USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
July 15, 2009

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:	2008
USDA-ARS Agreement ID:	59-0790-4-115
USDA-ARS Agreement Title:	Management of FHB in Arkansas.
FY08 USDA-ARS Award Amount:	$ 64,624

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-SWW	Developing FHB-Resistant Wheat Cultivars for the Midsouth.	$64,624
	Total Award Amount	**$ 64,624**

_____
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
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: *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?**

   Wheat varieties grown in the region lack high levels of resistance to FHB and mycotoxin accumulation. Wheat lines with resistance to FHB lack competitive yield potential, suitable milling and baking quality, and/or resistance to other important diseases.

   The project in Arkansas collaborates with other programs in the soft red winter wheat region to develop and identify wheat lines that combine all of the important traits described above so that FHB-resistant varieties can slowly begin to replace FHB-susceptible varieties. The Arkansas project also is attempting to identify the varieties that are most susceptible to FHB so that growers can be discouraged from growing these varieties, resulting in a quicker reduction in the risk for FHB-associated losses and mycotoxin levels in grain. The Arkansas project also is conducting research to characterize the FHB resistance in adapted lines and to develop more efficient methods to screen for certain components of FHB resistance so that lines can be screened more efficiently for FHB resistance.

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 (1):
   The levels of types I and II resistance in a growth chamber experiment and the levels of FHB resistance under inoculated and misted field conditions were determined for wheat lines in the Southern Uniform Winter Wheat Scab Nursery.

   Impact:
   These results contribute to the collaborative effort to release FHB-resistant varieties with competitive yield, quality, and resistance to other diseases.

   Accomplishment (2):
   The FHB resistances in the soft red winter wheat gene pool were shown to be more effective against NIV chemotypes than DON chemotypes of *Fusarium graminearum.*

   Impact:
   These results indicate that wheat lines should continue to be evaluated using DON chemotypes of the pathogen, and that any lines resistant to DON chemotypes likely will be even more resistant to NIV chemotypes.

   Accomplishment (3):
   The technique for evaluating type I resistance was modified to make it more accurate and extended in time to also estimate type II resistance.

Impact:
These improvements should make it more feasible to evaluate type I resistance and more efficient to evaluate type II resistance.

Accomplishment (4):
Resistance gene *FHB1* was shown to be the only resistance gene that protected wheat spikes from blighting after being injected with pure DON. However, *FHB1* was not associated with ability to produce plump kernels in the presence of pure DON.

Impact:
These results support the previous work of others that *FHB1* degrades DON into another compound that is less toxic to plants and that this degradation is the mechanism of resistance. Our work indicates that *FHB1* appears to be the only resistance gene in the soft red winter wheat gene pool with this mechanism. Furthermore, injecting spikes with pure DON appears to be a useful method for identifying lines with tolerance to FHB, a component proposed by Mesterhazy. However, the most important impact of these findings is that varieties with *FHB1* may have elevated levels of one or more "phantom mycotoxins" that are not detected by tests for DON but are still toxic to humans and animals.

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.

Gale, L. R., Harrison, S. A., Milus, E. A., O'Donnell, K. O., Ward, T. J., and Kistler, H. C. 2008. Genetic characterization of predominantly nivalenol-producing populations belonging to the Fusarium graminearum species complex from the southern U.S. Phytopathology 98:S56.

Horevaj, P., and Milus E. A. 2008. Resistance in winter wheat lines to deoxynivalenol injected into florets at flowering stage. Cereal Research Communications 36SB:495-498.

Horevaj, P., and Milus E. A. 2008. Resistance in winter wheat lines to initial infection and subsequent spread of deoxynivalenol and nivalenol chemotypes of *Fusarium graminearum.* Cereal Research Communications 36SB:499-502.

Horevaj, P., and Milus E. A. 2008. Resistance of Winter Wheat to Fusarium Head Blight and Mycotoxin Accumulation. Oral presentation that won second place in a Gamma Sigma Delta Graduate Student Competition at the University of Arkansas.

Milus, E. A., and Hedge, J. 2008. Evaluations for FHB severity, Fusarium-damaged kernels, DON content, type I resistance, heading date, and powdery mildew resistance. Pages 9, 15, 19, 20, 22 and 25, respectively, in: 2008 Southern Uniform Winter Wheat Scab Nursery Report. J.P. Murphy and R.A. Navarro, editors.

If your FY08 USDA-ARS Grant contained a VDHR-related project, 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. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

No varieties or germplasm lines were released during 2008.