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:	59-0206-2-085
USDA-ARS Agreement Title:	Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat.
FY15 USDA-ARS Award Amount:	$ 11,662
Recipient Organization:	University of Nebraska Sponsored Programs 312 N 14th, Alexander West Lincoln, NE 68588-0430
DUNS Number:	55-545-6995
EIN:	47-0049123
Recipient Identifying Number or Account Number:	25-6235-0201-001
Project/Grant Reporting Period:	06/13/15-06/12/16
Reporting Period End Date:	06/12/16

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.	$ 11,662
	FY15 Total ARS Award Amount	**$ 11,662**

July 14, 2016

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: *Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.*

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

The goals the project is addressing are:

Goal #1: Develop integrated management strategies for FHB and mycotoxins that are robust to conditions experienced in production fields of wheat and barley.

Goal #2: Help develop and validate the next generation of management and mitigation tools for FHB and mycotoxin control.

2. What was accomplished under these goals?

1) major activities

Four locally adapted winter wheat cultivars differing in levels of FHB resistance were planted in the fall of 2014 at the Agricultural Research and Development Center (ARDC) near Mead, NE. The cultivars were Overley (susceptible), McGill (moderately susceptible), Overland (moderately resistant) and Everest (moderately resistant). Each cultivar was subjected to the following treatments: 1) Non-fungicide treated, spray-inoculated with spores of *F. graminearum* 24 hours after early anthesis, 2) sprayed with the fungicide Prosaro (6.5 fl oz/acre) at early anthesis, spray-inoculated with spores of *F. graminearum* 24 hours later; 3) sprayed with Prosaro two days after early anthesis, spray-inoculated with spores of *F. graminearum* 24 hours later; 4) sprayed with Prosaro four days after early anthesis, spray-inoculated with spores of *F. graminearum* 24 hours later; 5) sprayed with Prosaro six days after early anthesis, spray-inoculated with spores of *F. graminearum* 24 hours later; and 6) non-sprayed, non-inoculated check. Treatments were arranged in a split plot design in randomized complete blocks with four replications. Cultivars were the main plots and fungicide spray timing-*F. graminearum* inoculation treatments were the subplots. Experimental units were 5 ft x 20 ft plots. Weather at the plot site was monitored with a WatchDog 2000 Series weather station (Spectrum Technologies, Paxinos, PA).

2) specific objectives

The specific objectives of this project were to 1) Evaluate the integrated effects of fungicide and genetic resistance on FHB and DON, 2) Generate data for a quantitative synthesis of the integrated effects of fungicide and resistance on FHB/DON and the influence of region-specific factors on the overall efficacy of this integrated approach, 3) Develop best-management-practices for FHB and DON, and 4) Generate data to advance the FHB and DON risk prediction effort.

3) significant results

FHB severity was high due to favorable environmental conditions for disease development (excessive rainfall before and during flowering). Cultivars differed significantly in FHB index ($P <= 0.05$) with the susceptible Overley having the highest severity (51%) followed by the moderately susceptible McGill (17%), the moderately resistant Everest (14%), and the moderately resistant Overland (12%). Fungicide-pathogen inoculation treatments differed significantly ($P <= 0.05$) in FHB severity with the non-inoculated, non-treated and inoculated, non-treated controls having the highest severity (29% and 25%, respectively) and the inoculated, fungicide treated at early anthesis having the lowest severity (17%). All fungicde timings (early anthesis and 2, 4, and 6 days after) reduced FHB index compared to the non-treated control; however, effectiveness in reducing FHB index was similar at all timings. McGill (46 bu/A) and Overland (43 bu/A) yielded higher than Overley (29 bu/A) and Everest (35 bu/A). Fusarium-

damaged kernels (FDK were highest in Overley (34%) followed by McGill (22%), Overland (14%), and Everest (13%). DON levels were high with Overley having 37 ppm and McGill, Overland, and Everest having 15, 13, and 12 ppm, respectively. Fungicide application or timing had no effect on yield, DON, and FDK. Weather data collected were furnished to the FHB and DON forecasting team in the U.S. Wheat and Barley Scab Initiative (USBSI) and will be used to improve the accuracy of FHB and DON forecasting models.

4) key outcomes or other achievements

The key outcomes of this research were that (i) combining fungicide application with cultivar resistance was most effective in reducing FHB index and DON; therefore, growers will be able to choose the combination of cultivar and fungicide that will be most effective in reducing disease and DON, (ii) fungicide application timing after anthesis did not significantly reduce FHB severity or DON compared to the early anthesis timing, but all fungicide timings reduced severity compared to the non-treated control; therefore, growers can apply fungicide from anthesis until 6 days after anthesis to control FHB and DON, and (iii) weather data collected will be used to improve the accuracy of FHB and DON forecasting models which will in turn reduce losses and increase grower profits. The overall outcome will be improved economic and social livelihoods for wheat growers and consumers of food and other products manufactured from wheat.

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

Mrs. Julie Stevens, a research technologist in the PI's lab, worked on the project. She was assisted by Mr. Carlos Bolanos Cariel, a graduate student in the PI's lab. The PI and Mr. Bolanos Cariel attended the 2015 FHB Forum in St. Louis, MO in December 2015.

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

Results have been disseminated through presentations at Extension meetings in Nebraska and discussions with attendees of the 2015 FHB Forum.

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?**
   N/A.
   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?**
   N/A.
   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.

Journal publications.
Nothing to report.

Books or other non-periodical, one-time publications.
Nothing to report.

Other publications, conference papers and presentations.

Bolanos Cariel, C., Wegulo, S. N., Hallen-Adams, H., and Baenziger, P.S. 2015. Effects of winter wheat cultivars, fungicide application timing, and the fungicides Prosaro® and Headline® on FHB and DON. In: S. Canty, Clark, S. Vukasovich and D. Van Sanford (Eds.), *Proceedings of the 2015 National Fusarium Head Blight Forum*. East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. pp. 5-6.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: Yes (Abstract and Poster)

Salgado, J.D., K. Ames, G. Bergstrom, C. Bradley, E. Byamukama, J. Cummings, V. Chapara, M. Chilvers, R. Dill-Macky, A. Friskop, P. Gautam, N. Kleczewski, L.V. Madden, E. Milus, M. Nagelkirk, J. Ransom, K. Ruden, J. Stevens, S. Wegulo, K. Wise, D. Yabwalo and P.A. Paul. 2015. Robust Management Programs to Minimize Losses due to FHB and DON: A Multi-state Coordinated Project. In: S. Canty, Clark, S. Vukasovich and D. Van Sanford (Eds.), *Proceedings of the 2015 National Fusarium Head Blight Forum*. East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative. pp. 24-29.
Status: Paper Published and Poster Presented
Acknowledgement of Federal Support: Yes, but not for this agreement.