USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY13 Preliminary Final Performance Report – No Cost Extension (NCE)
July 15, 2015

Cover Page

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Fiscal Year:	FY13-NCE
USDA-ARS Agreement ID:	59-0206-2-089
USDA-ARS Agreement Title:	Effects of Defense Peptides on Fusarium Head Blight.
FY13 USDA-ARS Award Amount:	$ 27,698

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
PBG	Effects of Defense Peptides on Fusarium Head Blight.	$ 27,698
	FY13 Total ARS Award Amount	**$ 27,698**

James T. English

7/13/15

Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
WES-CP – Western Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: *Effects of Defense Peptides on Fusarium Head Blight.*

1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?

In this project, we are testing the concept that antifungal, mating pheromone peptides can be used to suppress infection of wheat by sexually-produced ascospores of *Gibberella zeae* or macroconidia of the asexual pathogen form, *Fusarium graminearum*. Previous work in John Leslie's laboratory showed that pheromone mating peptides produced by *G. zeae* inhibit infectious ascospores. Initial work in this project confirmed this inhibitory potential in vitro and expanded its effect to infectious macroconidia. Subsequent project work conducted under laboratory conditions showed that mating peptides protected wheat heads in point inoculation experiments, i.e. pathogen inoculum and mating peptides placed together in the floral tube (stigmatic channel).

In subsequent greenhouse experiments, we tested the ability of spray-applied candidate inhibitory peptides to protect wheat from infection by *F. graminearum*. Unfortunately, the results were negative.

We suggested that lack of protection could be the result of inadequate tissue coverage by spray-applied peptides, run-off of peptides in sprayed water, or degradation of the peptides when exposed to the wheat surface environment over time. We further suggested that it may be necessary to create transgenic wheat that expresses the peptides within tissues to better evaluate the efficacy of the peptides. If produced in tissues, the peptide could be expressed more stably and be better positioned to interact with the invading pathogen.

Consequently, we set the goal of creating gene constructs containing inhibitory mating pheromone peptides for the purpose of plant transformation and peptide expression in planta.

2. List the most important accomplishments and their impact (i.e. how are they being used) to minimize the threat of Fusarium Head Blight or to reduce mycotoxins. Complete both sections; repeat sections for each major accomplishment:

Accomplishment: After reviewing a panel of John Leslie's inhibitory mating pheromone peptides, two have been initially selected for incorporation into constructs for transformation. The selected peptides include one inhibitory mating pheromone derived from *G. zeae* and a second peptide derived from *Neurospora crassa*. The constructs are now being designed to enable transformation of wheat and also for transformation of Arabidopsis.

Impact: Completed constructs will be made available for transformation of wheat and *Arabidopsis*, and subsequent disease resistance evaluations.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY13-NCE award period. The term "support" below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student's stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY13-NCE award period?**
   No
   If yes, how many?

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY13-NCE award period?**
   No
   If yes, how many?

3. **Have any post docs who worked for you during the FY13-NCE award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
   None
   If yes, how many?

4. **Have any post docs who worked for you during the FY13-NCE award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
   None
   If yes, how many?

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY13-NCE award period. List the release notice or publication. Briefly describe the level of FHB resistance. *If not applicable because your grant did NOT include any VDHR-related projects, enter N/A below.*

N/A

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 FY13-NCE grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

None