USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY18 Performance Report
Due date: September 23, 2019

Cover Page

Cooperating Principle Investigator (CPI):	Jianli Chen
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Fiscal Year:	2018
USDA-ARS Agreement ID:	58-2090-8-069
USDA-ARS Agreement Title:	Developing FHB Resistant Wheat Cultivars for Idaho and the Western US
FY18 USDA-ARS Award Amount:	$ 39,163
Recipient Organization:	University of Idaho Moscow, ID 83844-3020
DUNS Number:	075746271
EIN:	82-6000945
Recipient Identifying Number or Account Number:	3-APSF719 AP3012
Agency PI:	Deven See
Project/Grant Reporting Period:	8/1/18 - 7/31/19
Reporting Period End Date:	07/31/19

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.	$ 39,163
	FY18 Total ARS Award Amount	$ 39,163

Jianli Chen 08/05/2019

Principal Investigator 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

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PI: Chen, Jianli
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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. Develop and release new spring wheat cultivars pyramided *Fhb1* (3BS) and *Fhb3* (5AS) with other FHB QTL and resistance genes to stripe rust, stem rust, cereal cyst nematodes, Hessian fly, and end-use quality; 2. Expand one FHB nursery in WA in addition to the Aberdeen nursery to evaluate cultivars and breeding lines from University of Idaho (UI) and Washington State University (WSU) as well as from the Uniform Regional Scab Nursery; 3. Train one post doc and one graduate student.

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

2.1.1) major activities:

a) We planted 60 soft x soft F1s and 20 soft x hard F1s that integrated *Fhb1* gene from resistance sources W14, Ning9016, and Futai8944. The 20 soft x hard F1s will be backcrossed or top-crossed with elite hard spring wheat this spring to develop FHB-resistant hard spring wheat cultivars.
b) We planted 15 soft white spring wheat lines and 16 hard spring wheat lines with Fhb1 resistance gene in elite wheat yield trials in multiple locations in ID to assess grain yield, end-use quality, and resistance to stripe rust.
c) We screened breeding lines for *Fhb1*, *Fhb3*, QTL 2B, QTL 4B, and QTL 5B using KASP molecular markers.

2.1.2) specific objective 1: Develop and release new spring wheat cultivars pyramided *Fhb1* (3BS) and *Fhb3* (5AS) with other FHB QTL and resistance genes to stripe rust, stem rust, cereal cyst nematodes, Hessian fly, and end-use quality

2.1.3) significant results: We selected 8 **soft white spring wheat (SWS) lines** that have Fhb1 and Fhb3 from W14, Ning9016, and Futai8944 and good FHB resistance and high yield and end-use quality. These lines were used as crossing parents in hard spring wheat backgrounds and 20 F1s were made in 2018 and planted in 2019 to make backcrosses or top-crosses.

2.1.4) key outcomes or other achievements: The eight FHB-resistant SWS have been planted in multiple locations in 2019 to assess grain yield, resistance to other diseases, and end-use quality. We are going to release a SWS line IDO1405S this year. This line has good FHB resistance with unknown FHB resistance gene.

2.2.1) major activities: In summer 2018, we assessed FHB resistance for 756 spring wheat lines in over 4000 headrows from breeding programs in WSU and UI. 451 lines were harvested and sent for DON test. Data collected in Aberdeen, ID in 2018 was exchanged with data collected in Pullman, WA. We planted 6 trials in two planting dates, 1000 headrows each date, in FHB nursery in Aberdeen in 2019.

2.2.2) specific objective 2: Expand one FHB nursery in WA in addition to the Aberdeen nursery to evaluate cultivars and breeding lines from University of Idaho (UI) and Washington State University (WSU) as well as from the Uniform Regional Scab Nursery

2.2.3) significant results. Lines integrated *Fhb1* gene have better resistance than that without Fhb1. FHB nursery in Pullman, WA was established with medium level of infection that allowed them to assess the disease infection.

2.2.4) key outcomes or other achievements: Use two planting dates is a good practice for a FHB nursery in Idaho environments.

2.3.1) major activities: Postdoc led a technician competed genotyping of 144 breeding lines for Fhb1and QTL on 2B, 3B, 4B, and 5B we identified.

2.3.2) specific objective 3: Train one post doc and one graduate student.

2.3.3) significant results: The postdoc established KASP genotyping assay in our program.

2.3.4) key outcomes or other achievements: Dr. Wang provided training to a MS. student in the breeding program for data analysis and writing of manuscript.

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

Lab training for genotyping *Fhb1* and other markers in breeding for FHB resistance.
Sent postdoc Dr. Rui Wang to present posters at PAG meeting in Jan. 2019.

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

We did one field day at Aberdeen and showed our FHB nursery, breeding method, and the selected FHB-resistant lines. Progress on FHB research was posted in the program website. Release of IDO1405 will be published in Journal of Plant Registration after formally released.

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?**

   Nothing to report.

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?**

   Nothing to report.

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?**

   Nothing to report.

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?**

   Nothing to report.

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**
IDO1405S	SWS	MR	3	2019

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 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 (8/1/18 - 7/31/19). 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.

Singh, L., J.A Anderson, **J. Chen**, B.S Gill, V.K Tiwari, and N. Rawat. 2019. Development and validation of a perfect KASP marker for Fusarium head blight resistance gene *Fhb1* in wheat. The Plant Pathology Journal 35 (3): 200-207. https://doi.org/10.5423/PPJ.OA.01.2019.0018.
Status: Published
Acknowledgement of Federal Support: NO

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

Other publications, conference papers and presentations.