

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	2005
FY05 ARS Agreement ID:	NA
Agreement Title:	Genetics of Pathogenicity and Fertility in Gibberella zeae.
FY05 ARS Award Amount:	\$ 47,297

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
EDM	Genetics of Pathogenicity and Fertility in Gibberella zeae.	\$ 47,297
	Total Award Amount	\$ 47,297

Principal Investigator

Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

(Form – FPR05)

Project 1: Genetics of Pathogenicity and Fertility in *Gibberella zeae*.**1. What major problem or issue is being resolved and how are you resolving it?**

Gibberella zeae (*Fusarium graminearum*) is the major cause of Fusarium Head Blight. O'Donnell et al. (2000) divided *Gibberella zeae* into seven phylogenetic lineages and these were later extended to nine and given species rank [O'Donnell et al. (2004)]. The objective of this study was to estimate the potential for genetic exchange between these lineages in the laboratory. Crosses were conducted on carrot agar as described by Bowden and Leslie (1999). Three strains of *G. zeae* lineage 7 with an insertion in the *MAT1-2* locus that renders them heterothallic were used as females. Standardized suspensions of macroconidia from strains of each of the nine lineages were used as males to fertilize the females. Ten days after fertilization, carrot agar plates were inverted over water agar plates and fertility was measured by counting ascospores deposited overnight. We also made direct crosses of *nit* mutants derived from tester strains from each of the nine lineages to assess fertility in a more direct manner.

**2. List the most important accomplishment and its impact (how is it being used?).
Complete all three sections (repeat sections for each major accomplishment):****Accomplishment:**

Ascospore production was variable, but depended on particular combinations of strains rather than on lineage. All males from all lineages produced viable progeny with at least two of the lineage 7 female strains. No evidence for consistent fertility barriers between lineage 7 and the others was found. Twenty-four strains representing nine lineages were also crossed as complementary *nit* mutants in a diallel design that confirmed the cross fertility of lineage 7 and the other eight lineages. The following lineage combinations showed at least some cross fertility: 1/4, 1/7, 2/4, 2/7, 3/4, 3/5, 3/6, 3/7, 3/8, 3/9, 4/6, 4/7, 5/7, 6/7, 6/8, 7/8, 7/9. Results for most other combinations of lineages were inconclusive due to poor female fertility of the strains.

Impact:

Laboratory crosses showed that many lineages of *G. zeae* are cross fertile. This suggests that gene flow between the lineages is possible if more than one lineage is present at the same location. The need for erecting separate species for the different lineages of *G. zeae* is questionable.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

These results provide a better understanding of the diversity and biological significance of lineages in *G. zeae*.

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.

Abstracts and meeting presentations:

1. Bowden, R. L., J. F. Leslie, J. Lee, & Y.-W. Lee. 2005. Cross fertility of lineages of *Gibberella zeae*. *Fungal Genetics Newsletter* **52 (Supplement)**: 60.
2. Bowden, R. L., J. F. Leslie, J. Lee, & Y.-W. Lee. 2006. Cross fertility of *Gibberella zeae*. CIMMYT Fusarium Head Blight Workshop on the Global Fusarium Initiative for International Collaboration. March 14-17, 2006. El Batan, Mexico.
3. Leslie, J. F. & R. L. Bowden. 2005. Field populations of *Gibberella zeae*. *Proceedings of the 2005 National Fusarium Head Blight Forum* (Milwaukee, Wisconsin): 166.
4. Leslie, J. F., A. A. Saleh & R. L. Bowden. 2005. Naturally occurring hybrids of *Fusarium graminearum*. *Phytopathology* **95**: s58.