheat at University of Idaho Wheat Breeding and Genetics Program. Poster at Annual FHB Forum, Milwaukee, WI, Dec. 3-5, 2017.

Status: Abstract Published and Poster Presented

Acknowledgement of Federal Support: YES (poster)