

**U.S. Wheat and Barley Scab Initiative
Annual Progress Report
September 18, 2000**

Cover Page

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Year:	FY2000
Grant Number:	59-0790-9-053
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$39,000.00

Project

Program Area	Objective	Requested Amount
Chemical & Biological Control	Identify safe, effective fungicides for FHB through evaluation across of wheat and/or barley varieties grown in relevant environments.	\$9,000.00
Chemical & Biological Control	To identify application technologies that will maximize fungicide coverage and efficacy against FHB.	\$30,000.00
	Requested Total	\$39,000.00

Principal Investigator

Date

Project 1: Identify safe, effective fungicides for FHB through evaluation across of wheat and/or barley varieties grown in relevant environments.

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. They consistently have provided reductions in FHB severity and DON levels around 50% in spring wheats. However, greater levels of control are desired for improved economic response. In addition, improved levels of control are needed in the crops that have fewer tolerant cultivars or very little tolerance, such as barley, durum, and some winter wheats. Some fungicides have federal registration for heading application to wheat and barley, while others do not. A wider spectrum of fungicide choices is needed. 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 assure a decrease in DON levels and to reduce the potential risk of resistance developing to single fungicide chemistries.

A core set of fungicides (six treatments) were tested on barley, spring wheat, and durum in multiple locations in North Dakota in 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 performance and consistency.

1. Please provide a comparison of the actual accomplishments with the objectives established.

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 core set of treatments was applied to two commercial cultivars of hard red spring wheat and one cultivar of barley at Fargo, plus to one spring wheat cultivar at Langdon, one spring wheat 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. Preliminary 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. Information on yields, test weights and DON levels is still forthcoming. Results will be distributed as they were in 1999.

2. What were the reasons established objectives were not met? If applicable. *Not applicable*
3. What were the most significant accomplishments this past year?

The efficacy of fungicides from the 1999 fungicide trials were determined and information was summarized and provided to growers, consultants, researchers, industry and government agencies. The information was used to support a Section 18 for Folicur fungicide, and was used by industry to support

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additional registrations. Growers in ND used this information to make fungicide decisions during the 2000 growing season. Similar action will be taken with 2000 results.

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; 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 43 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, plus provided additional guidelines for use of air-assisted sprayers. Field studies in 2000 were designed to corroborate some greenhouse studies.

1. Please provide a comparison of the actual accomplishments with the objectives established.

The grant supported a research associate who conducted the 43 sprayer trials in the greenhouse and who established the field trials, as well. The spray trials evaluated timing of application, nozzle orientation, adjuvants, and spray air delivery, 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.

2. What were the reasons established objectives were not met? If applicable. *Not applicable. Field data from 2000 still being compiled and analyzed.*
3. What were the most significant accomplishments this past year?

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. Spray-air technology research has also indicated good potential for improved head coverage and improved FHB control. Aerial applicators are using our research information to improve their timing of application as relates to growth stage and time of day.

Use of improved techniques also correlates with use of a disease forecasting model developed at NDSU. Improved use of adjuvants has been shown to improve 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.

(In addition to publications highlighting work from the 2000 research, I've listed below several 1999 publications that were published following the 1999 progress report. Similar publications will occur following completion of the analysis of the 2000 data.)

Scientific publications

1. Halley, S., Pederson, J., McMullen, M., and Lukach, J. 1999. Sprayer modifications for enhanced control of Fusarium head blight with fungicides. Pages 51-52 in: Proceedings of the 1999 National Fusarium Head Blight Forum, Dec. 5-7, 1999, Sioux Falls, S.D. Michigan State University.
2. Halley, S., McMullen, M., Pederson, J., and Moos, J. 2000. Fungicide application timing effects of field severity of Fusarium head blight in wheat and barley. *Phytopathology* (Abstr.) submitted (Poster presentation at NC APS meeting, Columbus, Ohio, June 2000.)
3. 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: (accepted for publication).
4. 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: (accepted for publication).
5. McMullen, M. and Bergstrom, G. 1999. Chemical and biological control of Fusarium head blight, 1999 projects and progress. Pages 61-63 in: Proceedings of the 1999 National Fusarium Head Blight Forum, Dec. 5-7, 1999, Sioux Falls, SD. Michigan State University.
6. McMullen, M., Milus, G., and Prom, L. 1999. 1999 Uniform fungicide trials to identify products effective against Fusarium head blight in wheat. Pages 64-68 in: Proceedings of the 1999 National Fusarium Head Blight Forum, Dec. 5-7, 1999, Sioux Falls, SD. Michigan State University.
7. McMullen, M. 1999. Chemical control of FHB. Pages 72-75 in: Proceedings of the Canadian Workshop on Fusarium Head Blight, Winnipeg, Manitoba, Nov. 28-30, 1999. Published by Canadian Grain Commission.

8. McMullen, M., Jones, R., Pederson, J., Halley, S., and Lukach, J. 1999. 1999 Uniform fungicide trials for FHB control in barley. Pages 69-70: Proceedings of the 1999 National Fusarium Head Blight Forum, Dec. 5-7, 1999, Sioux Falls, SD. Michigan State University.

Extension publications and presentations:

1. Hofman, V., McMullen, M., et al. 2000. Application of fungicides for suppression of Fusarium head blight (scab). NDSU Extension Circular AE-1148. 4p.
2. McMullen, M. 1999. Evaluation of fungicides for suppression of head and leaf diseases in wheat. Pages 443-444 in: Crop Production Guide #10, NDSU Extension Service Publication.
3. Pederson, J., McMullen, M., and Halley, S. 1999. Evaluation of fungicides for suppression of head and leaf diseases in barley. Page 445 in: Crop Production Guide #10, NDSU Ext. Service Publication.
4. McMullen, M. 2000. Chemical control of wheat scab – problems and progress. Pages 110-133 in Proceedings of Illinois Crop Protection Technology Conference. Jan. 5-6, 2000. Univ. of Illinois, Champaign (also a presentation).
5. McMullen, M. June 26, 2000. Presentation on fungicide application techniques at Crop Management Short Course, Carrington Research and Extension Center, Carrington, ND.
6. McMullen, M. 1999, 2000. Presentations on Fungicides and Application Techniques, Nov. 28, 1999, ND Ag. Trade Show, Fargo; 2000 dates – Pesticide Certification Training, Minot, Grand Forks, Williston, Dickinson, Bismarck, and Fargo, ND.
7. Saylor, T. 2000. NDSU research reinforces fungicide application recommendations to control scab in wheat and barley. *Prairie Grains*, June 2000, Issue 30. Published by Minnesota Assn. of Wheat Growers, Red Lake Falls, MN 56750.