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

Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	59-0206-9-053
USDA-ARS Agreement Title:	Management of Fusarium Head Blight of Wheat in Maryland.
FY10 USDA-ARS Award Amount:	$ 19,716

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Management of Fusarium Head Blight of Wheat in Maryland - Uniform Fungicide Trial Component.	$ 8,740
MGMT	Management of Fusarium Head Blight of Wheat in Maryland - Uniform Integrated Management Trial Component.	$ 10,976
	Total ARS Award Amount	**$ 19,716**

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: *Management of Fusarium Head Blight of Wheat in Maryland - Uniform Fungicide Trial Component.*

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

   Management of Fusarium head blight with the best available fungicides has been demonstrated by the coordinated uniform fungicide trial of the USWBSI to reduce DON by an average 40-45%. This is a great improvement over the 12-23% reductions achieved with first generation products registered in some states under section 18 for scab suppression. However, in seasons when untreated fields are averaging as low as 2-3 ppm DON, a 45% reduction will not produce a crop that would pass the 1 ppm FDA advisory limit and could still be rejected. New products and combinations need to be tested to improve upon the DON reduction. Research conducted to date has demonstrated that the optimum timing for first generation materials was at initial flowering for wheat based on visual symptom reduction. The optimum timing of newer materials and combinations needs to be confirmed and DON reduction should be the primary criteria. Furthermore, at the end-user level it is operationally impossible for all fields that need a fungicide application to be treated exactly at initial flowering, and when the environment is conducive for disease development rainfall will prohibit application or have the potential to greatly reduce efficacy. The effective window of application needs to be determined so that the best management practices are clearly defined and delimited. Finally, there is increasing evidence that the strobilurin class of fungicides when used for management of other diseases of wheat may increase DON in the event of a subsequent scab outbreak. Therefore the impact of fungicides used for management of other wheat diseases on scab and DON development in particular needs to be considered, and recommendations on their use as they affect DON be incorporated in best management practices for scab. Trials under the FY10 funding were conducted to address these additional concerns by expanding upon the basic uniform fungicide trial by including a combination of the best fungicides, a range of application dates including 5 days after early flowering, and several products applied pre-flowering to determine their effect on DON.

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):**

   <u>Accomplishment:</u>
   The environmental conditions during the FY10 funding cycle trials were not conducive for natural scab epidemics in Maryland. Even under inoculated conditions only moderately low levels of scab developed in this trial, illustrating the continued need for cooperative multi-state trials to obtain data on efficiacy. However, results summarized across the multi-state trials indicate that two new products Syngenta A 9232D and Dupont DPX LEM17 may have potential as additional fungicide combinations that will help in the management of this disease. However, neither new product was significantly better than the current standards. Also based on the multi-state summary and analysis it was demonstrated that Headline

fungicide when applied at pre-flowering growth stages for the management of other wheat diseases could significantly increase DON.

Impact:

The multi-state cooperative trials have proved to be the most successful way to obtain fungicide efficacy data on FHB management. Two new products were identified that may provide additional options for producers, although none were clearly better than the current standards. One of those products, DPX LEM 17, is a different class of chemistry than all other effective products, which may provide some utility as a fungicide resistance management option. The continued evidence that Headline use prior to flowering may increase DON in the event of FHB development has significant implications regarding best crop management practices. Recommendations for the use of Headline regarding its allowable application window should be more limited than currently allowed on the label without improved FHB forecasting.

Project 2: *Management of Fusarium Head Blight of Wheat in Maryland - Uniform Integrated Management Trial Component.*

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

   The search for management tactics that can protect producers from the losses in yield and mycotoxin contamination associated with Fusarium head blight has taken great strides forward with the development of cultivars with moderate resistance and the registration of two triazole fungicides, Prosaro and Caramba. However, neither resistance nor fungicide application independently, has proved to be adequate in seasons highly favorable for disease development. Furthermore, some of the more highly resistant cultivars have had lower yield potentials than other highly adapted but susceptible cultivars and thus lose favor among producers after seasons with low disease development. The effectiveness of the best available fungicides has been primarily tested with highly susceptible varieties and disease-conducive environments. Thus their overall contribution to and possible interaction as a management package is not adequately understood. An integrated approach primarily testing the combination of cultivars that have a modicum of resistance with the best available fungicide is being tested and demonstrated in this project under various debris management and rotation schemes. We are also using the web-based forecasting system to help producers determine the “real-time” risk of disease development to help determine if the fungicide application is warranted that season.

