

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

Cover Page

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Year:	FY1999
Grant Number:	59-0790-9-065
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$57,561.00

Project

Program Area	Objective	Requested Amount
Epidemiology	To develop a scab forecast system by monitoring the environment and pathogens.	\$50,000
Chemical & Biological Control	Identify safe fungicides that are most effective against FHB and evaluate across wheat classes and varieties, barley varieties, and environments.	\$4,000
Chemical & Biological Control	To assist in deploying epidemiology information that will link disease forecasting with the optimum timing for fungicide application.	\$4,000
Chemical & Biological Control	Develop and implement systems for disseminating research information in a timely fashion to producers.	\$1,000
	Requested Total	\$59,000¹

Principle Investigator

Date

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

Project 1: To develop a scab forecast system by monitoring the environment and pathogens.

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

Fusarium head blight has become a major problem of wheat and barley in the US Corn Belt and upper Midwest. The widespread adoption of reduced tillage in these regions, as a soil conservation measure, leaves crop residues that harbor the pathogen on the soil surface. This presumably has greatly increased the amount of potential inoculum. When weather conditions favorable for inoculum production, dispersal, and infection occur during the spring, epidemics of Fusarium head blight occur.

It is unlikely that farmers will revert to clean tillage on a wide scale, so Fusarium head blight must be managed even though crop residues that harbor the pathogen are left on the soil surface. Any management scheme requires thorough knowledge of the epidemiology of the disease, including knowledge of how weather conditions influence production of inoculum, its dispersal, and infection of the host. The experiments we are conducting involve detailed monitoring of these events, along with collection of weather data. These data will be used to identify weather conditions conducive for disease development.

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

During the spring of 1999, propagules of *Fusarium graminearum* and other *Fusarium* species were monitored by exposing wheat spikes for 24-hour periods, then washing them and plating the wash water on a selective medium. Spore density in the air each day was also monitored by operation of a Burkard spore sampler. Spores collected each day were suspended in water and likewise plated on a selective medium to quantify them. Spores dispersed by rain splash were collected in funnel traps, and plated on a selective medium. Disease development in the plot area was monitored by counting the number of diseased spikes in 20 60-cm lengths of row throughout the plot area. Mean incidence of scab was 6.6%. For those spikes that had symptoms of Fusarium head blight, average severity (percentage of spikelets per spike blighted) was 30%.

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

This was the first year for mechanical spore sampling, and some problems were encountered, such as rain water entering the Burkard sampler, and fouling of the funnel traps by bird droppings. Nonetheless, spore count data have been obtained for most of the period wheat was vulnerable to infection. We were not able to purchase the Campbell weather monitoring system until late in the spring, and it was not operational until after wheat had commenced flowering. Some weather data were obtained, however. The experiment was conducted on a research farm where standard

weather data are collected, so some weather data will be available for the analysis of spore trapping data.

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

Getting the spore samplers and Campbell weather station set up and operational for at least part of the season provided valuable experience for subsequent years. The Fusarium head blight that developed in the test site can be described as light to moderate, which will provide valuable data points for comparison with more severe epidemics, as well as environments in which no disease developed.

Project 2: Identify safe fungicides that are most effective against FHB and evaluate across wheat classes and varieties, barley varieties, and environments.

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

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It is unlikely that farmers will revert to clean tillage on a wide scale, so Fusarium head blight must be managed even though crop residues that harbor the pathogen are left on the soil surface. Given that most wheat and barley cultivars now available are susceptible to head blight, and the long time required to incorporate effective resistance into cultivars that have other desirable characteristics, fungicides may provide a means of managing this disease at least in the near term.

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

Prescribed treatments, in common with trials in several states, were applied to wheat plots at two locations in Indiana when wheat was in the early flowering stage. Incidence and severity of Fusarium head blight were recorded for each treatment, as well as severity of foliar diseases. Plots were harvested for yield and grain quality assessment.

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

Weather conditions at neither location were favorable for development of Fusarium head blight, so it was not possible to assess efficacy of treatments for control of this disease.

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

The experiment was conducted according to prescribed protocols. A new twin-nozzle spray boom was used for the first time this year, which directed more spray onto the spikes. The lack of disease development and therefore lack of definitive data on efficacy of fungicides for control of Fusarium head blight was a consequence of weather that was not conducive for disease.

Project 3: To assist in deploying epidemiology information that will link disease forecasting with the optimum timing for fungicide application.

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

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It is unlikely that farmers will revert to clean tillage on a wide scale, so Fusarium head blight must be managed even though crop residues that harbor the pathogen are left on the soil surface. Given that most wheat and barley cultivars now available are susceptible to head blight, and the long time required to incorporate effective resistance into cultivars that have other desirable characteristics, fungicides may provide a means of managing this disease at least in the near term. Effective use of fungicides to control Fusarium head blight will require deployment of a reliable, weather-based disease forecast system. This will allow farmers to use fungicides only when a need is indicated.

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

No work has been undertaken on this part of the research project yet.

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

This part of the research program cannot be undertaken until more data have been obtained both from the epidemiology research and the fungicide efficacy trials.

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

None.

Project 4: Develop and implement systems for disseminating research information in a timely fashion to producers.

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It is unlikely that farmers will revert to clean tillage on a wide scale, so Fusarium head blight must be managed even though crop residues that harbor the pathogen are left on the soil surface. Effective management of Fusarium head blight will require an integrated approach, involving cultural practices, use of cultivars with some resistance, and possibly fungicide applications. Information developed by the US Wheat and Barley Scab Initiative needs to be conveyed to farmers so that they can improve their ability to deal with this disease.

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

Nothing has been accomplished yet for this objective.

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

Because the program has just begun, it is too early to disseminate information to growers. During the winter, collaborating groups will discuss the results of common experiments, and some recommendations may be developed for the spring of 2000.

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

None

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.

- Bai, G., Chen, X., and Shaner, G. Breeding for resistance to Fusarium head blight of wheat in China, in K. J. Leonard and W. R. Bushnell (eds) Scab of Small Grains, APS Press (in press).
- Bai, G., H., Kolb, F. L., Shaner, G., Domier, L. L. 1998. AFLP markers for QTL controlling scab resistance in wheat. The 1998 National Fusarium Head Blight Forum, Edited by P. Hart, R. Ward, R. Bafus, and K, Bedford. Oct 26-27, 1998, East Lansing, MI.
- Bai, G., Kolb, F., Shaner, G., and Domier, L. AFLP markers linked to a major QTL controlling scab resistance in wheat. *Phytopathology* 89:343-348.
- Buechley, G., Shaner, G. 1998. Greenhouse evaluation of Italian wheat accessions. The 1998 National Fusarium Head Blight Forum, Edited by P. Hart, R. Ward, R. Bafus, and K, Bedford. Oct 26-27, 1998, East Lansing, MI.
- Francl, L., Shaner, G., Bergstrom, G., Gilbert, J., Pedersen, W., Dill-Macky, R., Sweets, L., Corwin, B., Jin, Y., Dallenberg, D., Wiersma, J. 1999. Daily inoculum levels of *Gibberella zeae* on wheat spikes. *Plant Dis.* 83:662-666.
- Shaner, G., Buechley, G. 1999. Control of wheat diseases with foliar fungicides, 1998. *Fungicide and Nematicide Tests* 54:337-338.
- Shaner, G. Epidemiology of Wheat Scab in North America, in K. J. Leonard and W. R. Bushnell (eds) Scab of Small Grains, APS Press (in press).