USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
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Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0206-9-082
USDA-ARS Agreement Title:	Managing Fusarium Head Blight of Wheat in Arkansas.
FY10 USDA-ARS Award Amount:	$ 70,737

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Efficacy of Fungicides against Nivalenol Chemotypes of Fusarium graminearum.	$ 6,112
VDHR-SWW	Development of FHB-resistant Wheat Cultivars for the Midsouth.	$ 64,625
	Total ARS Award Amount	**$ 70,737**

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: *Efficacy of Fungicides against Nivalenol Chemotypes of Fusarium graminearum.*

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

   The major issues are to determine if fungicides that are effective against DON chemotype isolates of *Fusarium graminearum* are equally effective against NIV chemotype isolates and to determine the levels of NIV contamination in grain that are likely to occur from epidemics involving NIV chemotype isolates. This is being resolved by evaluating treatments in the Uniform Fungicide Trial for efficacy against NIV chemotype isolates under field conditions.

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: Under similar conditions, NIV chemotypes appear to cause less disease than DON chemotypes.
   Impact: The presence of NIV chemotypes does not appear to increase the threat of head blight.

   Accomplishment: Fungicides that are effective against isolates of the DON chemotype were found to have similar efficacy against isolates of the NIV chemotype.
   Impact: The same fungicides can be used to manage both chemotypes, simplifying the use of fungicides to manage the new NIV population.

   Accomplishment: NIV levels in grain were determined to be 2.2, 1.2 and 1.4 ppm for nontreated, Prosaro-treated, and Caramba-treated plots, respectively.
   Impact: Given that NIV is several times more toxic than DON to humans and animals, these levels indicate that NIV contamination may pose a significant health risk in areas where the NIV chemotype occurs.

Project 2: *Development of FHB-resistant Wheat Cultivars for the Midsouth.*

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

   The issues are to develop FHB-resistant wheat varieties that are competitive with contemporary susceptible varieties and to encourage growers to plant varieties with FHB resistance rather than susceptible varieties. We are contributing to the development of competitive resistant varieties by 1) making crosses and selections for FHB resistance, 2) evaluating the Southern Uniform Winter Wheat Scab Nursery (SUWWSN), the most promising lines from the LSU breeding program, and the Uniform Southern Nursery (USN) for resistance to FHB and other important diseases, 3) developing new methods for quantifying various components of FHB resistance and selecting resistant lines, and 4)

participating in the Jamestown mapping population study. We are contributing to the increase in acreage planted to FHB-resistant varieties by 1) determining the FHB reactions for commonly-grown and promising replacement varieties, 2) disseminating these reactions via ScabSmart, Extension publications and newsletters, and popular press articles, and 3) attempting to make FHB reactions publically available for branded varieties developed with USWBSI funding.

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: The Arkansas program submitted four lines with FHB resistance to the 2011 SUWWSN, including two lines that resulted from the collaboration with the LSU program.
Impact: Arkansas lines are usually among the most resistant lines in the nursery, and some of these lines may be released as varieties or used as parents in other breeding programs.

Accomplishment: Lines from the SUWWSN, USN, and the LSU breeding program have been evaluated annually for resistance to FHB and other diseases.
Impact: These evaluations are contributing to the development of FHB-resistant varieties that are adapted to the Midsouth.

Accomplishment: FHB reactions, based on both greenhouse and field evaluations, for commonly-grown and promising replacement varieties in Arkansas were determined and disseminated.
Impact: These reactions will allow growers to avoid the most susceptible varieties and choose moderately resistant varieties that have other beneficial traits.

Accomplishment: Measuring the relative yield of wheat spikes treated with DON at flowering identified several European but no American wheat lines with tolerance to FHB.
Impact: American breeding programs likely could benefit by using these sources of tolerance as parents.

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance.

No cultivars or germplasm lines were released during this reporting period.

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.

Horevaj, P., Gale, L. R. and Milus, E. A. 2011. Resistance in winter wheat lines to initial infection and spread within spikes by deoxynivalenol and nivalenol chemotypes of *Fusarium graminearum.* Plant Dis. 95:31-37.

Horevaj, P., Milus, E.A., and Bluhm, B. 2011. A real-time qPCR assay to quantify *Fusarium graminearum* biomass in wheat kernels. Journal of Applied Microbiology (in press).

Horevaj, P., Brown-Guedira, G., and Milus, E. A., 201_. Resistance in winter wheat lines to deoxynivalenol applied into florets at flowering stage and tolerance to phytotoxic effects on yield. Plant Pathology (submitted)

Horevaj, P., Moon, D., and Milus, E.A. 2010. Deoxynivalenol level in wheat grain highly associated with percentage of scabby grain caused by *Fusarium graminearum.* International Wheat Conference, St. Petersburg, Russia.

Milus, E.A., Moon, D., and Rohman, P. 2010. Efficient selection for low DON levels in wheat. Page 151 in: Proceedings of the 2010 National Fusarium Head Blight Forum, Milwaukee, WI.

Milus, E.A., Moon, D., and Rohman, P. 2010. Usefulness of greenhouse evaluations as a predictor of wheat head blight resistance in the field. Page 152 in: Proceedings of the 2010 National Fusarium Head Blight Forum, Milwaukee, WI.

Bradley, C. A., Adee, E. A., Ebelhar, S. A., Dill-Macky, R., Wiersma, J. J., Grybauskas, A. P., Kirk, W. W., McMullen, M. P., Halley, S., Milus, E. A., Osborne, L. E., Ruden, K. R., and Young, B. G. 2010. Multi-state uniform fungicide evaluations for control of Fusarium head blight and associated mycotoxins. Page 74 in: Proceedings of the National Fusarium Head Blight Forum, Milwaukee, WI.

Milus, E. A., Moon, D., and Rohman, P. 2010. Evaluations for FHB severity, Fusarium-damaged kernels, grain yield, DON content, types I and II resistance in the greenhouse, and stripe rust and stem rust resistance. Pages 9, 12, 14, 15, 17 and 22, respectively, in: 2010 Southern Uniform Winter Wheat Scab Nursery Report. J.P. Murphy and R.A. Navarro, editors.

Kelley, J.P., Sheets, S., Bacon, R.K., Miller, R., Milus, E.A., Cartwright, R., Moon, D., and Rohman, P. 2010. Wheat Update 2010. U of A Cooperative Extension Service Publication. 19 pages.