USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY15 Final Performance Report
Due date: July 15, 2016

Cover Page

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Fiscal Year:	2015
USDA-ARS Agreement ID:	N/A
USDA-ARS Agreement Title:	Genotyping Breeding Lines for FHB Resistance using Next Generation Sequencing Methods
FY15 USDA-ARS Award Amount:	$ 45,000

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
EC-HQ	Genotyping Breeding Lines for FHB Resistance.	$ 45,000
	FY15 Total ARS Award Amount	**$ 45,000**

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: *Genotyping Breeding Lines for FHB Resistance.*

1. **What are the major goals and objectives of the project?**
   The major goals were to optimize and apply sequencing-based genotyping technologies as a means to provide wheat and barley breeders with genome-wide marker data. Specific objectives were to (1) optimize the sequencing technologies for spring wheat and durum wheat samples, and to (2) continue use the sequencing-based genotyping for barley breeding programs.

2. **What was accomplished under these goals?**
   1) major activities:
   We optimized and employed two sequencing-based methods in this study, one was to sequence the targeted genomic regions with known SNP information, and the other was to sequence the complexity reduced portions of the genomic regions or genotyping by sequencing (GBS) method.

   2) specific objectives:
   The sequencing-based genotyping methods were optimized for both wheat and barley. In barley, we used both targeted sequencing and GBS methods and provided genotype data for ~2,700 breeding populations in a two-year period. In HRS wheat, 178 parents used in the crossing blocks were assembled from three public and two private spring wheat breeding programs, and were genotyped using GBS method. In durum wheat, a set of 96 parents were collected and genotyped using GBS.

   3) significant results:
   A design flaw in the original targeted sequencing protocol that resulted in discrepancy of genotype data among replicates of the same sample but from different DNA sources was corrected. The revised protocol has improved the rate of data agreement among replicates from previous 60-70% to now above 90% when different seed sources were used, and above 95% when the same DNA source was sequenced multiple times.

   4) key outcomes or other achievements
   We continue optimize the targeted sequencing protocol so that more targets can be multiplexed in a single sample reaction, thus help lower the per sample genotyping cost. The information of wheat parental SNP alleles, their flanking sequences, and their chromosome map coordinates can be used as the reference to call SNPs from the wheat breeding populations.

3. **What opportunities for training and professional development has the project provided?**
   One post-doc researcher was trained to carry out sequencing based genotyping methods and generated data for wheat samples.

4. How have the results been disseminated to communities of interest?
The results were disseminated to breeders either through email or a website set up allowing users to download large data files.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY15 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 FY15 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 FY15 award period?** No.

   If yes, how many?

3. **Have any post docs who worked for you during the FY15 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 FY15 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 FY15 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

Refer to the FY15-FPR_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Nothing to report.

Journal publications.

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

Other publications, conference papers and presentations.