

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:	59-0206-8-188
USDA-ARS Agreement Title:	New Sources of Resistance to FHB and DON in Wheat.
FY18 USDA-ARS Award Amount:	\$ 24,250
Recipient Organization:	Kansas State University 10 Anderson Hall Manhattan, KS 66506
DUNS Number:	929773554
EIN:	48-0771751
Recipient Identifying Number or Account Number:	AR9805 / GAPP005089
Project/Grant Reporting Period:	5/26/18 - 5/25/19
Reporting Period End Date:	05/25/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HW-CP	New sources of Resistance to FHB and DON in Wheat.	\$ 24,250
FY18 Total ARS Award Amount		\$ 24,250



June 4, 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
 HW-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: *New sources of Resistance to FHB and DON in Wheat.*

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

There are only a few sources of resistance to FHB available for wheat improvement. The proposed research is aimed at identifying new sources of FHB resistance in wild relatives of wheat and using directed chromosome engineering to produce agronomically useful compensating wheat-alien translocations, which are then being transferred into adapted winter wheat cultivars. We have previously identified novel sources of FHB resistance derived from *Leymus racemosus*, *Fhb3*, and *Elymus tsukushiensis*, *Fhb6*. In addition, we are continuing to evaluate wheat-alien introgression lines for the presence of novel sources of FHB resistance.

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

1) major activities

Novel sources of FHB resistance have been previously identified, *Fhb3* present on the Robertsonian translocation T7AL·7Lr#1S and *Fhb6*, present on the recombinant chromosome T1AL·1AS-1E^{ts}#1S.

2) specific objectives

Objective 1: Transfer of *Fhb6* present in WGRC61 into adapted winter wheat cultivars Everest, Lyman, and Overland, with native resistance to FHB and use molecular markers, genomic in situ hybridization analysis, and field evaluations to recover the recurrent wheat genotype with the *Fhb6* gene.

Objective 2: New sources of FHB resistance are constantly being sought. Previous observations suggested that our germplasm release KS93WGRC28 with *Pm21* present on the wheat-rye Robertsonian translocation T6BS·6RL might also confer FHB resistance which needed to be verified.

3) significant results

Objective 1: We have previously developed a molecular marker BE426771 to determine the presence of *Fhb6* and have selected 101 families of the following crosses, which were heterozygous for *Fhb6*:

WGRC61 X Everest, BC3F2 71 individual spikes selected

WGRC61 X Lyman, BC1F2 12 individual spikes selected

WGRC61 X Overland, BC1F2 18 individual spikes selected

These families are being grown again in our scab field nursery and evaluated for their FHB resistance and DON accumulation, and homozygous lines will be selected and made available to the breeding community

Objective 2: Unfortunately, greenhouse and field evaluations did not confirm that KS93WGRC28 besides powdery mildew resistance also has FHB resistance, suggesting that its lower disease level was most likely caused by the lateness of this line. However, in cooperation with Dr. Yanming Zhang from the Laboratory of molecular cytogenetics

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and genetic breeding, Harbin Normal University, China, who is presently a visiting scholar at the Wheat Genetic Resources Center, we have identified a potential new source of type-2 FHB resistance derived from *Thinopyrum intermedium*. We are presently using molecular marker and in situ hybridization analyses to identify the *Th. intermedium* chromosome involved and once the homoeology and genomic affinity of this chromosome is identified we will initiate directed chromosome engineering to produce agronomically useful recombinants.

4) key outcomes or other achievements

Novel sources of FHB resistance derived from wild relatives of wheat and development of hard red winter wheat germplasm with improved levels of FHB and DON accumulation made available to wheat improvement programs.

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

The project provided part-time support for one graduate student.

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

The results were presented at the National Fusarium Head Blight Forum and were published in peer-reviewed international scientific journals. The germplasms with novel sources of FHB resistance were distributed to public and private wheat breeding programs.

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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 (5/26/18 - 5/25/19). 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)

Nothing to Report

Journal publications.

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

Other publications, conference papers and presentations.