

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
July 15, 2011**

Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0206-9-090
USDA-ARS Agreement Title:	Integrated Management of Fusarium Head Blight in Indiana.
FY10 USDA-ARS Award Amount:	\$ 24,885

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrated Management of Fusarium Head Blight and Deoxynivalenol in Indiana.	\$ 5,373
PBG	Establishing Sensitivity of <i>Fusarium graminearum</i> Isolates to Fungicides.	\$ 19,512
	Total ARS Award Amount	\$ 24,885

Principal Investigator

Date

* 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: *Integrated Management of Fusarium Head Blight and Deoxynivalenol in Indiana.*

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) levels on wheat vary each year in Indiana but the disease is consistently present and of concern to growers, and there is a need for effective FHB and deoxynivalenol (DON) management programs. Varieties with moderate resistance to FHB do not always provide desirable levels of disease control in certain environments, and fungicides have become an important component in FHB and DON management plans in the region. A research study was established in Indiana to determine how these tactics can be combined to provide improved control of FHB.

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:

A research trial was conducted in West Lafayette, IN to evaluate the effect of genetic resistance and fungicide application to achieve optimal management of FHB. The fungicide Prosaro® was applied to experimental plots of six varieties of varying susceptibility to FHB. Non-treated plots of each of the varieties were included in the experiment to test the effects of a foliar fungicide application at Feekes 10.5.1, and variety susceptibility for improved FHB management. In comparisons between fungicide-treated and untreated plots of the same variety, fungicide-treated plots had lower disease levels and higher yields in all varieties except one. Combined management using resistant varieties and fungicide applications improved disease suppression by 30% when compared to susceptible varieties that received fungicide applications.

Impact:

The results of this research project indicate that a well-timed fungicide application can significantly reduce the impact of FHB and DON in wheat varieties, and increase yields in most varieties. This information is of primary importance to growers and is presented in various programs and field days, including the Purdue Wheat Production workshops. Research is also summarized in Extension articles to aid growers in managing FHB and DON in wheat. Additional research is needed to more thoroughly investigate the interaction between fungicide and variety susceptibility under Indiana conditions.

Project 2: *Establishing Sensitivity of Fusarium graminearum Isolates to Fungicides.*

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) levels on wheat vary each year in Indiana but the disease is consistently present and of concern to growers. Current management recommendations for producers incorporate cultural methods, moderately resistant varieties, and fungicide applications to minimize the impact of FHB and its associate mycotoxin deoxynivalenol or DON. The DMI triazole group of fungicides is most efficacious at reducing the impact of FHB and DON, and used in combination with a moderately resistant variety to reduce the levels of FHB and DON in production settings. The widespread use of triazole fungicides for FHB management could potentially impact the pathogen biology of *F. graminearum* by selecting for less sensitive isolates already present in the pathogen population. The goal of the proposed research is to characterize the current sensitivity of *Fusarium graminearum* populations on wheat across the Midwest. These results will help us understand in what regions we may see differences in levels of fungicide efficacy, and determine if there are certain locations or where the *F. graminearum* population is changing in response to recommended management practices that include fungicide applications.

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:

Isolates of *Fusarium graminearum* collected from the Midwest in fungicide-treated and non-treated plots are screened on fungicide-amended media and percent inhibition of isolate growth by each fungicide is used to calculate individual EC₅₀ values for each *F. graminearum* isolate tested. EC₅₀ values are used to examine isolate sensitivity across locations and years. In vitro sensitivity assays indicate that isolates never exposed to triazole fungicides within Indiana vary greatly in their sensitivity to triazole fungicides. *F. graminearum* growth inhibition ranged from 32 % to 0% of the untreated control when exposed to the fungicide metconazole at a concentration of 0.1 ppm, with an average of only 7.4% growth in the presence of metconazole. In contrast, the same isolates were only inhibited an average of 36.3% and 82.6% for prothioconazole and tebuconazole, respectively at 0.1 ppm. This indicates that metconazole is intrinsically more active against *F. graminearum*. Field studies indicate little difference in the efficacy of metconazole or prothioconazole for FHB control and these results warrant additional research.

Impact:

This research gives us an improved understanding of how *F. graminearum* isolates respond to triazole fungicides. The range in in vitro sensitivity among isolates suggests the Indiana *F. graminearum* population is diverse, which could make detecting shifts in fungicide

sensitivity difficult in nature. Additional research will determine if shifts in sensitivity have occurred where triazole fungicides have been used. These results have been shared various Extension meetings throughout Indiana, including wheat field days and the Purdue Wheat Production Workshops.

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.

Wise, K. Chapman, K., Bradley, C.A., and Paul, P. 2011. Sensitivity of *Fusarium graminearum* isolates to triazole fungicides. p. 7 in: Proceedings of the 2011 Eastern and Southern Soft Wheat Workers Meeting, Grapevine, TX.

Willyerd, K., Madden, L., McMullen, M., Wegulo, S., Bockus, B., Sweets, L., Bradley, C., Wise, K., Hershman, D., Bergstrom, G., Grybauskas, A., Osborne, L., Esker, P., and Paul P. 2010. Inoculated field trials for evaluating FHB/DON Integrated management strategies. pp. 109-110 in: Proceedings of the 2008 National Fusarium Head Blight Forum, Indianapolis IN.

Wise, K.A., and Woloshuk, C. 2010. Diseases of Wheat: Fusarium Head Blight. Purdue Extension Bulletin BP-33-W.

Wise, K. 2010. Fungicide applications for foliar wheat disease management. Purdue Pest & Crop Newsletter. Issue 4: April 23, 2010.

Wise, K. 2010. Will Fusarium Head Blight (Scab) be a problem in Indiana wheat? Purdue Pest & Crop Newsletter. Issue 5: April 30, 2010.

Wise, K. 2010. More on Fusarium Head Blight in Indiana wheat. Purdue Pest & Crop Newsletter. Issue 6: May 7, 2010.

Wise, K. 2010. Wheat disease update. Purdue Pest & Crop Newsletter. Issue 7: May 14, 2010.

Wise, K. 2010. Wheat and barley producers can sign up for scab alerts. Purdue Pest & Crop Newsletter. Issue 7: May 14, 2010.

Wise, K. 2010. Monitor Fusarium head blight risk in northern Indiana wheat. Purdue Pest & Crop Newsletter. Issue 8: May 21, 2010

Wise, K. 2010. Scab strikes again in Indiana wheat. Purdue Pest & Crop Newsletter. Issue 12: June 18, 2010.

Wise, K., and Woloshuk, C. 2010. Dealing with DON in wheat. Purdue Pest & Crop Newsletter. Issue 13: July 9, 2010.