

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

Cover Page

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Year:	FY2000
Grant Number:	
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$30,000.00

Project

Program Area	Objective	Requested Amount
Epidemiology	Investigate G. zeae isolate diversity for aggressiveness.	\$31,000.00
Chemical & Biological Control	Identify safe fungicides that are most effective against FHB and evaluate across wheat classes and varieties, barley varieties, and environments.	\$5,000.00
Chemical & Biological Control	Identify safe fungicides that are most effective against FHB and evaluate across wheat classes and varieties, barley varieties, and environments.	\$1,000.00
	Requested Total	\$37,000.00¹

Principal Investigator

Date

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

Project 1: Investigate *G. zeae* isolate diversity for aggressiveness.

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

Fusarium head blight is currently not a severe disease problem in North Carolina. However, growers in the state have expressed concern over the potential for an increased problem with the disease due to the occurrence of severe outbreaks of FHB in the midwestern United States. The purpose of this study was to determine both the diversity of the pathogen population and its potential to cause severe disease within the state. The purpose of the second part of the study was to both evaluate FHB resistance in promising wheat germplasm which is currently under development in the Southeast, and determine if environmental conditions in the region can be conducive to high levels of FHB.

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

The objectives were approached methodically and the actual accomplishments are detailed by objective in the next question.

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

They were met and exceeded.

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

Sixty-six isolates of *Fusarium graminearum* associated with Fusarium head blight (FHB) were collected in North Carolina and tested for *in-vitro* rate of growth, *in-vitro* toxin production of deoxynivalenol (DON) and zearalenone, and pathogenicity on three cultivars of soft red winter wheat. Significant differences among isolates were found in all phenotypic traits measured. Genotypic diversity among the isolates was surveyed using the RAPD technique and high levels of genotypic diversity were observed. Mean disease ratings, *in-vitro* deoxynivalenol (DON) and zearalenone ranged from 3.4 - 96.4%, 0 - 7176.2 ppm, and 0 - 354.7 ppm, among isolates, respectively. A multiple regression model using *in-vitro* growth, *in-vitro* DON and zearalenone production, collection location, wheat cultivar of isolate origin, plot, tillage conditions and previous crop as independent variables and disease rating as the dependent variable was developed. The cumulative R^2 value for the model equaled 0.27 with *in-vitro* rate of growth contributing the highest R^2 value. Analysis of phenotype and genotype among isolates demonstrated diversity within a single plot, within a single location and within the state of North Carolina. Genotypic and phenotypic diversity in terms of pathogenicity were significant under both conventional and reduced tillage conditions, and diversity was high regardless of whether the previous crop had been a host or non-host for *F. graminearum*. These data indicate a variable pathogen population of *Fusarium graminearum* exists in North Carolina, and members of this population can be both highly pathogenic on wheat and produce high levels of detrimental toxins, indicating a potential threat for problems with FHB within the state.

Eighty-six soft red winter wheat lines were evaluated for resistance to Fusarium head blight (FHB) and heading date over three years and eight locations in North Carolina. Disease incidence and severity were recorded. Natural weather conditions produced significant levels of FHB at four locations. No

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high levels of resistance to FHB were found among the entries, however 'Florida 302' demonstrated significantly low levels of disease incidence over all four test locations.

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?

As part of a multistate cooperative effort we are attempting to find fungicides that will effectively control head scab in this region. We have established replicated studies and inoculated them with spore suspensions in an attempt to incite disease. Plots were treated with fungicide according to national protocols and recommendations of cooperators.

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

Unfortunately, no disease developed. This area had extremely hot and dry weather during heading and despite irrigation and inoculation no disease developed. We were able to evaluate the fungicides and timings for control of other important wheat diseases.

3. What were the reasons established objectives were not met? If applicable.
Extremely uncondusive weather; see question 2

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

We were able to develop information on control of powdery mildew and septoria blotch in wheat.

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?

We are developing a method to deliver important control information immediately to growers in this region. We are planting our plots at the principle location for field day so we can address growers during midseason.

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

We were able to show our test to growers and explain our research to them. Although little disease developed there we could show them the phenotypes of important varieties and explain results of other work.

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

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

Getting results of multiple experiments to growers in a timely fashion.

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.