USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY11 Final Performance Report
One-Year No Cost Extension (NCE) through FY12
July 16, 2013

Cover Page

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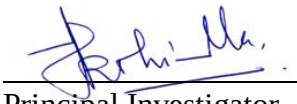
Fiscal Year:	FY11 (NCE for FY12)
USDA-ARS Agreement ID:	59-0206-1-118
USDA-ARS Agreement Title:	Proteomic Dissection of RILs for the Discovery of Scab Responsive Genes in Wheat.
FY11 USDA-ARS Award Amount:	$ 14,634

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Proteomic Dissection of RILs for the Discovery of Scab Responsive Genes in Wheat.	$ 14,634
	Total ARS Award Amount	**$ 14,634**



July 16, 2013
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: *Proteomic Dissection of RILs for the Discovery of Scab Responsive Genes in Wheat.*

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

   When FHB/scab spores attack the wheat plant and start establishing there successfully, myriad of events take place inside the wheat plant's cell. Our hypothesis is that in resistant lines of wheat plant, some key proteins are favorably differentially regulated (up or down regulated) compare to the susceptible wheat lines. Presently, in this direction very little is known at molecular level. Through this project our main focus was to discover scab responsive wheat plant genes by studying a resistant near isogenic line (NIL) and a susceptible NIL (kindly provided by Dr. Gary Muehlbauer, University of Minnesota) and subject them to the proteomic experimental pipeline to discover the proteins (and finally the corresponding genes) differentially regulated before and after the scab infections. Since *Fusarium* isolates vary in cultural characteristics and ability to cause scab, a mixture of local islolate was being used as inoculum (kindly provided by Dr. Yang Yen, South Dakota State University). Infected young heads were collected at different time intervals along with uninfected control (sprayed with water and broth only). The harvested samples were snap frozen in liquid nitrogen and stored at minus 80^{o}C till further experiments. We isolated total protein from both- prior infection stage and after infection stage. The total proteins from the samples were subjected to a cutting-edge proteomic technique 2 dimensional – differential in gel electrophoresis (2D-DIGE) to discover the differentially regulated proteins in resistant versus susceptible NIL of wheat.

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):**

   <u>Accomplishment:</u>

   Our 2D-DIGE approach was novel in this field and has resulted in the identification of 20 protein spots differentially expressed between the susceptible and the resistant NILs of wheat. The mass spectrometric identification of the protein spots were more interesting where we have discovered 7 genes that seems to be critical for deciding the resistance or susceptibility of the wheat plant. These seven genes were further re-validated with quantitative PCR (Q-PCR) method.

   <u>Impact:</u>

   1. New knowledge generated by the experiment will enhance our understanding of wheat-FHB interactions significantly.
   2. The newly discovered genes could be used by wheat breeders to screen the germplasm and apply "Marker assisted selection" approach in their future breeding programs.

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.

1. Eldakak, M., A. Roy, Y. Zhuang, K. Glover, S. Ali, Y. Yen, and J.S. Rohila. 2012. Proteomic dissection of near isogenic lines for the discovery of scab responsive genes of wheat. Poster presentation at National Fusarium Head Blight Forum, Orlando, FL. pp 133.
2. Ali, S., M. Eldakak, P. Gautam, K. Glover, J.S. Rohila, J. Gonzalez, W. Berzonsky.2012. *Gibberrella zeae* Chemotype Diversity on Moderately FHB Resistant Wheat Genotypes in South Dakota. In: Canty, S., A. Clark, A. Anderson-Scully and D. van Sanford (Eds.), Proceedings of the 2012 National Fusarium Head Blight Forum. pp. 115-117.