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

Cover Page

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Fiscal Year:	2016
USDA-ARS Agreement ID:	N/A
USDA-ARS Agreement Title:	Improvement and Adoption of FHB Management Techniques.
FY16 USDA-ARS Award Amount:	$ 44,088

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
EC-HQ	Reducing Scab and DON by Following Up on National Survey of Producers.	$ 30,078
MGMT	Integrated FHB Management of Winter Barley in the Mid-Atlantic USA.	$ 14,010
	FY16 Total ARS Award Amount	**$** 44,088

Christina Cowger 7/26/17
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: *Reducing Scab and DON by Following Up on National Survey of Producers.*

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

In spring 2014, the National Agricultural Statistics Service (NASS) conducted a survey commissioned by the USWBSI of wheat and barley producers in 17 states. The survey covered growers' perceptions of scab as a problem, their scab management practices, and their scab information sources. Preliminary analysis of the results indicates both gaps in adoption of scab management practices and regional/state differences with respect to which barriers to adoption are seen as most important. Both things suggest that there is much the Initiative could do, working in a targeted manner, to enhance adoption of best management practices (BMP) for scab.

*Use of moderately resistant cultivars: In each of six market classes, the varieties that growers reported as their top varieties were assigned a scab rating of MR, MS, S, or UNKNOWN, based on all available data. Of the acreage reported by respondents that was planted to identifiable and scab-rated varieties, the percentages of MR acreage were: 9% for barley, 31% for durum, 51% for hard red spring, 15% for hard red winter, 31% for soft red winter, and 47% for soft white winter. In each case, the remainder of the identifiable, scab-rated acreage was in MS or S varieties. However, in several market classes the percentage of MR acres is undoubtedly less, as is explained.

* Use of effective fungicides: Many respondents indicated they used strobilurins or triazole-strobilurin mixes for scab management.

* Barriers to adoption of scab management practices: Four barriers that were experienced to varying degrees are potentially areas in which the Initiative can take action. Of these, the most widely selected by respondents across states was the difficulty in determining flowering dates in order to apply fungicides at the right time; a full 10.3% of respondents indicated that was a problem. The other three barriers that could be most readily addressed are: information on scab resistance of varieties is not available or timely (8.4%); seed of scab-resistant varieties is hard to obtain (5.9%); information about scab risk is hard to get in a timely way (6.3%).

Survey results have highlight certain areas where effort to increase BMP use should be focused. It is proposed that the Executive Committee convene a USWBSI Task Force to Increase Scab BMP Adoption. The task force should consist of MGMT Committee members, grain purchasers, growers, small-grain commodity representatives, and agricultural communications professionals. The EC should charge the task force to develop initiatives related to each of the opportunities identified by the survey. Potential initiatives are sketched.

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

1) major activities

* Our workshop, held in Detroit on Nov. 4, 2016, brought together 20 pathologists, breeders, millers, maltsters, and a grower/Initiative co-director (Art) from the U.S. & Canada. We covered 4 main topics arising from the survey results that relate to

increasing use of scab best management practices: increasing effective fungicide choices; increasing acreage of MR varieties; increasing the percentage of variety releases that are MR; and outreach.
* Analysis of survey data: Cowger presented more survey results at the Dec. 2016 Forum, focusing on sources of information

2) specific objectives:
Communicate the specific survey results and findings to the Initiative community to stimulate discussion and problem-solving; engage smaller teams in brainstorming and tasks needed to enhance the Initiative's toolbox and impact

3) significant results
* Increased awareness within the Initiative of barriers to adoption, factors influencing adoption, and possible strategies for increasing adoption.

* Based on the information obtained from the MGMT breakout session and this survey, Andrew Friskop is submitting a pre-proposal to develop educational material pertaining to FHB and mycotoxins. This is an Extension effort relating to the production of materials, videos, ebooks, etc. Andrew's plan is to have a point person(s) from each USWBSI state to help deliver the information. The primary objective is to have USWBSI-branded information that could be delivered to growers, stake holders and industry. This will start with the production of hard copy materials (think Extension pubs) and subsequently be re-packaged to address the needs of different audiences.

