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

**Cover Page**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Institution:</td>
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</table>
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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)

<table>
<thead>
<tr>
<th>USWBSI Research Category*</th>
<th>Project Title</th>
<th>ARS Award Amount</th>
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<tbody>
<tr>
<td>MGMT</td>
<td>Integrated Management of Fusarium Head Blight and Deoxynivalenol in Indiana.</td>
<td>$ 5,373</td>
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<tr>
<td>PBG</td>
<td>Establishing Sensitivity of <em>Fusarium graminearum</em> Isolates to Fungicides.</td>
<td>$ 19,512</td>
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<tr>
<td><strong>Total ARS Award Amount</strong></td>
<td><strong>$ 24,885</strong></td>
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* 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 deoxynivaleonol 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 
ocurred 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.

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, 
Inoculated field trials for evaluating FHB/DON Integrated management strategies. pp. 109-

Extension Bulletin BP-33-W.

Wise, K. 2010. Fungicide applications for foliar wheat disease management. Purdue Pest & Crop 

Wise, K. 2010. Will Fusarium Head Blight (Scab) be a problem in Indiana wheat? Purdue Pest & 

Wise, K. 2010. More on Fusarium Head Blight in Indiana wheat. Purdue Pest & Crop 


Wise, K. 2010. Wheat and barley producers can sign up for scab alerts. Purdue Pest & Crop 

Wise, K. 2010. Monitor Fusarium head blight risk in northern Indiana wheat. Purdue Pest & 

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