

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY09 Final Performance Report  
July 15, 2010**

**Cover Page**

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<b>Fiscal Year:</b>	2009
<b>USDA-ARS Agreement ID:</b>	59-0790-7-080
<b>USDA-ARS Agreement Title:</b>	Integrated Management and Prediction of Fusarium Head Blight and DON in Winter Wheat.
<b>FY09- USDA-ARS Award Amount:</b>	\$ 14,268

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
MGMT	Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.	\$ 11,707
MGMT	Within-Field Inoculum from Corn Debris and the Management of FHB/DON.	\$ 2,561
	<b>Total Award Amount</b>	<b>\$ 14,268</b>



Principal Investigator

July 8, 2010

Date

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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 Winter Wheat Region  
 SWW – Southern Sinter Wheat Region

**Project 1:** *Integrating Strategies to Mitigate Fusarium Head Blight and DON in Winter Wheat.*

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

The major problem being resolved is to more effectively manage Fusarium head blight (FHB, scab) and deoxynivalenol (DON) in winter wheat through integration of management strategies. We are resolving the problem by comparing the effect of a fungicide (Prosaro = prothioconazole + tebuconazole) application at early flowering to no fungicide application on three cultivars with different levels of tolerance to FHB (2137, susceptible; Harry, moderately resistant; and Jagalene, susceptible). The three cultivars were planted in the fall of 2008. In the spring of 2009, corn-kernel inoculum of *Fusarium graminearum* was applied to the soil surface of all plots. There also was a low to moderate level of natural inoculum. Prosaro was applied or not applied to plots of all three cultivars. Plots were inoculated with spores of *F. graminearum* ( $1 \times 10^5$  spores/ml) using a hand-pumped backpack sprayer two days after fungicide application. Data on FHB index, yield, *Fusarium*-damaged kernels (FDK) and DON were obtained from the plots following harvest with a small plot combine.

**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:**

It was found that averaged over all cultivars, fungicide application significantly ( $P = 0.05$ ) increased yield (1729 kg/ha in the check treatment versus 2230 kg/ha in the Prosaro treatment), reduced FDK (39.6% in the check treatment versus 25.8% in the Prosaro treatment), and reduced DON (2.2 ppm in the check treatment versus 1.2 ppm in the Prosaro treatment). Index was generally low and although it was higher in the non-sprayed check treatment (4.1%) than in the Prosaro treatment (3.2%) this difference was not statistically significant. Averaged over all fungicide treatments, Harry had significantly ( $P = 0.05$ ) higher index (9.5%), FDK (47.1%) and DON (4.1 ppm) than Jagalene (0.5%, 28.6%, and 0.6 ppm index, FDK, and DON, respectively) and 2137 (1.0%, 22.4%, and 0.4 ppm index, FDK, and DON, respectively). Prosaro significantly ( $P = 0.05$ ) reduced DON in Harry but not in Jagalene or 2137, reduced FDK in Harry and Jagalene but not in 2137, and increased yield in Jagalene but not in Harry and 2137.

**Impact:**

Data demonstrating differences among cultivars in their reaction to FHB and DON when treated with fungicide or not treated with fungicide will enable producers to choose the combination of cultivar and fungicide application that will be most effective in reducing FHB and DON. Losses from FHB and DON will be reduced and profits for producers will increase.

**Project 2:** *Within-Field Inoculum from Corn Debris and the Management of FHB/DON.*

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

The problem being resolved is determination of the relative contribution of within-field inoculum sources of *Gibberella zeae*, causal agent of Fusarium head blight (FHB), to FHB and DON in local wheat. This information can be used to develop and/or exclude strategies for managing FHB and DON. We are resolving the problem by introducing or not introducing locally collected corn stubble into 33-inch-diameter, 2 feet high cages (microplots) placed at least 100 feet apart in wheat fields before the heading growth stage. FHB is rated in each microplot at the soft dough growth stage and at maturity heads are harvested, threshed and submitted to a specialized lab for DON determination.

**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:**

Results from the 2009 growing season showed that neither index nor DON differed between corn stubble and no stubble microplots implying that elimination of corn stubble from single wheat fields in a major corn-producing region may have limited benefits in terms of reducing FHB and especially of reducing DON contamination of grain.

**Impact:**

By not implementing a costly strategy (such as elimination of corn stubble) that does not reduce FHB or DON, growers can save time and money. New, effective FHB and DON management strategies can be developed if it is known that certain strategies do not reduce FHB or DON.

**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.**

1. Bergstrom, G. C., Waxman, K. D., Schmale III, D. G., Bradley, C. A., Sweets, L. E., Wegulo, S. N., and Keller, M. D. 2009. Effects of within-field corn debris in microplots on FHB and DON in ten U.S. wheat environments in 2009. Page 22 in: Proceedings of the 2009 National Fusarium Head Blight Forum. Wyndham Orlando Resort, Orlando, Florida, U.S.A. 7-9 December, 2009.
2. Wegulo, S. N., Bockus, W. W., Hernandez Nopsa, J., Zwingman, M. V., and Millhouse, J. C. 2009. Integrated management of Fusarium head blight and deoxynivalenol in winter wheat. Pages 93-94 in: Proceedings of the 2009 National Fusarium Head Blight Forum. Wyndham Orlando Resort, Orlando, Florida, U.S.A. 7-9 December, 2009.