USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY14 Final Performance Report
July 15, 2015

Cover Page

PI:	Shahryar Kianian
Institution:	USDA-ARS
Address:	Cereal Disease Laboratory 1551 Lindig Street University of Minnesota St. Paul, MN 55108
E-mail:	Shahryar.Kianian@ARS.USDA.GOV
Phone:	612-624-4155
Fax:	
Fiscal Year:	FY14
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Pedigree Based Association Analysis of Novel Sources of FHB Resistance in Durum Wheat.
FY14 USDA-ARS Award Amount:	$ 46,084

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
DUR-CP	Enhancing FHB Resistance by Epigenetic Modification of Durum Cultivars.	$ 46,084
	FY14 Total ARS Award Amount	**$ 46,084**

Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
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
WES-CP – Western 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: *Enhancing FHB Resistance by Epigenetic Modification of Durum Cultivars.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

The immediate objectives of this project were to:

1. continue with pyramiding of the FHB resistance regions on chromosomes 5AL, 5BL and 2BL identified in Tunisian derived lines into durum cultivars;
2. develop diagnostic markers for routine and effective screening of breeding populations;
3. characterize the epigenetic changes of FHB resistant durum cultivars produced by altering the DNA methylation pattern, and
4. characterize durum cultivars missing portions of chromosome 2A region that may contain a FHB suppressor locus.

2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:

Accomplishment:

Our progress in the past year has been hampered by the lack of a dedicated postdoctoral scientist on this project. We identified and hired a postdoctoral scientist, who began in the first week of April 2014 and resigned his position and left a week later. Soon after we advertised the position again and have hired a new scientist (Jitendra Kumar) who began work the last week of May 2015. Therefore, in FY14 majority of the work on this project was conducted by a research technician working with the PI at USDA-ARS.

Crosses to combine important regions identified in the Tunisian derived lines into a durum cultivar have continued. We have generated BC1 lines and plan to test them with the associated markers and phenotype the selected lines before additional backcrosses. After several backcrosses into a common durum wheat background we plan to intercross the lines and select for lines carrying multiple QTL in the same background. We plan to use KASP markers for tightly linked SNP markers for majority of the work in selecting the QTL regions.

The mutant lines – lines modified by Methyl-azacytedine that removes CG methylation – have been advanced to the M4 generation. Each generation has been tested for FHB resistance and has show greatly improved resistance (less than 20% severity as compared with 80-100% for parental lines). These lines (24 total) are now being tested in field nurseries in Minnesota and North Dakota. The testing on the St Paul campus of the University of Minnesota is with different isolates of inoculum to those used in ND for the initial work. We hope to identify the best resistance among the 24 lines for use in additional breeding efforts to improve resistance. These lines have already all been crossed to the parental lines to check for retention of resistance and are being grown in growth chamber for RNAseq analysis.

We have also developed the initial seeds needed for irradiation to generate deletion lines for testing the impact of removal of segments of chromosome 2A on increased resistance to FHB. The first set of irradiated lines will be planted in the 2015 Fall greenhouse for crossing and development of RH populations.

Impact:

1. Development and identification of lines using chemical or radiation mutagenesis, based on popular durum wheat cultivars, that have greatly improved resistance to FHB
2. Development and further advancement of durum lines carrying multiple resistance QTL in the same background

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY14 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 FY14 award period?** No

   If yes, how many? N/A

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY14 award period?** No

   If yes, how many? N/A

3. **Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?** None

   If yes, how many? N/A

4. **Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?** None

   If yes, how many? N/A

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY14 award period. List the release notice or publication. Briefly describe the level of FHB resistance. *If not applicable because your grant did NOT include any VDHR-related projects, enter N/A below.*

None

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the FY14 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

None