

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY12 Final Performance Report
July 16, 2013**

Cover Page

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Fiscal Year:	FY12
USDA-ARS Agreement ID:	59-0206-9-064
USDA-ARS Agreement Title:	Studies on Management Strategies and Environmental Factors Affecting FHB and DON in Multiple Grain Classes, ND.
FY12 USDA-ARS Award Amount:	\$ 46,075*

USWBSI Individual Project(s)

USWBSI Research Category**	Project Title	ARS Award Amount
MGMT	Integrated Management Coordinated Project, ND.	\$ 37,037
MGMT	Uniform Fungicide Trials in ND.	\$ 9,038
	Total ARS Award Amount	\$ 46,075

Principal Investigator

Date

* Partial funding for this research is under ARS agreement # 59-0206-9-062

** 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: *Integrated Management Coordinated Project, ND.*

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

Optimum management of FHB requires use of an integrated approach, including use of more resistant varieties in combination with optimum fungicides, as well as good choice of rotation practices. North Dakota participated in the 2012 Uniform FHB Integrated Management Trials, with several grain classes and locations. At Fargo, trials with 6-row and 2-row barley varieties with fungicide treatment and soybean or wheat as previous crop were conducted. At Langdon, trials were conducted with 6-row barley and durum wheat, using varieties, fungicide treatment and previous crop as factors. Trials with 20 spring wheat and 17 winter wheat varieties and fungicide treatments were done at Froman, Finley, and Prosper locations in ND, as well. All results were reported to Pierce Paul, Ohio State University, for inclusion in the national report, except those from Langdon, where harvest and DON data collection were too late for inclusion.

Information from these trials indicates value of rotation in reducing FHB and DON, plus shows the response of variety to fungicide, with varying response depending on degree of susceptibility of that variety to the disease. This is valuable information to demonstrate to producers the value of integration and the need for management levels required for varying varieties.

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 trials did show differences in yield response to fungicides (4 – 7 bushels increase for the winter and spring wheat tests), even in drier locations in the state, and Langdon did have measurable disease and DON, despite a general dry condition in ND in 2012. At Langdon, fungicides reduced DON in 6-row barley from 1.5 ppm on average to 1.0 ppm. The trial also showed that using the more FHB resistant cultivar Quest, vs the susceptible cultivar Tradition, reduced DON by another 0.3 ppm. Growing the barley on canola vs wheat ground also helped reduce the DON levels, by 40%. For durum, fungicide treatment reduced DON levels by 50% and Divide durum, a more resistant variety, had consistent lower DON than the other 5 varieties tested.

Impact: These trials further demonstrate the value of all three approaches to managing FHB, crop rotation, variety choice and use of an efficacious fungicide. The growers using these practices will have reduced or no market grade or price reductions. These trials demonstrated the value of incorporating FHB resistance into varieties, as these varieties performed much better than variety releases without the FHB resistance.

Project 2: *Uniform Fungicide Trials in ND.*

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

Uniform fungicide trials were established on barley, durum and spring wheat at 3 locations in ND in 2012. The Fargo location was very dry, so trials on barley and wheat at Fargo did not have measurable FHB. FHB did develop and data were analyzed on Kelby hard red spring wheat at Carrington and Lebsock durum at Langdon. Results were provided to the Uniform Fungicide summary report for all states. Results indicated that triazole fungicides reduced FHB index by the greatest (greater than 50% over the untreated check) when applied at flowering, but were less effective if applied prior to flowering. Headline fungicide applied at Feekes growth stage 9 did not reduce FHB index over the untreated check. However, if Headline applied at Feekes 9 was followed by Caramba or Prosaro treatment at Feekes 10.51, then FHB index was also reduced significantly.

For other states, as indicated in the multi-state report, Headline applied once at Feekes 9 generally had the highest DON level over the untreated check, while the triazole fungicide applied at Feekes 10.51 or 5 to 7 days later resulted in the lowest DON levels.

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: These trials validate the use of triazole fungicides at optimum timing for FHB management, and also provide further evidence that use of a strobilurin fungicide alone may raise the FHB index and DON levels.

Impact: These studies provide growers in ND information about effectiveness of fungicides in reducing FHB and DON for multiple grain classes. The data helps validate the proper timing of fungicides and the appropriate fungicides to use. If growers choose to use a strobilurin at the leaf stage of Feekes 9 to control leaf diseases such as rust, they must come back with a triazole fungicide at flowering to reduce FHB, if they are in an FHB risk area, or else they may get increased DON over above that of untreated.

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.

McMullen, M., Bergstrom, G., De Wolf, E., Dill-Macky, R., Hershman, D., Shaner, G., and Van Sanford, D. 2012. A unified effort to fight an enemy of wheat and barley: Fusarium head blight. Feature Article, *Plant Disease* 96: 1712-1278.

McMullen, M., Friskop, A., Jordahl, J., Meyer, S., Bergstrom, G., Bradley, C.A., Dill-Macky, R., Smith, M., Wiersma, J., Halley, S., Arens, A., Milus, G., Ruden, K., and Schatz, B. 2012. Uniform fungicide trial results for management of FHB and DON, 2012. Page 19-20 in: S. Canty, A. Clark, A. Anderson-Scully and D. Van Snaford (eds). Proc. 2012 National Fusarium Head Blight forum, Dec. 4-6, 2012. Orlando, FL. East Lansing, MI/ Lexington, KY.

Willyerd, K.T., Li, C., Madden, L., Bradley, C.A., Bergstrom, G.A., Sweets, L., McMullen, M.P., Ransom, J., Grybauskas, A., Osborne, L.E., Wegulo, S., Hershman, D.E., Wise, K.A., Bockus, W.W., Groth, D., Dill-Macky, R., Milus, E.A., Esker, P., Waxman, K., Adee, E.A., Ebelhar, S., Young, B.G., and Paul, P.A. 2012. Efficacy and Stability of Integrating Fungicide and Cultivar Resistance to Manage Fusarium Head Blight and Deoxynivalenol in Wheat. *Plant Disease* 96: 957-967.

Articles posted on-line by Joel Ransom, about winter wheat and spring wheat variety response to Prosaro fungicide for FHB management.

<http://www.ag.ndsu.edu/varietytrials/fargo-main-station/2012-trials-results/2012-trial-results-winter-wheat-forman/view>

<http://www.ag.ndsu.edu/varietytrials/fargo-main-station/2012-trials-results/2012-trial-results-hard-red-spring-wheat-finley/view>

<http://www.ag.ndsu.edu/varietytrials/fargo-main-station/2012-trials-results/2012-trial-results-winter-wheat-prosper/view>

<http://www.ag.ndsu.edu/varietytrials/fargo-main-station/2012-trials-results/2012-trial-results-hard-red-spring-wheat-forman/view>