

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY07 Final Performance Report (approx. May 07 – April 08)  
July 15, 2008**

**Cover Page**

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<b>Fiscal Year:</b>	2007
<b>USDA-ARS Agreement ID:</b>	59-0790-6-066
<b>USDA-ARS Agreement Title:</b>	Structural and Functional Studies of Trichothecene Biosynthetic Enzymes.
<b>FY07 ARS Award Amount:</b>	\$ 52,683

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
PGG	Development of Improved Enzymes for the Inactivation of Trichothecene Toxins.	\$52,683
	<b>Total Award Amount</b>	<b>\$ 52,683</b>

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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

**Project 1:** *Development of Improved Enzymes for the Inactivation of Trichothecene Toxins.*

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

The major goal for the past fiscal year was to develop an improved enzyme for inactivating fungal mycotoxins. It was planned to utilize the three-dimensional structure of trichothecene 3-*O*-acetylase from *F. sporotrichioides* and *F. graminearum* (Tri101) as a framework to develop a modified enzyme with improved efficacy towards the inactivation of DON and nivalenol. Progress towards this goal was assisted by a kinetic analysis of these isozymes that clearly indicated that an improved enzyme could be made. The work utilizes a combination of biomolecular structural engineering coupled with kinetic and thermodynamic measurements.

**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:**

The most important accomplishment was the determination of the structure of trichothecene 3-*O*-acetylase from *F. sporotrichioides* and *F. graminearum* (Tri101) coupled with an analysis of the kinetic properties of these enzymes. This has allowed improved enzymes to be designed, developed, and tested that show greater thermal stability than the wild type enzyme and a better kinetic profile for the toxins found in the USA.

**Impact:**

The improved enzymes have the potential to create a transgenic barley or wheat that shows greater resistance to FHB.

**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?:**

As a consequence of the studies performed in this proposal it is possible to propose why the earlier transgenic wheat and barley that utilized Tri101 were not effective. These studies provide a better enzyme for inactivating trichothecene mycotoxins which can be tested in future studies.

**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.**

J Biol Chem. 2008 Jan 18;283(3):1660-9. Epub 2007 Oct 8. Structural and functional characterization of the TRI101 trichothecene 3-O-acetyltransferase from *Fusarium sporotrichioides* and *Fusarium graminearum*: kinetic insights to combating *Fusarium* head blight. Garvey GS, McCormick SP, Rayment I.