

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
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Cover Page

PI:	Robert Bowden
Institution:	USDA-ARS
Address:	Plant Science and Entomology Research Unit (PSERU) 4008Throckmorton Hall Manhattan, KS 66506 USA
E-mail:	rbowden@ksu.edu
Phone:	785-532-2368
Fax:	785-532-6167
Fiscal Year:	2007
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Test of a Novel Control Method against Fusarium Head Blight.
FY07 ARS Award Amount:	\$ 45,000

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
PGG	Test of Sex Pheromones as a Novel Control Method against Fusarium Head Blight.	\$45,000
	Total Award Amount	\$ 45,000

Principal Investigator

Date

* CBCC – Chemical, Biological & Cultural Control
EEDF – Etiology, Epidemiology & Disease Forecasting
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GET – Genetic Engineering & Transformation
HGR – Host Genetics Resources
HGG – Host Genetics & Genomics
IIR – Integrated/Interdisciplinary Research
PGG – Pathogen Genetics & Genomics
VDUN – Variety Development & Uniform Nurseries

(Form FPR07)

Project 1: *Test of Sex Pheromones as a Novel Control Method against Fusarium Head Blight.*

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

The germination of conidia and ascospores of *Fusarium graminearum* (*Gibberella zeae*) is inhibited by fungal sex pheromones under laboratory conditions. This suggests that pheromone peptides might be able to prevent germination and penetration of plants by *F. graminearum* under natural conditions. For example, a transgenic plant expressing pheromone in the florets could exhibit a novel form of Type I resistance to initial infection. There are many hurdles to overcome, but the first priority is to test the feasibility of this strategy. This proposal aims to determine optimum conditions for spore inhibition by the pheromone and then conduct infection inhibition tests by applying pheromones onto wheat spikes.

**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:

We found that germination of conidia in the laboratory was inhibited for 24 hours at concentrations of 40 μmol of the *ppg1* pheromone peptide from *G. zeae*. The *ppg1* pheromone peptide from *Neurospora crassa* was more effective and inhibited germination for 24 hr at a concentration of 10 μmol . Synthetic pheromone peptides were produced by substitution of amino acids from the pheromone peptide from *Neurospora* into the peptide from *G. zeae*. Some of the synthetic recombinant peptides were more effective than the natural peptides and were able to inhibit germination for 24 hr at 1 μmol . In growth chamber pathogenicity tests, 100 μmol of *G. zeae* pheromone peptide co-inoculated with conidia into single florets was ineffective at preventing infection.

Impact:

As a result of this work, we know that sex pheromones have important functions in the sexual cycle of *G. zeae*, the fungus that causes Fusarium head blight. Therefore, sex pheromones are a potential target for disease control. Initial attempts to inhibit conidial germination and prevent disease infection with sex pheromones were not successful. Further work is needed to define conditions affecting pheromone inhibition of germination of conidia.

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?:

The functions of sex pheromones in *G. zeae* have been determined. A variety of natural and synthetic fungal sex pheromone peptides have been shown to inhibit germination of conidia and ascospores in the laboratory.

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.

REFEREED JOURNALS

1. Lee, J., J. E. Jurgenson, J. F. Leslie & R. L. Bowden. 2008. Alignment of genetic and physical maps of *Gibberella zeae*. *Appl. Environ. Microbiol.* 74:2349-2359.
2. Lee, J., J. F. Leslie & R. L. Bowden. 2008. Expression and function of sex pheromones and receptors in the homothallic ascomycete *Gibberella zeae*. *Eukaryot. Cell* 7:1211-1221.

ABSTRACTS

1. Lee, J., R. L. Bowden & J. F. Leslie. 2007. Pheromone functions in *Gibberella zeae*. *Fungal Genetics Newsletter* 54(Suppl.):134.
2. Lee, J., J. F. Leslie & R. L. Bowden. 2007. Functions of the sex pheromones of *Gibberella zeae*. *Proceedings of the 2007 National Fusarium Head Blight Forum (Kansas City, Missouri)*:30.