USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY12 Final Performance Report
July 16, 2013

Cover Page

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Fiscal Year:	FY12
USDA-ARS Agreement ID:	59-0206-1-117
USDA-ARS Agreement Title:	Structural and Functional Studies of Trichothecene Biosynthetic Enzymes.
FY12 USDA-ARS Award Amount:	$ 24,967*

USWBSI Individual Project(s)

USWBSI Research Category**	Project Title	ARS Award Amount
PBG	Development and Testing of Improved Enzymes for Transgenic Control of FHB.	$ 24,967
	Total ARS Award Amount	**$ 24,967**

Ivan Rayment

July 11, 2013

Principal Investigator Date

* Award Amount does not include additional funding awarded in September of 2012 earmarked for other PIs at same institution

** 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?

This project is directed towards developing improved enzymes that can mitigate or inactivate the trichothecene mycotoxins. These enzymes will be introduced first into barley and then into wheat to demonstrate if they can reduce the impact of Fusarium Head Blight.

2. List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):

Accomplishment:

The major accomplishment is the development of a more stable version of trichothecene 3-*O*-acetylase **(**TRI101) which is known to be ~70 times more active towards DON than enzymes that have previously been introduced into wheat and barley. This enzyme is being transferred into barley for in vivo testing of its efficacy. In addition the structure of a rice UDP-glucosyltransferases that detoxifies DON has been determined in collaboration with Gary Muehlbauer. Efforts are underway to expand the specificity of this enzyme through protein engineering. Finally, a screen for trichothecene biodegradative enzymes has been developed which is being used to identify bacterial enzymes that detoxify DON by deepoxidation to form deepoxy-4-deoxynivalenol. A series of bacteria that exhibit this activity are being screened in collaboration with Zhou Ting.

Impact:

This approach may establish the feasibility of generating GM barley and wheat that are resistant to FHB

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.

None