USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY16 Final Performance Report
Due date: November 10, 2017

Cover Page

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Fiscal Year:	2016
USDA-ARS Agreement ID:	59-0206-6-018
USDA-ARS Agreement Title:	Investigating Sources of Fusarium Head Blight Resistance from Wheat and its Wild Relatives.
FY16 USDA-ARS Award Amount:	$ 48,544
Recipient Organization:	University of Maryland Office of the Comptroller Contract and Grant Accounting RM 4101, Chesapeake Bldg College Pard, MD 20742-3141
DUNS Number:	790934285
EIN:	52-6002033
Recipient Identifying Number or Account Number:	KFS 5258230
Project/Grant Reporting Period:	9/6/16 - 9/5/17
Reporting Period End Date:	09/05/17

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Over-expression and Allele Mining for *Fhb1* in Wheat.	$ 48,544
	FY16 Total ARS Award Amount	**$ 48,544**

10/13/2017

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

Project 1: *Over-expression and Allele Mining for Fhb1 in Wheat.*

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

The major goals of the project were developing constructs for over-expressing *Fhb1* gene in suitable vectors. Transformation of amenable wheat cultivars Bobwhite and Fielder was to be done using particle bombardment method. The analysis of transformed lines for difference in resistance levels (percentage diseased spikelets and Fusarium damaged kernels) and DON content was to be performed. The expected outcome is enhanced level of FHB resistance in the transformed lines.

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

1) Major activities: Transgenic lines in Bobwhite and Fielder background over-expressing PFT were developed.

2) Specific objectives:
   a) Constructs of *Fhb1* in pAHC17 vector were generated.
   b) Transformed wheat cultivars Bobwhite and Fielder over-expressing *Fhb1* were generated.
   c) Seeds of T0 generation were grown to produce T1 plants.
   d) The T1 generation of cultivars with over-expression of *Fhb1* were tested for scab resistance. These plants showed FHB resistance/ significant delay in FHB spread as compared to wild type plants.

3) Significant results: Transgenic lines over-expressing PFT were found to have either reduced FHB severity or significantly slower progress of disease as compared to wild type.

4) Key outcomes or other achievements: Key outcome was establishing that PFT plays a major role in FHB resistance in wheat.

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

A graduate student was trained in inoculation techniques, FHB scoring, and data analysis for Fusarium Head Blight in wheat. In addition: DNA and RNA extraction to validate the expression of the transformed gene was included in the training. Several undergraduate students involved in various semester had hands on training in growing wheat plants, inoculating them and scoring for FHB.

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

In addition to the publication of preliminary results of over-expression of gene (Rawat et al. 2016), The results were presented at International Wheat Genetics Symposium 2017, in Tulln, Austria in front of an international audience. The audience included scientists specializing in genetics and pathology of wheat, barley and other grain crops.

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?** No

   If yes, how many?

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 (9/6/16 - 9/5/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Rawat, N., Pumphrey, M.O., Liu, S., Zhang, X., Tiwari, V.K., Kaori, A., Trick, H.N., Bockus, W.W., Akhunov, E., Anderson, J.A. and Gill, B.S. (2016) Wheat Fhb1 encodes a chimeric lectin with agglutinin domains and a pore-forming toxin-like domain conferring resistance to Fusarium head blight. Nature Genetics doi:10.1038/ng.3706.
Status: Published
Acknowledgement of Federal Support: YES

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

Other publications, conference papers and presentations.

Rawat, N. (2017). Pore-forming toxin-like gene provides resistance against Fusarium head blight in wheat. 2017 International Wheat Genetics Symposium, Tulln, Austria.

Status: Presented
Acknowledgement of Federal Support: YES