

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
July 15, 2011**

Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Functional Dissection of FHB Resistance in Wheat and Barley.
FY10 USDA-ARS Award Amount:	\$ 58,000

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Exploring the Role of Ethylene Signaling in FHB Resistance and Susceptibility.	\$ 48,000
BAR-CP	High Efficiency Method for Generating FHB-Resistant Barley: Removing Bottlenecks in the Pipeline for Deploying FHB Resistance Genes.	\$ 10,000
	Total ARS Award Amount	\$ 58,000

Steve R Scofield

7-11-2011

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: *Exploring the Role of Ethylene Signaling in FHB Resistance and Susceptibility.***1. What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

The goal of this project is identify the key genes functioning genetic pathways functioning in pathways providing resistance to Fusarium head blight (FHB) in wheat. The genes identified in this work will then be overexpressed in transgenic wheat to generate improved FHB resistance.

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:**

We have gathered extensive data using chemical treatments of wheat that either increase or decrease ethylene-signaling. The chemical treatments reducing ethylene signaling confirm or virus-induce gene silencing studies down-regulating ethylene signaling genes, and result in strong conversion of resistance to susceptibility. Chemical treatments that increase ethylene signaling were observed to improve the FHB resistance of susceptible wheat varieties, strongly supporting the strategy we have for engineering FHB resistance.

Impact:

Our findings correct recently published work that held that Fusarium exploited ethylene signaling in cereals to initiate infection. Our findings will put the research community back on the correct track. If our transgenic plants overexpressing ERF and TaPEIP prove to have useful anti-FHB activity this will have significant positive impact for reducing the loses from FHB.

Project 2: *High Efficiency Method for Generating FHB-Resistant Barley: Removing Bottlenecks in the Pipeline for Deploying FHB Resistance Genes.*

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

The goal of this project is develop more efficient transformation protocols for barley and to use these methods to quickly test the best candidate transgenes for anti-FHB activity in barley

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:

Transgene constructs expressing TaERF, TaPEIP, TaBAK1 and TaBRI1 have been transferred to the Dahleen lab for transformation into barley

Impact:

Barley has very limited sources of genetic resistance to FHB. If any or all of these constructs prove successful as anti-FHB sources it would have a major positive impact for countering the devastating consequences of 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.

Cakir, C., Gillespie, M, and **Scofield, SR**. Rapid determination of gene function by virus-induced gene silencing in wheat and barley. *Crop Sci.* 50: 77-84. 2010.

- Presented the talk “Ethylene-signaling has an essential role in resistance to Fusarium Head Blight” at the 58th Annual Soft Wheat Quality Workshop, Wooster, OH, March 9, 2011.
- Presented the keynote talk “Progress in the development of BSMV-VIGS as a tool for rapid assessment of cereal gene function” at the International Cereal VIGS Workshop, Rothamsted Research, Harpenden, United Kingdom, June 22, 2011.
- Presented the seminar “Dissecting the major disease resistance pathways of cereal crops” to the Department of Plant Biology and Pathology, Rutgers University, New Brunswick, NJ April 29, 2011.