U.S. Wheat and Barley Scab Initiative
Annual Progress Report
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Project

Program Area	Objective	Requested Amount
Epidemiology	Investigate G. zea isolate diversity for aggressiveness.	$10,000
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	Develop and implement systems for disseminating research information in a timely fashion to producers.	$1,000
	Requested Total	$15,000[1]

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

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Project 1: Investigate G. zea isolate diversity for aggressiveness.

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

The purpose of this study is to provide data on pathogen diversity in regard to pathogenicity factors such as isolate aggressiveness and toxin production. This information could be used to facilitate selection of resistant lines and to provide basic information that could affect possible control options for wheat scab in soft red wheat production.

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

Isolates were collected from wheat heads exhibiting symptoms of scab in the coastal, piedmont, and mountain regions of North Carolina and surrounding states during the months of May and June. Two isolates of *Fusarium graminearum* (R-6914), (R-6925), an isolate of *F. culmorum* (R-6565), and an isolate of *F. avenaceum* (R-5314) were obtained from the Pennsylvania State University Fusarium Center (University Park, Pennsylvania, 16802) and included in all tests. Seeds from infected heads were surface sterilized in 10% sodium hypochlorite for one minute and then washed for one minute in sterile distilled water. Samples were then plated on synthetic nutrient agar (SNA) as described by Nirenberg (10). SNA is a low nutrient media which reduces mutations in *Fusarium*. Single spore isolations as described by Synder and Hansen (9) were performed for each sample. Rate of growth was measured for each isolate in a randomized complete block design. A five mm plug was taken from each isolate and placed in the center of a Petri dish containing 15 ml of SNA. Three replicates of each isolate were incubated at 25/22C (day/night) for seven days. Cultures were exposed to twelve hours of flourescent light per day. Measurements of radial growth were taken at 3, 5, and 7 days, and log transformed prior to final analysis. Incubator shelves functioned as blocks.

Pathogenicity testing was started using three cultivars: Cardinal (resistant, PI365440) Wakefield (intermediate, PI547040), and Caldwell (susceptible, CItr17897) in the greenhouse. A completely randomized design will be used with 70 isolates X 3 cultivars X 6 replications per cultivar, for a total of 1260 tests, and the first three reps have been completed. Plants are to be vernalized prior to planting and inoculated at anthesis. One ml of inoculum at a concentration of 1000 macroconidia per ml will be pipetted onto the top of the seed head and allowed to drain over the head tissue. Plastic bags will be misted with water and then placed over inoculated heads for five days. Controls are sterile water in place of inoculum. Symptoms of bleaching on seed heads will be recorded as percentages at ten and twenty days after inoculation (13). Due to differences in maturity, inoculations of the three cultivars will need to be made at different times. Upon maturity, lengths of inoculated heads will be recorded as possible covariates to rating. Seed heads infected with the five most aggressive and five least aggressive isolates will be threshed in a single panicle thresher and individual seedlots analyzed for *in-vivo* DON.

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

NA

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

All isolates collected in North Carolina were identified as *Fusarium graminearum* based on visual characters as described by Nelson et al. (9) and compared to standard cultures. Disease rating, and rate of growth varied greatly among isolates (Table 1). Disease ratings increased with time and percent infection was highest at 20 days after inoculation for most isolates. Disease ratings differed significantly among the three cultivars tested ($p>0.0001$). The resistant cultivar 'Cardinal', consistently showed less disease for each isolate than did the more susceptible 'Wakefield' and 'Caldwell'. Levels of *in-vivo* DON were lower in the resistant 'Cardinal' cultivar than in the susceptible 'Caldwell' cultivar. No disease occurred in the control inoculations.

Several significant correlations between phenotypic traits of different isolates were observed (Table 2). Disease rating, the location where an isolate was collected, and the cultivar of wheat originally infected with the isolate were correlated. Disease rating showed a lesser correlation with rate of isolate growth. Rate of isolate growth also was correlated with the collection location and the cultivar of wheat originally infected with the isolate.

However, the results reported here are based on only one half of the reps planned and should be considered preliminary until all reps are comlpleted.

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?

There are no fungicide treatments currently available and labeled for use that do an adequate job of controlling head scab in this region. We are testing a number of chemical treatments and application timings to determine if adequate control of head scab can be achieved. Wea re participating in the national fungicide trial by evaluating over twenty total treatments for disease control.

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

Plots were established to evaluate fungicides for control of head scab in the coastal region of North Carolina. Treatments were applied and inoculum applied. However, the spring was abnormally dry and no scab developed.

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

This was one of the driest springs on record in this region. No precipitation occurred for a six week period and it was not possible to induce disease.

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

We were able to reconfigure our spray system by adding twin jet nozzles for better coverage and a spray computer was added to the vehicle to facilitate more constant application speeds and rates.

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 have developed a system where our results are immediately available to the extension small grain specialist in our stare. The small grain breeder in the state also has immediate access to our results. We also put evaluation plots at the site of the statewide field day to insure adequate communication to growers and industry representatives.

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

Our objectives to communicate our first year results were met.

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

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

Communicating our results to growers, industry representatives and other scientists was our primary accomplishment.

Publications and Presentations

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.

None