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

Cover Page

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Year:	**FY1999**
Grant Number:	**59-0790-9-035**
Grant Title:	**Fusarium Head Blight Research**
Amount Granted:	**$91,707.00**

Project

Program Area	Objective	Requested Amount
Epidemiology	Develop a scab forecasting system for wheat by monitoring the environment and pathogen.	$45,000
Epidemiology	Develop a scab forecast system for barley by monitoring the environment and pathogen.	$45,000
Chemical & Biological Control	To assist in deploying epidemiological information that will link disease forecasting with the optimum timing for fungicide or biological control agent application.	$4,000
	Requested Total	$94,000[1]

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Principle Investigator   Date

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

(Form – PR1)

PI: Leonard Francl
Grant: 59-0790-9-035

Project 1: Develop a scab forecasting system for wheat by monitoring the environment and pathogen.

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

          We want to develop a disease forecasting system that will provide wheat producers a real-time prognosis
          that they can use in their disease management program. To accomplish this, Fusarium head blight
          epidemics are being dissected into component parts and critical events will be analyzed and modeled. The
          primary focus areas at present are the phenomena of inoculation, infection period and colonization.

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

      Wheat disease development under field conditions was assessed in three northcentral US locations with several
      planting dates in each site. This experimental design maximizes the number of environments that can be
      analyzed within a season and thus minimizes model development time. Environment, inoculum load, growth
      stage and consequent disease intensity were measured daily during the period of greatest crop susceptibility.
      Preliminary data were obtained from six environments in 1999. The protocol was mirrored in two Corn Belt
      locations to develop a similar database. The protocol was assessed after the season ended and slightly modified
      for the 2000 season.
      Previous results have suggested that epidemic severity was related to the number of robust inoculum events
      (Francl et al. Plant Dis. 83:662, 1999). Therefore, inoculum levels were also assessed daily in an experiment
      designed to analyze environmental influences on inoculation events.

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

      Project is on schedule.

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

      It is difficult to draw concrete conclusions from one year's data but it seems like a series of events have to occur
      in order to bring about symptom development. This temporal series appears to include both environmental and
      host-pathogen factors and both pre-infection and post-infection events.

Project 2: To develop a scab forecast system for barley by monitoring the environment and pathogen.

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

We want to develop a disease forecasting system that will provide barley producers a real-time prognosis that they can use in their disease management program. To accomplish this, Fusarium head blight epidemics are being dissected into component parts and critical events will be analyzed and modeled. The primary focus areas at present are the phenomena of inoculation, infection period and colonization.

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

Disease development is being studied with wheat as a model system. This approach maximizes the results from limited resources and so minimizes development time.
Previous results have suggested that epidemic severity was related to the number of robust inoculum events (Francl et al. Plant Dis. 83:662, 1999). Therefore, inoculum levels were also assessed daily in an experiment designed to analyze environmental influences on inoculation events.

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

Project is on schedule.

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

It is difficult to draw concrete conclusions from one year's data but it seems like a series of events have to occur in order to bring about symptom development. This temporal series appears to include both environmental and host-pathogen factors and both pre-infection and post-infection events.

Project 3: To assist in deploying epidemiological information that will link disease forecasting with the optimum timing for fungicide or biological control agent application.

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

Parallel research on optimal timing and optimal application technology must be coordinated to provide an optimal disease control recommendation. Eventually, we want to provide a disease prognosis to producers who have the right tools and know-how to manage the scab outbreak.

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

In a symposium at the American Phytopathological Society annual meeting, I presented information gathered to date on disease progress in relation to environment, inoculum load and host growth stage. This communication reached several scientists who are researching fungicide technology and biological control.

A heuristic forecasting system was deployed via the Internet and toll-free number for producers and researchers in North Dakota and Minnesota. This preliminary model provides an estimate of optimal disease management while analytical model development continues.

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

Expectations were fully achieved.

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

The web-based forecasting system received over 7,000 visits from more than 1,400 distinct guests in three months of operation.

PI: Leonard Francl
Grant: 59-0790-9-035

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.

Francl, L. J. 1999. Natural inoculation of wheat by *Gibberella zeae* and head blight development. American Phytopathological Society Publication no. P-1999-0029-SSA.