

**U.S. Wheat and Barley Scab Initiative
 FY00 Final Performance Report (approx. May 00 – April 01)
 July 30, 2001**

Cover Page

PI:	Marcia McMullen
Institution:	North Dakota State University
Address:	Dept. of Plant Pathology Walster Hall Fargo, ND 58105
Email:	mmcmulle@ndsuxt.nodak.edu
Phone:	701-231-7627
Fax:	701-231-7851
Year:	FY2000 (approx. May 00 – April 01)
Grant Number:	59-0790-9-053
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$38,049

Project

Program Area	Project Title	Requested Amount
Chemical & Biological Control	Uniform fungicide trials to identify safe products that are effective against FHB.	\$9,000.00
Chemical & Biological Control	To identify application technologies that will maximize fungicide coverage and efficacy against FHB.	\$30,000.00
	Requested Total	\$39,000.00¹

Principal Investigator

Date

¹ Note: The Requested Total and the Award Amount are not equal.

Project 1: Uniform fungicide trials to identify safe products that are effective against FHB.

1. What major problem or issue is being resolved and how are you resolving it?

Fungicides and/or biological agents are important tools to effectively manage FHB. Fungicides have consistently provided 50% reductions in FHB severity and DON levels in spring wheats. However, greater levels of control are needed for improved yields, quality, and market grade. In addition, improved levels of control are needed in the crops that have fewer available tolerant cultivars or very little tolerance, such as barley, durum, and most winter wheats. Some fungicides have federal registration for heading application to wheat and barley, while others do not. In addition, some of the most environmentally safe products have been shown to reduce FHB severity but increase DON levels. New products and combinations of products are being tested to determine which are most efficacious in reducing FHB and in decreasing DON levels. A wider spectrum of fungicides with different modes of action also is needed to reduce the potential risk of resistance developing to single fungicide chemistries. Finding effective biological agents also will increase the opportunity to reduce FHB while maintaining a safe environment.

A core set of fungicides (six treatments) was tested on barley, spring wheat, and durum in multiple field locations in North Dakota in the summer of 2000. Three additional treatments, including a biological agent, were included in some locations. This trial was part of the Uniform Fungicide Trial of the National Initiative in which 15 states cooperated. The intent was to test the core set of treatments across numerous environments to evaluate fungicide and biological performance and consistency.

2. What were the most significant accomplishments?

The objective of the research was to establish a core set of promising fungicide treatments and evaluate across crops and environments. This objective was met. The grant supported work at Fargo, Langdon, Carrington, and Minot, ND. The treatments were applied to two commercial cultivars of hard red spring wheat and one cultivar of barley at Fargo, to one spring wheat cultivar at Langdon, one spring wheat cultivar at Carrington, and one durum wheat at Minot. At Fargo, a mist irrigation system was established and used to provide favorable conditions for disease development for one spring wheat and one barley test. The other spring wheat was grown on last year's corn ground. At other locations irrigation also was supplied. Favorable conditions occurred at all locations for evaluation of the fungicides. Analysis of data from the Fargo trials indicates from 80-90% reduction in FHB field severity with the best treatments in hard red spring wheat and 60% reduction in barley. Similar results were observed at Carrington, Minot, and Langdon. Across locations, DON levels were reduced by 40% with available treatments, and by 70% with an experimental product. Yields were increased by 28.6% with a special exemption product (Folicur), and by 39% with an experimental product (Caramba).

The project identified the most efficacious products for reducing FHB and DON and for increasing yield, and this information was provided to growers, commodity organizations, crop consultants, the agricultural industry and shared at the national FHB Forum. The research results supported a successful Section 18 request to EPA. Growers in ND used this information to make fungicide decisions during the 2001 growing season.

Project 2: To identify application technologies that will maximize fungicide coverage and efficacy against FHB.

1. What major problem or issue is being resolved and how are you resolving it?

Adequate coverage of wheat and barley heads with a fungicide or a biological control agent is difficult for several reasons: the grain heads are positioned vertical to the traditional spray pattern; in many cultivars the grain heads have awns that intercept the spray; and the glumes have a waxy, non-wetting surface that makes retention of the spray less than optimum. Improved coverage of the grain heads is desired to improve the control provided by these products. In addition, improved timing of application of fungicides is needed as relates to weather events that favor *Fusarium* spore dispersal and infection.

To address these concerns, fungicide application trials were established in a greenhouse environment, using an experimental track sprayer, and in the field using hand held or tractor mounted sprayers. Greenhouse studies on spray parameters included 27 separate trials on spring wheat, durum wheat, and barley. The studies determined optimum timing of application and the need for appropriate type and rates of adjuvants. These studies also reconfirmed the appropriate sprayer pressures and nozzle configurations for flat fan sprayers, and examined the effect of duration of dew periods on fungicide control of FHB. Field studies in 2000, using a tractor-mounted sprayer, also examined adjuvant types and rates, timing of application, and nozzle orientation.

2. What were the most significant accomplishments?

The grant supported a research associate who conducted the sprayer trials in the greenhouse and who established the field trials and designed and set up the field misting system, as well. The spray trials evaluated timing of application, nozzle orientation, adjuvants, and effect of dew on fungicide performance, as set forth in the objectives. Experiments were done on multiple crops with appropriate replication. Research information was analyzed and summarized and provided to producers via an extension bulletin, publication in *Prairie Grains* magazine, and through appropriate news releases.

