

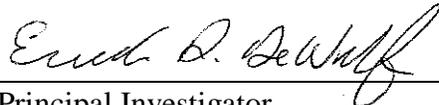
**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY12 Final Performance Report
July 16, 2013**

Cover Page

PI:	Erick De Wolf
Institution:	Kansas State University
Address:	Department of Plant Pathology 4607 Throckmorton PSC Manhattan, KS 66506
E-mail:	dewolf1@ksu.edu
Phone:	785-532-3968
Fax:	785-532-5692
Fiscal Year:	FY12
USDA-ARS Agreement ID:	59-0206-2-087
USDA-ARS Agreement Title:	Development and Deployment of Prediction Models for Fusarium Head Blight.
FY12 USDA-ARS Award Amount:	\$ 44,086*

USWBSI Individual Project(s)

USWBSI Research Category**	Project Title	ARS Award Amount
MGMT	Development of Prediction Models for Fusarium Head Blight.	\$ 33,084
MGMT	Continued Deployment of Prediction Models for Fusarium Head Blight.	\$ 11,002
	Total ARS Award Amount	\$ 44,086


Principal Investigator

7/15/13

Date

* Award Amount does not include additional funding awarded in September of 2012 earmarked for other PIs at same institution

** MGMT – FHB Management

FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain

GDER – Gene Discovery & Engineering Resistance

PBG – Pathogen Biology & Genetics

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: *Development 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?

Fusarium head blight (FHB) is currently managed with a combination of genetic resistance and timely use of fungicides when weather conditions favor the disease development. Evaluating the need for fungicides at a given location is difficult, and avoiding unnecessary applications helps farmers maintain their profitability. We are developing prediction models that help farmers determine if fungicide applications are needed given local weather conditions or if these additional input costs could be saved.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

This project has completed development of logistic regression models that assess the risk of FHB epidemics. After several rounds of extensive model evaluations, 15 candidate models were identified, of which 4 are currently being tested for potential deployment. These models combine weather-based predictors with other risk factors such as variety genetic resistance, grain market class and presence of crop residues likely to support large populations of *Fusarium*. The results indicate that while these new models perform better than currently deployed models given the expanded data set, the overall accuracy of these models is similar to the benchmarks (70-80% accuracy) set in previous iterations of model development. Having established the baseline for the logistic modeling approaches, we are now evaluating whether the Boosted Regression Tree (BRT) and other more sophisticated approaches can further improve model accuracy. Preliminary BRT models are approximately 31% more accurate than the logistic regression models.

Impact:

The prediction models developed as part of this project contribute to the FHB forecasting effort in 30 states. Four new models are being tested prior to public deployment with a specialized user interface designed for this purpose. These models are more accurate than the currently deployed models based on data available during development and should improve the accuracy of information available to farmers and other stakeholders of the USWBSI.

Project 2: *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?

The outbreaks of Fusarium head blight are influenced significantly by local weather conditions. Many wheat and barley growers need to evaluate the potential risk of FHB on their farm every year and determine if fungicides are needed to suppress disease. Underestimating the disease risk exposes the farmers to the potential loss of yield caused by uncontrolled FHB. In contrast, overestimating the disease often results in unnecessary fungicide applications, which increase production costs and have potentially harmful effects on the environment. The goal of this project is to deploy prediction models of FHB that help growers determine if fungicides are needed to manage FHB in their area.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

Successful deployment of Fusarium head blight prediction models for 30 states with a history of problems with FHB. This system brings the scientific community together to provide research-based disease management recommendations to thousands of farmers and other stakeholders.

A new user interface for the FHB prediction tools was completed in time for the 2013 season. This new tools includes mobile version of the tool that is available on smart phones and other mobile devices.

Impact:

Forecasting models and the FHB-Alert System that help producers evaluate the risk of severe disease and need for fungicides are available in 30 states with a history of severe FHB. In 2012 the internet-based tools received more than 10,000 visits and 21,000 page views between March and September (the months when the model predictions are most useful). There are nearly 1,000 subscribers to the FHB Alerts in 2012.

Users of the FHB prediction models and the FHB Alert System where surveyed in 2012. The survey results included input from 342 respondents and indicated that 62% of these users were either farmers or farm advisors. More than 68% of the users applied the information directly on their farm, or used it to make recommendations about disease management to others. In 2012, 96% of the users considered the information to be of high or moderate value for their farm operations and businesses. A subset of questions targeting the influence of the information suggests that more than 88% of the users experienced a moderate or great improvement in their awareness of the disease risk in their area. The results also showed that the information influenced disease management decisions directly for 33% of the respondents, and motivated another 30% to seek advice from others.

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 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Journal publications:

McMullen, M., Bergstrom, G., De Wolf, E. Dill-Mackey, R., Hershman, D., Shaner, G. and Van Sanford, D. 2012. A unified effort to fight an enemy of wheat and barley: Fusarium head blight. *Plant Disease* 96:1712-1728.

Technical publications:

Bockus, W.W., De Wolf, E. D. and Wegulo, S. N. 2012. Effect of foliar fungicide application on Fusarium head blight in eight winter wheat cultivars, 2011. *Plant Disease Management Reports* 6:CF004.

Presentations:

Bockus, W., Davis, M., De Wolf, E., and Fritz, A. 2012. Adoption of wheat cultivar Everest significantly lowered the Kansas statewide Fusarium head blight phenotype. In: S. Canty, A. Clark, A. Anderson-Scully and D. Van Sanford (Eds.), Proceedings of the 2012 National Fusarium Head Blight Forum (pp. 48). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.

De Wolf, E. 2012. Fusarium head blight management: progress and possible knowledge gaps. In: S. Canty, A. Clark, A. Anderson-Scully, D. Ellis, and D. Van Sanford (Eds.), Proceedings of the 2012 National Fusarium Head Blight Forum (pp. 18). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.

De Wolf, E. 2012. Forecasting epidemics of Fusarium head blight in the United States. Proceedings of the National Integrated Pest Management Symposium, 2012. March 27-29; Memphis, TN.

De Wolf, E., Shah, D., Paul, P. Willlyerd, K. and Madden, L. 2012. Boosted regression trees identify pre- and post-anthesis wheat variables for predicting Fusarium head blight epidemics. In: S. Canty, A. Clark, A. Anderson-Scully and D. Van Sanford (Eds.), Proceedings of the 2012 National Fusarium Head Blight Forum (pp. 17). East Lansing, MI/Lexington, KY: U.S. Wheat & Barley Scab Initiative.