

**U.S. Wheat and Barley Scab Initiative
Annual Progress Report
September 15, 1999**

Cover Page

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Year:	FY1999
Grant Number:	59-0790-9-053
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$39,024.00

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.	\$8,000
Chemical & Biological Control	Maintain information base on fungicide and application trials and on biological and residue treatment studies; collect and compile research data and reports, provide summaries of results.	\$1,000
Chemical & Biological Control	Develop and implement systems for disseminating research information in a timely fashion to producers.	\$1,000
Chemical & Biological Control	To identify application technologies that will maximize fungicide coverage and efficacy against FHB.	\$30,000
	Requested Total	\$40,000¹

Principle Investigator

Date

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

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 are valuable tools in an integrated approach to managing FHB. However, few fungicides have been registered in the US for the needed application window for control of FHB (at full head emergence through flowering), and few have shown good efficacy in controlling the disease. Fungicides are needed that are more effective and are still safe to the environment, applicator, and to the crop. Fungicides must be evaluated over a number of environments and small grain crops to determine which are most consistent in showing efficacy in reducing FHB severity and DON levels across different environmental conditions and crop type. The objective was to develop a uniform set of fungicide treatments to be evaluated across a number of locations and crops, to achieve more information on potential useful fungicides to control FHB.

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

A Uniform Fungicide Trial was established to evaluate the performance of a set of fungicide products over a number of environments and small grain crops. Fourteen states (ND, SD, MN, MO, OH, MI, IN, IL, MD, KY, NY, NC, VA, AR) participated in the uniform trial that compared nine fungicide treatments to the untreated check, for reducing FHB severity and DON (vomitoxin) levels. Standard, registered products were compared to new chemistries that may soon become registered. North Dakota participated in this uniform trial with tests on spring wheat, durum and barley at four separate sites in the state. Fungicides were applied according to the standard protocol for the Uniform Trial, disease ratings were taken, and yield and quality measurements were made at all locations.

3. What were the reasons established objectives were not met? If applicable.

The objectives of this project were met. Disease severities varied across site, with some sites and crops in ND having more FHB than others, but valuable information was gained at each site about FHB control or about leaf disease control. However, some states participating in the Uniform Fungicide Trial were under unusual, severe drought conditions and gained little information about fungicide efficacy in 1999.

4. What were the most significant accomplishments this past year?

Fourteen states cooperatively participated in the Uniform Fungicide Trial and developed a set of standard treatments across a broad range of small grain varieties and environments. All data from the trials are not yet summarized, but some treatments consistently showed better improvement in reducing FHB and DON across environments.

Project 2: Maintain information base on fungicide and application trials and on biological and residue treatment studies; collect and compile research data and reports, provide summaries of results.

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

Information from fungicide trials across locations needs to be compiled and summarized. Fungicide results from the Uniform Trials and from biological trials will be compiled and summarized for the 1999 National FHB Forum, while individual state's results will be summarized and compiled for producers within the state, as well.

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

Results from the 1998 and fungicide and biocontrol trials were summarized and presented at the 1998 National FHB Forum in Michigan. Similar summaries will be provided at the 1999 National FHB Forum, and data is being compiled at this time. Some participants in the Uniform Fungicide Trial have already presented their results to their state's constituents and have presented posters on their results at the annual American Phytopathological Society's meeting in Montreal, August, 1999. North Dakota's results from greenhouse trials conducted over the winter and spring of 1999 were summarized and presented to producers via an Extension Report, news releases, and at meetings, as well as presented at the NC Division meeting of the American Phytopathological Society, held in Lincoln, in June, 1999, and at the joint American Phytopathological Society, Canadian Phytopathological Society meeting in Montreal, in Aug., 1999. Results of individual trials will be published in the Fungicide and Nematicide Tests 1999 publication.

3. What were the reasons established objectives were not met? If applicable.

All objectives were met or will be met shortly.

4. What were the most significant accomplishments this past year?

An NDSU extension publication was published, results were presented at professional meetings, and results will be summarized for the 1999 National FHB Forum.

Project 3: Develop and implement systems for disseminating research information in a timely fashion to producers.