4) key outcomes or other achievements:
Specific suggestions came from the Detroit workshop for analyses and fact sheets regarding strobilurins and scab, and economics of selecting MR varieties, that are being implemented.

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

Technicians and hourlies have been trained in field techniques.

4. How have the results been disseminated to communities of interest?
Presentation to December 2016 USWBSI Forum by Cowger; slides available publicly, covered in Fusarium Focus, p. 6 (https://scabusa.org/pdfs/fus-focus_newsletter_v1_2-2017.pdf)

Project 2: *Integrated FHB Management of Winter Barley in the Mid-Atlantic USA.*

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

The first objective is to provide data to enhance the selection of Mid-Atlantic barleys with FHB resistance.

The second objective is to better understand profitability of integrating cultivar resistance and fungicide applications for scab reduction in Mid-Atlantic winter barley crops.

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

1) major activities

Starting in 2014-15, several Mid-Atlantic barley nurseries were screened for FHB resistance: the Uniform Winter Barley Yield Trial, Uniform Winter Malting Barley Nursery, Uniform Barley Winterhardiness Nursery, and the ARS Barley Elite Yield Trial. A total of 91 checks and experimental lines were screened for scab resistance in a replicated, inoculated, misted trial. The nursery was of similar size in 2015-16 and in 2016-17. Both two- and six-row barleys are accepted in all the nurseries; currently, most entries are six-row. The P.I. collaborates with Dr. Dave Marshall and the Virginia Tech team to provide data, which include disease symptoms and DON.

In 2014-15, we conducted the first trial of a multi-year experiment. In a split-plot design, main plots consisted of four barley cultivars widely grown in the Mid-Atlantic region and having different levels of FHB resistance. Three levels of spray treatment with Prosaro ("on-time," "late," and an unsprayed check) were the sub-plots. Data are being collected on disease symptoms, yield, test weight, and DON. The experiment has been repeated in 2015-16 and 2016-17.

2) specific objectives – already given.

3) significant results

Scab intensity was greater in 2014-15 than in 2015-16 in the nursery. For both experiments, a third year of results is needed to draw conclusions, and that will be the 2016-17 DON data, and those analyses are in progress now.

In the screening of advanced lines, variety performance in 2014-15 did not correlate strongly with variety performance in 2015-16. Three-year data will be examined by maturity group to see if stronger associations across years are available for certain maturity classes.

In the integrated management experiment, the first two years yielded a consistent pattern, despite the different levels of scab intensity in those years.

4) key outcomes or other achievements

Conclusions from the integrated management experiment:

VARIETY RESISTANCE: In a high-scab year, variety resistance also provided a significant reduction in DON. Endeavor and Thoroughbred have moderate resistance (MR), while Nomini and Atlantic are susceptible. The average of the two MR varieties provided a 68% DON reduction compared to Atlantic and a 56% DON reduction compared to Nomini. 2)

FUNGICIDE TIMING: In a high-scab year, applying Prosaro at 100% spike emergence or 6 days later resulted in the same DON levels. This suggests there is some flexibility on timing. Prosaro reduced DON by about 34% relative to the unsprayed check.

FUNGICIDE + RESISTANCE: To get low DON levels, combining fungicide and variety resistance was necessary in the high-scab year.

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

Technicians and hourlies have been trained in field techniques.

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

A poster on the integrated management results was presented at

* the 2016 USWBSI Forum.
* the January 2017 Joint Crops conference in Durham, NC, which brings together growers, county agents, commodity group representatives, and industry reps from across the state

After its exposure at the Joint Crops Conference, the poster was requested and displayed by a county agent at a statewide barley meeting in Stem, NC.

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?

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

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. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

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

Other publications, conference papers and presentations.

Cowger, C. and Arellano, C. 2016. "Fungicide timing and variety resistance to manage Fusarium head blight in mid-Atlantic winter barley crops." In: S. Canty, A. Clark, K. Wolfe and D. Van Sanford (Eds.), *Proceedings of the 2016 National Fusarium Head Blight Forum* (p. 17). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (poster), YES (abstract)