

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

Cover Page

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Fiscal Year:	FY14
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Genotyping Breeding Lines for FHB Resistance.
FY14 USDA-ARS Award Amount:	\$ 45,000

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR	Genotyping Breeding Lines for FHB Resistance.	\$ 45,000
	FY14 Total ARS Award Amount	\$ 45,000

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: *Genotyping Breeding Lines for FHB Resistance.***1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

There is a need to rapidly develop wheat cultivars adapted to the eastern winter wheat growing region of the United States with high levels of resistance to Fusarium head blight. Improved breeding methods that make use of marker-assisted selection and genome-wide marker data are needed.

To address these needs, this project used genome-wide marker technologies to map resistance in adapted wheat lines and cultivars. A pipeline for genotyping by sequencing was developed for wheat that aligns sequences to the chromosome arm survey sequence and identifies single nucleotide polymorphisms. We used this pipeline to analyze a sequence data from a panel of lines from University of Illinois breeding program this pipeline resulted in identification of more than 35,000 SNP covering all 21 chromosomes of wheat. These data were used to identify markers on seven different wheat chromosomes significantly associated with FHB resistance. Our project also worked with researcher as North Carolina State University to identify QTL associated with FHB resistance in the cultivars NC-Neuse and Bess. Markers associated with the newly identified FHB resistance present in locally adapted lines can now be used to evaluate entries in the regional nurseries and breeders lines.

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 (1): Established genome-wide marker protocols and pipelines for wheat. A pipeline for genotyping by sequencing was developed for wheat that aligns to the chromosome arm survey sequence to call single nucleotide polymorphisms.

Impact: Evaluation of tens of thousands of single nucleotide polymorphisms per line can be now done quickly and inexpensively. This is leading to identification of FHB resistance QTL present in locally adapted lines and to development of new more efficient approaches for breeding FHB resistant cultivars.

Accomplishment (2): Identified DNA markers associated with FHB resistance in eastern soft winter wheat.

Impact: Markers associated with the newly identified FHB resistance QTL present in locally adapted lines can now be used to evaluate entries in the regional nurseries, in cultivars and in segregating populations. This allows wheat breeders to better select parents for crossing and to select progeny having multiple genes contributing to increased levels for FHB resistance.

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?

- 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? yes**

If yes, how many? 1 PhD student graduated; working for Monsanto

- 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? No**

If yes, how many?

- 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? No**

If yes, how many?

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.

N/A

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.

Petersen S, JH Lyerly, PV Maloney, G Brown-Guedira, C Cowger, J Costa, Y Dong, JP Murphy 2015. Identification and mapping of QTL conferring resistance to *Fusarium* Head Blight in the soft red winter wheat cultivar NC-Neuse. *Crop Sci* *submitted*

Arruda, MP, PJ Brown, AM Krill, G Brown-Guedira, C Thurber, BJ Foresman, FL Kolb. 2015. Genome-wide association mapping of Fusarium head blight resistance in wheat (*Triticum aestivum* L.) using genotyping-by-sequencing. *Plant Genome* *submitted*

Marcio P. Arruda, Allison M. Krill¹, Patrick J. Brown¹, Alexander Lipka¹, Gina Brown-Guedira, Carrie Thurber and Frederic L. Kolb. Genomic Selection for Fusarium Head Blight Resistance: The Experience from the University of Illinois Wheat Breeding Program. Eastern Wheat and Southern Small Grain Workers Conference. April 28-30 2015. Richmond, VA.