

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

Cover Page

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Year:	FY2000
Grant Number:	59-0790-9-029
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$45,696.00

Project

Program Area	Objective	Requested Amount
Epidemiology	Develop a genetic map of G. zeae.	\$45,696.00
	Requested Total	\$45,696.00

Principal Investigator

Date

Project 1: Develop a genetic map of *G. zeae*.

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

Although *Gibberella zeae* (*Fusarium graminearum*) is one of the most important plant pathogens in the world, relatively little is known about the genetics and population structure of this organism. As we attempt to devise control strategies against this intractable pathogen, we need to consider the potential for the fungus to evolve countermeasures. Our long-term goals are: 1) to understand the evolutionary potential of *G. zeae* to adapt to control measures such as fungicides, biocontrol agents, and cultivar resistance; and 2) to study the genetics of ecologically or agriculturally important traits of the pathogen.

Specific objectives were: 1) construct a genetic linkage map of *G. zeae* using amplified fragment length polymorphism (AFLP) markers; 2) use the map to determine the location of genes that control mycotoxin type and amount, 3) correlate linkage groups to physical chromosomes, and 4) use the map to study the diversity of *G. zeae* in different portions of the northern Corn Belt.

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

Objective 1: We have constructed a genetic map with 441 marker loci on nine linkage groups. The total map distance is 1036 centimorgans. A putative inversion was found on linkage group 2 differentiating the Kansas and Japanese parents of the mapping cross.

Objective 2: In cooperation with Nancy Alexander and Ron Plattner at USDA-ARS, we have mapped the deoxynivalenol/nivalenol switch to the trichothecene biosynthetic cluster. The cluster maps to linkage group 1. A new locus was discovered that controls toxin amount and it was unlinked to the trichothecene cluster.

Objective 3: Initial attempts to separate chromosomes on CHEF gels revealed one small (2 MB) chromosome, but larger chromosomes were not resolved. Therefore, we have not yet been able to correlate linkage groups with physical chromosomes.

Objective 4: We have compared genetic fingerprints of populations of *G. zeae* from Kansas, Illinois, Ohio, Virginia, and the Red River Valley of North Dakota and Minnesota. Although a high degree of genetic variability was detected, the populations all appeared to be similar. This suggests a high degree of gene flow between populations.

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

Objective 3 has not been accomplished because we have not yet developed an adequate protocol to separate chromosomes of this fungus. Work is continuing on this objective.

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

A. Constructed genetic linkage map of *G. zeae*, the scab fungus.

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- B. Discovered and mapped two genes controlling toxin type and amount.
- C. Found that populations of *G. zea* from across the Corn Belt appear to be well mixed.

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Progress Report

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.

Oral presentation at the International Symposium on Wheat Improvement for Scab Resistance

Bowden, R. L., Zeller, K. A., and Leslie, J. F. 2000. Population structure of *Gibberella zeae* in the Great Plains of North America. Pages 211-213 in Proceedings of the International Symposium on Wheat Improvement for Scab Resistance, 5-11 May, Suzhou and Nanjing, China. W. J. Raupp, Z. Ma, P. Chen, and D. Liu, eds. 282 pp.

Poster presentation at APS annual meeting in New Orleans:

Jurgenson, J. E., Bowden, R. L., Zeller, K. A., and Leslie, J. F. 2000. AFLP linkage map of *Gibberella zeae*. (abstract). *Phytopathology* 90:S40.

The following newsletter article discussed our mapping project:

Trail, F. 2000. *Fusarium graminearum*: the head scab fungus: an update on genetics and genomics. *IS-MPMI Reporter*, August, 2000. Pages 1-2.