U.S. Wheat and Barley Scab Initiative
FY02 Final Performance Report (approx. May 02 – April 03)
July 15, 2003

Cover Page

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Project

Program Area	Project Title	USWBSI Recommended Amount
EDM	Diversity of North and South American and Korean populations of Gibberella zeae.	$26,336
	Total Amount Recommended	**$26,336**

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Principal Investigator Date

(Form – FPR02)

Project 1: Diversity of North and South American and Korean populations of Gibberella zeae.

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

The major issue being addressed is the homogeneity of *Fusarium graminearum* strains both within the United States and in other agriculturally important portions of the world. We have been using presumably neutral genetic markers, Amplified Fragment Length Polymorphisms or AFLPs, anchored in our genetic map, to measure genetic diversity within populations and to determine if the diversity is uniformly distributed or whether populations in some areas are significantly different from one another. We also have been examining populations from Mexico and South America, where a great deal of winter breeding is done, to determine if wheat planted in these regions is attacked by populations of *G. zeae* that are similar to those found in the United States. Samples from Korea are now being included as well because of the threat that isolates from Asia, or South America and Mexico, might pose to US farmers if global populations are not comparable. Alternatively, the presence of unique strain types in the United States could be used as plant-quarantine type trade barriers that could impact sales of US grain outside the country.

2. What were the most significant accomplishments?

Our published data to date suggest that *G. zeae* populations from the Central United States are very closely related to each other, that extensive gene flow occurs between these populations, and that the genetic diversity in the pathogen inoculum differs little, if any, across fairly large distances or over several years of time. We have found no evidence of genetic differentiation between two populations from fields in Kansas and North Dakota. A larger study involving eight populations from within the United States has been completed and submitted for publication. The results of this study are based on 30 AFLP markers with defined linkage relationships, that we used to determine that there was no evidence for anything other than random mating within the individual populations we were examining, *i.e.* no systematic pattern of linkage disequilibrium was observed. In this manuscript we report that there are minimal, but still statistically significant, differences of 2-3% between these populations. These differences also are correlated with physical difference and may reflect the time it takes for differences in allele frequencies to diffuse across relatively large geographic distances. All of the isolates examined from the United States could be assigned to O'Donnell *et al.*'s Lineage 7 on the basis of similarity with AFLPs (but DNA sequencing of the genes on which the lineages are based has not been done). Analyses of the populations from outside the United States are at a more preliminary stage. Isolates from Mexico are predominantly members of Lineage 3; those from Korea probably represent Lineages 3, 6 and 7; those from South America appear to be dominated by Lineage 7, but to also contain representatives of 1, 2 and 6. The Lineage 7 populations from North and South America appear to be related, but not particularly closely.

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.

Bowden, R. L., K. A. Zeller, J. I. Vargas, G. Valdovinos-Ponce, and J. F. Leslie. 2003. Population structure of *Gibberella zeae* in North, Central and South America. *Proceedings of the Ninth International* Fusarium *Workshop (Sydney, Australia)*, p. 29-30.

Jeon, J.-J., H. Kim, H.-S. Kim, K. A. Zeller, T. Lee, S.-H. Yun, R. L. Bowden, J. F. Leslie, and Y.-W. Lee. 2003. Genetic diversity of *Fusarium graminearum* from maize in Korea. *Fungal Genetics Newsletter* **50(Supplement):**142.

Leslie, J. F. 2003. Fuzzy lines in *Fusarium*. *Proceedings of the Ninth International* Fusarium *Workshop (Sydney, Australia)*, p. 57.

Smith-White, J. L., B. A. Summerell, M. Colville, J. F. Leslie, and L. W. Burgess. 2003. *Gibberella zeae*: Identification of the genetic lineages within Australasia. *Proceedings of the Ninth International* Fusarium *Workshop (Sydney, Australia)*, p. 34.

Zeller, K. A., R. L. Bowden & **J. F. Leslie**. 2003. Diversity of epidemic populations of *Gibberella zeae* from small quadrats in Kansas and North Dakota. *Phytopathology* **93:**874-880.

Zeller, K. A., and J. F. Leslie. 2003. When species concepts collide. *Phytopathology* **93:**S93.

Zeller, K. A., J. I. Vargas, G. Valdovinos-Ponce, J. F. Leslie, and R. L. Bowden. 2002. Population genetic differentiation and lineage composition among *Gibberella zeae* (*Fusarium graminearum*) in North and South America. *Proceedings 2002 National* Fusarium *Head Blight Forum Proceedings*, p. 188.

Zeller, K. A., J. I. Vargas, G. Valdovinos-Ponce, J. F. Leslie, and R. L. Bowden. 2003. Population genetic differentiation and lineage composition among *Gibberella zeae* in North and South America. *Fungal Genetics Newsletter* **50(Supplement):**143.