

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

Cover Page

PI:	Eugene Milus
Institution:	University of Arkansas
Address:	Department of Plant Pathology 217 Plant Science Bldg. Fayetteville, AR 72701
E-mail:	gmilus@uark.edu
Phone:	501-575-2676
Fax:	501-575-7601
Fiscal Year:	2009
USDA-ARS Agreement ID:	59-0206-9-082
USDA-ARS Agreement Title:	Managing Fusarium Head Blight of Wheat in Arkansas.
FY09- USDA-ARS Award Amount:	\$ 70,737

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
MGMT	Efficacy of Fungicides against Nivalenol Chemotypes of Fusarium graminearum.	\$ 6,112
VDHR-SWW	Developing FHB-Resistant Wheat Cultivars for the Midsouth.	\$ 64,625
	Total 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 Winter Wheat Region
 SWW – Southern Sinter 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: 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 poses a significant health risk in areas where the NIV chemotype occurs .

Project 2: *Developing 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 Soft Red Winter Wheat Nursery for resistance to FHB and other important diseases, and developing new methods for quantifying various components of FHB resistance and selecting resistant lines. 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: Submitted 9 wheat lines with FHB resistance to the 2010 SUWWSN.

Impact: Several 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: A new method was developed for quantifying both type I and type II resistances in one experiment.

Impact: The method has been used to evaluate commonly-grown varieties in Arkansas and entries in the SUWWSN, and the method has been accepted for publication in Plant Disease.

Accomplishment: Lines evaluated for FHB resistance in field nurseries are now visually evaluated for general phenotype using the LSU 1 to 9 scale, and lines harvested for evaluating percentage of scabby grain are now also evaluated for relative yield compared to check varieties.

Impact: These additional variables should facilitate development of FHB-resistant varieties that are competitive with contemporary susceptible varieties.

Accomplishment: Injecting wheat spikes with DON at flowering and measuring relative yield compared to check spikes of similar size and maturity identified lines that were previously reported to have tolerance to FHB based on multiple years of field data.

Impact: This method may allow for more efficient selection of lines with tolerance to FHB and has been submitted for publication in Plant Disease.

Accomplishment: FHB reactions, based on both greenhouse and field evaluations, for commonly-grown and promising replacement varieties in Arkansas were determined.

Impact: These reactions allow growers to avoid the most susceptible varieties and choose resistant varieties that have other beneficial traits and allow estimates of the acreage planted to resistant varieties in Arkansas.

Accomplishment: Informed the Steering Committee about problems associated with branded varieties being marketed without the FHB reactions that were determined using USWBSI funding.

Impact: Too soon to determine.

Include below a list 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. 201_. Resistance in winter wheat lines to initial infection and spread within spikes by deoxynivalenol and nivalenol chemotypes of *Fusarium graminearum*. Plant Dis. 94:xxx. (accepted with revisions)

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

Horevaj, P., and Milus, E. A. 2009. Resistance in winter wheat to *Fusarium* head blight. Phytopathology 99:S159. (invited symposium presentation at national meeting of the American Phytopathological Society)

Horevaj, P., and Milus, E. A. 2009. Level of *Fusarium* mycotoxins in wheat grain highly associated with percentage of scabby kernels. Page 122 in: Proceedings of the 2009 National *Fusarium* Head Blight Forum. Orlando, FL.

Bradley, C.A., Adee, E.A., Ebelhar, S. A., Grybauskas, A. P., Hollingsworth, C. R., Kirk, W. W., McMullen, M. P., Milus, E. A., Osborne, L. E., Ruden, K. R., and Young, B. G. 2009. Application timings of Caramba and Prosaro fungicides for management of FHB and DON. Page 34 in: Proceedings of the 2009 National *Fusarium* Head Blight Forum. Orlando, FL.

Bradley, C.A., Adee, E.A., Ebelhar, S. A., Grybauskas, A. P., Hollingsworth, C. R., Kirk, W. W., McMullen, M. P., Milus, E. A., Osborne, L. E., Ruden, K. R., and Young, B. G. 2009. Effect of pyraclostrobin applications to wheat at different growth stages on DON concentrations in grain. Page 35 in: Proceedings of the 2009 National *Fusarium* Head Blight Forum. Orlando, FL.

Kelley, J.P., Sheets, Bacon, R.K., Kelly, J., Miller, R., Milus, E.A., Monfort, S. Cartwright, R., Moon, D., and Rohman, P. 2009. Wheat Update 2009. U of A Cooperative Extension Service Publication. 17 pages. (Lists FHB reactions of varieties in Arkansas)

Milus, E. A., Moon, D., and Rohman, P. 2009. Evaluations for FHB severity, *Fusarium*-damaged kernels, DON content, types I and II resistance in the greenhouse, and *Septoria tritici* blotch resistance. Pages 9, 13, 16, 17 and 23, respectively, in: 2009 Southern Uniform Winter Wheat Scab Nursery Report. J.P. Murphy and R.A. Navarro, editors.

Milus, E. A. 2009. Arkansas reports moderately resistant wheat varieties. Page 6 in: *Fusarium* Focus, Fall issue (An online publication of the US Wheat and Barley Scab Initiative).

Milus, E. A. et al. 2009. Scabs '09 impact. Page 4 in: *Fusarium* Focus, fall issue (An online publication of the US Wheat and Barley Scab Initiative).