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 environmental conditions were extremely favorable for a severe natural epidemic of Fusarium head blight in Maryland in the 2009-2010 growing season but not in the 2010-2011 season. Therefore there was not enough FHB development in the management trials in Maryland during the FY10 funding cycle to test for the effects of the combination of resistance with fungicides. However, as part of the multi-state cooperative trial conducted over several seasons there is increasing evidence that the combination of moderate resistance with fungicide treatment is more effective than resistance alone or fungicide treatment alone.

Impact:

The combination of resistance and fungicide treatment is currently necessary to manage FHB outbreaks to produce a saleable product. The management research testing these combinations have been instrumental in demonstrating and providing hard evidence that neither tactic alone is adequate in a severe epidemic year. Best management of FHB will require a pre-season decision to select a cultivar with resistance to FHB and an in-season fungicide treatment based on disease potential and disease-conducive weather.

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.

Grybauskas, A. P. 2010. Managing scab and rust diseases of wheat and barley. UME Agronomy Newsletter 1(3): 5-6.

Grybauskas, A.P. 2010. The decisions you make pre-season have the greatest affect on Wheat Scab and its by-product vomitoxin. UME Agronomy Newsletter 1(10): 2-5.

Willyerd, K., Madden, L., McMullen, M., Wegulo, S., Bockus, B., Sweets, L., Bradley, C., Wise, K., Hershman, D., Bergstrom, B., Grybauskas, A., Osborne, L., Esker, P., and Paul, P. 2010. Inoculated field trials for evaluating FHB/DON integrated management strategies. Pages 109-110 in: National Fusarium Head Blight Forum, S. M. Canty, A. Clark, A. Anderson-Scully, D. Ellis and D. Van Sanford, eds. University of Kentucky, Milwaukee, WI.

Willyerd, K. L., C. Bradley, A. Grybauskas, D. Hershman, L. Madden, M. McMullen, L. Osborne, P. Paul and L. Sweets. Multi-state evaluation of integrated management strategies for Fusarium head blight and deoxynivalenol in small grain. Phytopathology 100:S137.

Grybauskas, A.P. and E. Reed. 2010. MD Field Crop Disease Management Research Update. NJ-DelMarVa-Pa Plant Pathologist Assoc., March 31, 2010, Newark, DE.

Grybauskas, A.P. and E. Reed. 2010. DON mycotoxin increases with some fungicide applications in wheat update. APS Potomac division annual meeting, March 24-25, 2010, Ocean City, MD.

Bradley, C.A., E.A. Adee, S.A. Ebelhar, R. Dill-Macky, J.J. Wiersma, A.P. Grybauskas, W.W. Kirk, M.P. McMullen, S. Halley, E.A. Milus, L.E. Osborne, K.R. Ruden, and B.G. Young. 2010. Multi-state Uniform Fungicide Evaluations for Control of Fusarium Head Blight and Associated Mycotoxins. Proceedings of the 2010 National Fusarium Head Blight Forum.

Grybauskas, A.P. 2010. Managing small grain diseases. Pennsylvania Agronomic Education Conference, January 19-20, State College, PA.

Grybauskas, A.P. 2010. Managing Fusarium head blight in wheat. Pennsylvania Agronomic Education Conference, January 19-20, State College, PA.

Grybauskas, A.P. 2010. Small grain fungicides effect on head blight. Delaware Agronomy Day Program, January 21, Harrington, DE.

Mycotoxins in field crops. Baltimore County Agronomy Day, Upperco, MD, December 9, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Cecil County Agronomy meeting, Rising Sun, MD, March 22, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Queen Ann County Agronomy meeting, Centreville, MD, March 5, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Dorchester County Agronomy meeting, Cambridge, MD, February 23, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Lower Eastern Shore Agronomy meeting, Princess Anne, MD, February 22, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Caroline County Agronomy meeting, Denton, MD, February 17, 2010.

Wheat scab management and effect of fungicides on vomitoxin, Carroll County Crops Roundtable, Westminster, MD, February 2, 2010.

Fungicides for wheat disease control and potential effect on toxins if scab develops. Kent County Ag Day, Chestertown, MD, January 27, 2010.

Scab outbreak of 2009 – what did we learn. Maryland Crop Improvement Association Annual Meeting, Ruthsburg, MD, January 21, 2010