

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY16 Final Performance Report  
Due date: July 28, 2017**

**Cover Page**

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<b>Fiscal Year:</b>	2016
<b>USDA-ARS Agreement ID:</b>	59-0206-4-010
<b>USDA-ARS Agreement Title:</b>	Identify and Develop Durum Wheat Resistant to Fusarium Head Blight.
<b>FY16 USDA-ARS Award Amount:</b>	\$ 119,610
<b>Recipient Organization:</b>	North Dakota State University Office of Grant & Contract Accounting NDSU Dept 3130, PO Box 6050 Fargo, ND 58108-0650
<b>DUNS Number:</b>	80-388-2299
<b>EIN:</b>	45-6002439
<b>Recipient Identifying Number or Account Number:</b>	FAR0022040
<b>Project/Grant Reporting Period:</b>	5/5/16 - 5/4/17
<b>Reporting Period End Date:</b>	05/04/17

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
DUR-CP	Develop Durum Wheat Resistant to Fusarium Head Blight.	\$ 93,396
DUR-CP	Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.	\$ 26,214
	<b>FY16 Total ARS Award Amount</b>	<b>\$ 119,610</b>

  
Principal Investigator

7-26-17  
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: *Develop Durum Wheat Resistant to Fusarium Head Blight.***

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

The relevance of the project's objectives to the goals and research priorities of the USWBSI are as follows:

- a) Breeding FHB-resistant durum wheat (Action VDHR goals 1-3 and CP priority 3-4);
- b) Screen durum populations/experimental lines for FHB resistance in greenhouses and irrigated field nurseries (Action VDHR goal 2 and CP priority 1);
- c) Evaluate experimental lines for DON (Action VDHR goal 2 and CP priority 4);
- d) Use marker assisted selection at the USDA-ARS Genotyping Center in Fargo, ND for valuable loci (Action VDHR goal 2-3 and CP priority 2);
- e) Evaluate identified FHB resistant lines for quality (Action VDHR goal 2 and CP priority 3-4); and
- f) 3-4); and
- g) Develop new populations by crossing adapted germplasm to newly identified sources of resistance (Action VDHR goal 1-3 and CP priority 3-4).

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

- 3 lines were evaluated in the Uniform Regional Durum Nursery
- 14 lines were evaluated in the Elite Advanced Yield Trial
- 49 lines were evaluated in the Advanced Yield Trials
- 200 lines were evaluated in the Preliminary Yield Trials
- 68 populations were screened in the field and greenhouses
- 18 new populations were developed
- 1,240 lines were tested for DON
- 8,000 lines were evaluated in the FHB nursery in Prosper, ND
- 1,300 lines were evaluated in the FHB nurseries at Carrington and Langdon, ND
- 2,140 lines were genotyped at the USDA-ARS Genotyping Center in Fargo, ND

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

Three students rating scab nurseries.

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

***Presentations:***

Gave presentations at Field Days hosted by NDSU Research Centers and to trade teams through ND Wheat Commissions.

**Project 2: Identify Sources of Resistance to Fusarium Head Blight in Durum Wheat.**

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

The relevance of the project's objectives to the goals and research priorities of the USWBSI are as follow:

- 1) Screen diverse durum accessions from ICARDA for reaction to FHB in an FHB screening nursery located at the Jiangsu Academy of Agricultural Sciences in Nanjing, China (Action VDHR goals 1-3 and CP priority 1);
- 2) Re-evaluate the accessions exhibiting high levels of resistance in the preliminary screening test in the greenhouse and field screening nurseries in North Dakota (Action VDHR goals 1-3 and CP priority 1) ;
- 3) Determine whether the new sources of resistance carry novel resistant loci by marker haplotyping using the existing markers associated with known resistant QTL (Action VDHR goals 3 and CP priority 2);
- 4) Make crosses using the resistant lines and distribute them to durum wheat breeders (Action VDHR goals 1-3 and CP priority 3).

**2. What was accomplished under these goals?**

- 6,053 accessions from ICARDA have been evaluated to date. After several evaluations in the field and greenhouses three accessions maintained disease severity less than 30%. Fifteen populations were developed from crossing the three accessions with adapted germplasm.
- 1,020 new lines were sent to China for evaluation.
- 40 selected ICARDA accessions from 2015 were reevaluated in the fall 2016 greenhouse.
- 4 F<sub>5</sub> populations were advanced from crossing adapted germplasm with Tunisian 7.
- 5 F<sub>5</sub> populations were advanced in New Zealand winter nursery from crossing adapted germplasm with Tunisian 7.
- 1 F<sub>5</sub> population was advanced from crosses of adapted germplasm with *Triticum dicoccum*.
- 2 F<sub>5</sub> populations were evaluated in yield trials from crosses of adapted lines to *T. Carthilicum*
- 4,000 F<sub>2</sub> plants were genotyped from crosses of adapted lines with wild relatives
- 15 F<sub>4</sub> populations were advanced from crosses of adapted lines to accessions from ICARDA's world collection.

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

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***Presentations:***

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## **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?**

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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 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

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## **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 (5/5/16 - 5/4/17). 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.**

Jitendra Kumar, Farhad Ghavami, Seyed M. Pirseyedi, Ajay Kumar, Steven Xu, Elias M. Elias, Ruth Dill-Macky and Shahryar Kianian (2016). "Epigenetic Control of FHB in Durum Wheat." In: S. Canty, K. Wolfe, and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum*. East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 82.

Status: Abstract Published and poster presented

Acknowledgement of Federal Support: YES

A. Szabo-Hever, Q. Zhang, S. Zhong, T.L. Friesen, E.M. Elias, S.S. Xu, and S. Chao. (2016). "Association Mapping for Fusarium Head Blight Resistance in Synthetic Hexaploid Wheat." In: S. Canty, K. Wolfe, and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum*. East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. p. 97.

Status: Abstract Published and poster presented

Acknowledgement of Federal Support: YES