

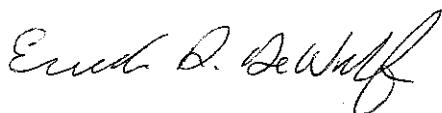
**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY14 Final Performance Report
July 15, 2015**

Cover Page

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Fiscal Year:	FY14
USDA-ARS Agreement ID:	59-0206-2-087
USDA-ARS Agreement Title:	Prediction Models and Improved Pre-Harvest Estimates of Deoxynivalenol.
FY14 USDA-ARS Award Amount:	\$ 45,197

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Continued Deployment of Prediction Models for Fusarium Head Blight.	\$ 12,112
MGMT	Development of Prediction Models for Fusarium Head Blight and Deoxynivalenol.	\$ 33,085
FY14 Total ARS Award Amount		\$ 45,197



Principal Investigator

7-15-15

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: *Continued Deployment of Prediction Models for Fusarium Head Blight.*

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

Prior to the USWBSI, there was no forecasting system available to help growers and agriculture industry evaluate the risk of severe Fusarium head blight in their area. The forecasting effort supported by the USWBSI provides web-based tools that help stakeholders evaluate the risk of disease in 30 states with a history of Fusarium head blight.

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:

Deployed forecasting system for Fusarium head blight (FHB). This prediction effort includes web-based tools that provide daily estimates of disease risk for 30 states. Commentary developed by a disease specialist in each state is displayed along with the risk maps. Commentary is also distributed via an FHB Alert System that sends email and text messages to mobile devices.

Impact:

The prediction tools received over 7,889 sessions (14,355 page views) by 4,394 users during the 2014-growing season in the U.S. (April – August). The FHB Alert System sent commentary to nearly 900 subscribers in 2014.

User surveys indicate that the information provided by the disease forecasting effort and FHB Alerts influenced disease management decisions on 3,000,000 acres of wheat and barley.

The 2014 survey asked growers to estimate the monetary value of the information provided to their farm or business. This survey indicates that the median monetary value of the information provided by the prediction system was \$15,000 per user. Combining this figure with use statistics suggests that annual impact of the FHB prediction model exceeds \$65 million.

Project 2: *Development of Prediction Models for Fusarium Head Blight and Deoxynivalenol.*

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

At the start of this project, the forecasting models available were known to correctly predict Fusarium head blight epidemics with greater than 70% accuracy. Our goal was to improve model accuracy by incorporating new variables and additional observations gathered by the Integrated Management Cooperative Project.

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:

The new data expanded the data matrix from 527 to 865 observations, a 64% increase. Sixteen states are now represented, with 74% of the observations coming from winter wheat and the remainder from spring wheat. FHB epidemics, defined as FHB index $\geq 10\%$, had occurred in 236 of the observations. No FHB (i.e. FHB index = 0) was recorded in 184 of the remaining 629 observations.

Impact:

The expanded data set has facilitated the next generation of the model development. Preliminary results indicate that the signal capturing the difference between FHB epidemics and non-epidemics is strongest in moisture-related variables, beginning about 3 to 4 weeks pre-anthesis and extending as far as 3 weeks into the post-anthesis period. If successful, the new models would allow earlier estimates of disease risk and help growers make timely decisions about fungicide applications that could suppress developing disease problems.

Accomplishment:

New prediction models for FHB were made available to farmers.

Impact:

These new models incorporate genetic resistance into the models used in winter wheat production areas for the first time and improve overall accuracy of the predictions in the US.

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?**

None.

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?**

No.

If yes, how many?

- 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?

Yes, One

- 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.

1. Shah, D. A., De Wolf, E. D., Paul, P. A., Madden, L. V. 2014. Predicting Fusarium head blight epidemics with boosted regression tree. *Phytopathology* 104:702-714.
2. De Wolf, E. D. and Paul, P. A. 2014. Predicting Mycotoxin Contamination in Wheat. Pages 248-255 in: *Mycotoxin Reduction in Grain Chains*; J.F. Leslie, and A. F. Logrieco, (eds). John Wiley & Sons, Inc.
3. Dill-Macky, R., Dong, Y., Van Sanford, D., Knott, C. and De Wolf, E. 2014. Examination of commercial grain samples to ascertain how deoxynivalenol contamination exceeded anticipated levels in some 2014 wheat crops for western Kentucky. In: S. Canty, A. Clark, N. Turcott and D. Van Sanford (Eds.), *Proceedings of the 2014 National Fusarium Head Blight Forum* (pp.13). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.
4. Shah, D., De Wolf, E. Salgado, J., Paul, P. and Madden, L. 2014. Weather time series curves in relation to Fusarium head blight epidemics. . In: S. Canty, A. Clark, N. Turcott and D. Van Sanford (Eds.), *Proceedings of the 2014 National Fusarium Head Blight Forum* (pp.42). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.