The greenhouse trials reconfirmed that forward/backward nozzle configurations of flat fan nozzles were superior to standard vertical orientation nozzles. This practice has been adopted by growers who use traditional ground sprayers. The studies also reconfirmed the necessity of appropriate timing of application, and gave guidelines to wheat and barley producers on when to start application, and when to end application, to get the highest economic return. The timing of application studies are coordinated with information provided through the NDSU disease forecasting model available on the internet and via a toll free number. Growers can determine the risk of FHB in their area and then determine if the crop growth stage is appropriate for fungicide protection during the highly favorable environmental period. The adjuvant studies have indicated the importance of adjuvants for improved efficacy of products, and also has shown which kinds are most appropriate (generally a non-ionic surfactant) and at what rates. Experimental adjuvants have also shown great promise for improving FHB control.

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.

Scientific publications and reports: 2001

McMullen, M., Jordahl, J., and Meyer, S. 2001. Adjuvants and efficacy of Folicur and Tilt fungicides for control of Fusarium head blight in spring grains. *Phytopathology (Abstr.)* (Poster presentation at NC APS meeting, Manhattan, KS, June 2001).

McMullen, M., Halley, S., and Jordahl, J. 2001. Evaluations of fungicides and a biological agent for control of Fusarium head blight and fungal leaf spots in wheat, 2000. *Fungicide and Nematicide Tests 56*: (online Report No. CF11 at www.scisoc.org/online/fntests/).

McMullen, M., Halley, S., and Jordahl, J. 2001. Evaluations of fungicides and a biological agent for control of Fusarium head blight and fungal leaf spots in barley, 2000. *Fungicide and Nematicide Tests 56*: (online Report No. CF1 at www.scisoc.org/online/fntests/).

Scientific publications and reports: 2000

Halley, S., McMullen, M., Pederson, J., and Moos., J. 2000. Fungicide application timing effects on field severity of Fusarium head blight in wheat and barley. *Phytopathology 91*:S177.

Halley, S., Pederson, J., and McMullen, M. 2000. Comparison of air and ground application methods on head coverage and fungicidal control of Fusarium head blight, 1999. *Fungicide and Nematicide Tests 55*: 335.

Horsley, R. D., McMullen, M. P., and Pederson, J. D. 2000. Efficacy of the fungicide Folicur in controlling barley Fusarium head blight in genotypes with partial resistance. *Pages 89-93 in: Proceedings of the 2000 National Fusarium Head Forum, Cincinnati, Ohio, Dec. 10-12, 2000. Published by the US. Wheat and Barley Scab Initiative Office, Michigan State University.*

Lukach, J., Halley, S., McMullen, M., and Pederson, J. 2000. Sprayer modifications for enhanced control of Fusarium head blight with fungicides, 1999. *Fungicide and Nematicide Tests 55*: 346.

McMullen, M., Halley, S., Pederson, J., Moos, J., and Jordahl, J. 2000. Effects of application parameters on control of Fusarium head blight with fungicides. *Pages 94-97 in: Proceedings of the 2000 National Fusarium Head Blight Forum, Cincinnati, Ohio, Dec. 10-12, 2000. Published by the US. Wheat and Barley Scab Initiative Office, Michigan State University.*

Year: 2000
PI: Marcia McMullen
Grant: 59-0790-9-053

Progress Report

McMullen, M., and Lukach, J. 2000. Uniform fungicide trial for controlling FHB in spring barley, ND, 2000. *Page 99 in: Proceedings of the 2000 National Fusarium Head Forum, Cincinnati, Ohio, Dec. 10-12, 2000. Published by the US. Wheat and Barley Scab Initiative Office, Michigan State University.*

McMullen, M., Schatz, B., and Lukach, J. 2000. Uniform fungicide trial for controlling FHB in spring wheat, ND, 2000. *Page 98 in: Proceedings of the 2000 National Fusarium Head Forum, Cincinnati, Ohio, Dec. 10-12, 2000. Published by the US. Wheat and Barley Scab Initiative Office, Michigan State University.*

Milus, E. A. and McMullen, M. 2000. Analysis of the 2000 Uniform wheat fungicide trials across locations. *Pages 100-104 in: Proceedings of the 2000 National Fusarium Head Forum, Cincinnati, Ohio, Dec. 10-12, 2000. Published by the US. Wheat and Barley Scab Initiative Office, Michigan State University.*

Extension Related Publications; presentations:

McMullen, M., Jordahl, J., and Meyer, S. 2001. Update on NDSU studies for optimizing fungicide application for scab control. *Pages 4-5 in: Prairie Grains, June 2001 issue, published by Assn. of Minnesota Wheat Growers, Red Lake Falls, MN.*

McMullen, M. 2000. Uniform fungicide results on spring wheat, ND, 2000. *Pages 497-498 in: Crop Production Guide 2001, D. Berglund, ed. NDSU extension Service Crop Production Guide No. 11.*

McMullen, M. and Lamey, A. 2000 Field Crop Fungicide Guide. NDSU Extension Circular PP 622 revised. 49 p.

McMullen, M. June 26, 2000. Presentation on fungicide application techniques at Crop Management Short Course, Carrington Research and Extension Center, Carrington, ND.

McMullen, M. 2000, 2001. Presentations on Fungicides and Application Techniques, Nov. 29, 2000, ND Ag. Trade Show, Fargo; 2001 dates – Pesticide Certification Training, Minot, Grand Forks, Williston, Dickinson, Bismarck, and Fargo, ND; District crop improvement meetings, Dec., 2000.

Hofman, V., McMullen, M., Gregoire, T., Lukach, J., Halley, S., Pederson, J., Moos, J., Panigrahi, S., and Gu, D. 2000. Application of fungicides for suppression of Fusarium head blight (scab). NDSU Extension Circular AE-1148. 4 p.