

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY14 Final Performance Report
July 15, 2015**

Cover Page

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Fiscal Year:	FY14
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Functional Dissection of FHB Resistance in Wheat and Barley.
FY14 USDA-ARS Award Amount:	\$ 57,000

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Harnessing the Basal Defense Pathway to Improve Fusarium Head Blight Resistance.	\$ 57,000
	FY14 Total ARS Award Amount	\$ 57,000

Steve R Scofield

Principal Investigator

July 1, 2015

Date

* MGMT – FHB Management
 FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
 GDER – Gene Discovery & Engineering Resistance
 PBG – Pathogen Biology & Genetics
 EC-HQ – Executive Committee-Headquarters
 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: *Harnessing the Basal Defense Pathway to Improve 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 the wheat and barley genes and signaling pathways that have crucial functions in the resistance mechanism to scab. Some of these genes are likely to be useful in engineering improved resistance to FHB on their own, or when combined with existing FHB resistance QTL.

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:**

Our work has demonstrated that ethylene signaling is crucial for resistance to Fusarium head blight (FHB) and a second disease of wheat caused by *Fusarium graminearum*, Crown rot (CR). A very significant difference in these two diseases is that CR assays may be performed with wheat seedlings, while FHB assays must be performed with plants grown to flowering. Multiple wheat genotypes with varying levels of resistance and susceptibility to CR have been tested and a common pattern has been observed. Genotypes that are susceptible become more resistant when ethylene signaling is stimulated by treatment with the chemical ACC, while genotypes that are resistant become susceptible when treated with the inhibitor of ethylene perception, 1-MCP. This is the same relationship between ethylene signaling and resistance that we have observed for FHB in wheat. We now have RNA-seq studies that compare gene expression changes during wheat's resistant and susceptible interactions in FHB and CR, and analysis will reveal the extent to which these mechanisms are similar.

Impact:

The impact of these findings is currently limited to the experimental work underway to understand and improve FHB resistance, however a seedling based system that could be used to explore FHB resistance mechanisms would greatly aid FHB research.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY14 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 FY14 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 FY14 award period? Yes**

If yes, how many? One

- 3. Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant taken faculty positions with universities? No**

If yes, how many?

- 4. Have any post docs who worked for you during the FY14 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies? No**

If yes, how many?

Include below a list of all germplasm or cultivars released with full or partial support of the USWBSI during the FY14 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 FY14 grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Walter S, Kahla A, Arunachalam C, Perochon A, Khan MR, Scofield SR, Doohan FM. (2015) A wheat ABC transporter contributes to both grain formation and mycotoxin tolerance. *J Exp Bot.* 66:2583-93.

Gunupuru R, Ali SS, Doohan FM, Scofield SR. (2015) Virus-induced gene silencing (VIGS) in barley seedling leaves. *Bio-protocol* 5(12) e1506. <http://www.bio-protocol.org/e1506>.