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:	NA
USDA-ARS Agreement Title:	Functional Dissection of FHB Resistance in Wheat and Barley.
FY13 USDA-ARS Award Amount:	$ 69,748

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Engineering Improved Fusarium Head Blight Resistance.	$ 69,748
	FY13 Total ARS Award Amount	**$ 69,748**

July 13, 2014

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
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: *Engineering Improved Fusarium Head Blight Resistance.*

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

The work funded in this project will define which wheat and barley genes play functional roles in the resistance mechanism to scab. Some of these genes are likely to be useful in engineering improved resistance to 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:

During 2013 we discovered that the ethylene-signaling pathway is critical in a second disease of wheat and barley, Fusarium crown rot. Experiments with both wheat and barley demonstrated that inhibition of ethylene perception makes plants more susceptible to crown rot, while stimulating ethylene signaling by application 1-amino cycloprane-1-carboxylic acid (ACC) reduces disease significantly.

Impact:

These studies are our first indications that the ethylene-signaling effects on we have observed in wheat on defense against Fusarium are paralleled in barley. Therefore, our efforts to exploit this pathway for FHB resistance should be applicable for all small grain cereals. Furthermore, these new findings point to strategies for improving crown rot resistance. And, an additional impact relates to improving the speed and effectiveness of our research. Being able to use the crown rot disease to unravel the role of ethylene signaling in defense against Fusarium offers important advantages over the FHB assay. The crown rot assay is performed with seedlings and can be scored by more quantitative methods.

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.

Presentation: "Functional evidence of a critical role for ethylene-signaling in basal resistance to Fusarium head blight," United States Wheat and Barley Scab Initiative National Forum, December 4, 2013.

Walter, S, Kahla, A, Arunachalam, C, Khan, MR, Scofield, SR and Doohan, FM. A wheat ABC transporter contributes to both grain development and mycotoxin tolerance. In review, J. Exp. Bot.

Ali, S, Gunupuru, LR, Kumar, SGB, Khan, MR, Scofield, SR, Nicholson, P, and Doohan, FM. Plant disease resistance is augmented in uzu barley lines modified in the brassinsteroid receptor BRI1. In review BMC Plant Biology.