

**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:	59-0206-0-059
USDA-ARS Agreement Title:	Development of Wheat with Resistance to Scab Adapted to the Mid-Atlantic.
FY14 USDA-ARS Award Amount:	\$ 37,146

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SWW	Wheat Scab Testing and Characterization of Resistance Genes in Maryland.	\$ 37,146
	FY14 Total ARS Award Amount	\$ 37,146

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: *Wheat Scab Testing and Characterization of Resistance Genes in Maryland.*

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

The major problem being addressed is the need to develop rapidly and effectively host resistance to scab (Fusarium Head Blight) from US native and exotic sources into adapted soft red winter wheat (SRWW) germplasm.

Several advanced MD lines with 3BS, 5A and 2DL resistance QTL were selected in 2014 for further testing and entered into the Mason Dixon Performance Nursery and the Southern and Northern Uniform FHB nurseries. The highest yielding lines in the Mason Dixon Performance test include MDC07026-F2-19-13-1, MDC07026-F2-19-13-3 and MDC07026-F2-19-13-4. These lines carry the Fhb1 resistant allele from Ning7840 and have moderate resistance to Fusarium head blight. They all have excellent quality with high flour yield, low softness equivalent, high Lactic acid solvent retention capacity (preferred for crackers), have desirable low sodium carbonate and large cookie diameter.

Additionally, the complete set of entries in the MD wheat state test were screened for scab resistance at Queenstown (MD). Data for the wheat state test was obtained for scab incidence, plant height, heading date. Results were published online at the UMDcrops website (<https://www.psla.umd.edu/extension/md-crops>) and are widely available to MD wheat growers.

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: Incorporation of the 3BS, 5A and 2DL quantitative trait loci (QTL) of resistance to scab from Sumai3 into adapted soft red winter wheat germplasm such as McCormick and SS8641 by marker-assisted backcrossing. Several advanced lines, such as MDC07026-F2-19-13-1, MDC07026-F2-19-13-3 and MDC07026-F2-19-13-4, with improved scab and rust resistance, high yield and high test weight are being tested in the Mason Dixon yield test and the Southern and Northern Uniform FHB nurseries.

Impact: the availability of these soft red winter wheat lines with scab resistance as well as a good agronomics will reduce scab damage in years favorable to scab development and are being used by other breeding programs to enhance scab resistance in adapted material with excellent potential for successful release. The line MDC07026-F2-19-13-4 with moderate scab resistance (Fhb1) and high yield is being increased for release in 2015. Limagrain and others have expressed interest in commercializing this line.

Accomplishment: Evaluation of the complete set of genotypes in the MD wheat state test for Fusarium head blight resistance at Queenstown (MD), grain yield, test weight, heading date, plant height, powdery mildew resistance and scab resistance data published online.

Impact: the availability of this information regarding the resistance of currently grown wheat varieties will allow farmers to select varieties based on scab resistance. The UMD website is widely used by MD growers (<https://www.psla.umd.edu/extension/md-crops>).

Accomplishment: Distribution to the breeding programs of VA Tech, Sungrains, and KWS of over 400 soft red winter wheat breeding populations, ranging from F2 through F8. These include crosses of parental combinations with high grain yield, high test weight, high quality, resistance to powdery mildew resistance, stripe, leaf and stem rust resistance as well as diverse sources of scab resistance, including native and exotic. These populations will be integrated into these breeding programs for selection of future scab resistant wheat variety releases.

Impact: These diverse breeding populations containing native and exotic sources of resistance to scab will enhance several breeding programs of soft red winter wheat (VA Tech, Sungrains: NC, GA, AR, FL as well as a KWS. These populations have a high potential for extraction of advanced lines with high grain yield, high test weight, resistance to powdery mildew and rusts as well as scab resistance. Wheat growers in the soft red winter wheat region will benefit from having a wider choice of adapted varieties.

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? Yes**

If yes, how many? One

- 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?**

If yes, how many? None

- 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?**

If yes, how many? None

- 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?**

If yes, how many? None

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.

Conway, B. 2014. Mapping Disease Resistance QTL for Fusarium Head Blight and Leaf Rust in a Wheat Doubled Haploid Population. University of Maryland MS thesis.
<http://drum.lib.umd.edu/handle/1903/15488>

S. Malla, C. Griffey, E. Milus, J.P. Murphy, E. Milus, A. Clark, D. Van Sanford, J. Costa, N. McMaster, D. Schmale, S. Chao and G. Brown Guedira. 2014. “Mapping FHB Resistance in Native SRW Wheat Cultivar Tribute”. In: S. Canty, A. Clark, N. Turcott and D. Van Sanford (Eds.), *Proceedings of the 2014 National Fusarium Head Blight Forum* (pp. 84). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.

S. Petersen, P.V. Maloney, J.H. Lysterly, R.A. Navarro, C. Cowger, G. Brown-Guedira, J.M. Costa and J.P. Murphy. 2014. “Fusarium Head Blight Resistance QTL in the NC-NEUSE / AGS 2000 Recombinant Inbred Line Population”. In: S. Canty, A. Clark, N. Turcott and D. Van Sanford (Eds.), *Proceedings of the 2014 National Fusarium Head Blight Forum* (pp. 91-92). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.

E. Wright, C. Griffey, S. Malla, D. Van Sanford, S. Harrison, J.P. Murphy, J. Costa, G. Milus, J. Johnson, A. McKendry, D. Schmale III, A. Clark and N. McMaster. 2014. “Identification of New QTL for Native Resistance to FHB in SRW Wheat”. In: S. Canty, A. Clark, N. Turcott and D. Van Sanford (Eds.), *Proceedings of the 2014 National Fusarium Head Blight Forum* (pp. 101). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.