

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY13 Final Performance Report
July 15, 2014**

Cover Page

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Fiscal Year:	FY13
USDA-ARS Agreement ID:	59-0206-1-117
USDA-ARS Agreement Title:	Structural and Functional Studies of Trichothecene Biosynthetic Enzymes.
FY13 USDA-ARS Award Amount:	\$ 24,943

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
PBG	Development and Testing of Improved Enzymes for Transgenic Control of FHB.	\$ 24,943
	FY13 Total ARS Award Amount	\$ 24,943

Principal Investigator

July 8th, 2014

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
 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: *Development and Testing of Improved Enzymes for Transgenic Control of FHB.*

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

The primary goal of this proposal is to develop improved enzymes for the inactivation and degradation of fungal mycotoxins associated with Fusarium head blight and test their efficacy in barley. Over the past seven years we have established a biochemical, structural and mechanistic framework for optimizing the application of the trichothecene 3-*O*-acetylase (TRI101) as a transgene for inactivating trichothecenes *in vivo*. We have determined that earlier trials with this enzyme in wheat and barley utilized a suboptimal isoform. An improved enzyme based on a thermally stabilized form of TRI101 from *F. graminearum* is undergoing transformation into barley to test whether this avenue will provide resistance to Fusarium infection. This is exciting because the new enzyme is at least 70 fold more active towards DON than the previous enzyme.

In parallel studies the structure and function of UDP glucosyltransferase enzymes have been investigated. These have been shown to have great promise as agent for control of FHB.

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:

Development of an improved version of TRI101 that is being transfected into Barley to examine if it will provide enhanced resistance. This is an ongoing study.

Investigation of the fundamental biochemical properties of trichothecene biosynthetic enzymes (TRI101 and TRI3)

Impact:

It remains to be seen if TRI101 will be effective as a method of reducing the impact of FHB or whether genetically modified cereals will be accepted by the general public. Even so, demonstration that the effects of FHB can be reduced by genetic modification would confirm the long term potential for this approach

FY13 (approx. May 13 – May 14)

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PI: Rayment, Ivan

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

None