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

Because FHB can be so devastating, producers need to implement new strategies for control as soon as they become available. Research information must be presented to producers in time for them to implement positive management steps during the growing season. Our objective is to provide producers the results of our fungicide research trials in time for them to take appropriate action for the upcoming growing season. An additional objective is to provide necessary information from these trials that will aid in registration of more efficacious products.

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

Research results from the winter and spring greenhouse trials was distributed to ND producers in May, well before the spray season of July. Producers could implement the results on their farm, and also coordinate fungicide efficacy and application information with the need for fungicide use from information provided by the disease forecasting system developed by Dr. Len Francl, NDSU. Research results from the 1999 growing season will be distributed during fall and winter meetings so that producers can make decisions about fungicide use prior to the year 2000 spray season.

3. What were the reasons established objectives were not met? If applicable.

Objectives were met.

4. What were the most significant accomplishments this past year?

The publication of an NDSU Extension Report about application techniques to improve efficacy of fungicides for Fusarium head blight control, and rapid dissemination to producers. Information also was disseminated via news releases and radio and television. Data on fungicide efficacy helped achieve section 18 and full label registrations for several fungicides. Disease forecasting information provided by NDSU on the Internet helped producers make decisions on fungicide use.

Project 4: 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?

Wheat and barley heads are not the traditional target for foliar fungicides. Unlike grain leaves, the grain spikes have a vertical architecture, are often waxy, and generally have awns or beards that interfere with fungicide deposition and retention. In addition to the need for improved fungicides with activity against FHB, improvements are needed in getting the fungicide spray to the appropriate target site. An evaluation of various spray parameters was needed to find acceptable and economic methods of increasing spray coverage of grain heads to increase FHB control. These studies were done in a greenhouse during winter and spring months, and in the field during the growing season.

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

Forty application studies were completed in the winter/spring of 1999 in a greenhouse built specifically for FHB studies. A 60 ft spray simulator was built in the greenhouse and was used to study spray variables such as nozzle type, sprayer speed, spray pressure, and gallons/acre under a controlled environment. Wheat and barley plants were grown to heading stage. Spray coverage of grain heads was measured using orange day glo dye and a video imaging system. Improved efficacy in controlling FHB with additional coverage was determined using inoculation studies with *Fusarium graminearum*. The optimum spray pressure was determined for each spray nozzle, optimum gallons/acre were determined for each crop, optimum application timing was determined for barley, and an experimental air assist sprayer was tested for coverage. Greenhouse results were further refined in 12 application studies during the summer field season, and improvements in coverage were achieved with an experimental air assist sprayer provided by Spray Air.

3. What were the reasons established objectives were not met? If applicable.

The objectives were met.

4. What were the most significant accomplishments this past year?

Greenhouse results indicated the optimum spray pressure for several commonly used nozzle configurations, the optimum gallons /acre needed for better control in spring wheat, durum, and barley, and the optimum timing of application for barley (optimum timing for wheat previously determined). This information was distributed to producers in May, for implementation by the July spray season. Field trials during the summer indicated that an air assist system will provide additionally improved coverage, if oriented at an angle toward the head. This information may

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allow manufacturers to make modest adjustments to their equipment that will result in much better FHB control with fungicides.

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. P., Halley, S., Pederson, J., Hofman, V., Moos, J., Panigrahi, S., Gu, D., and Gregoire, T. 1999. Improved fungicide spraying for Wheat/Barley head scab control. NDSU Ext. Rpt. 56: 4 p.

McMullen, M., Halley, S., Pederson, J., Moos, J., Hofman, V., and Panigrahi, S. 1999. How spray nozzles, pressures, and gpa affect coverage and fungicide efficacy for Fusarium head blight control. *Phytopathology* 89:S106.

McMullen, M. 1999. Chemical and biological control of Fusarium head blight - problems and progress. Invited Presentation at the Symposium on "Understanding Fusarium Scab to Develop Disease Control Strategies". American Phytopathological Society and Canadian Phytopathological Society Annual Meeting, Montreal, Canada, Aug. 11, 1999.