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

Cover Page

PI:	Bernd Friebe
Institution:	Kansas State University
Address:	Department of Plant Pathology 4024 Throckmorton Manhattan, KS 66506-5502
E-mail:	friebe@k-state.edu
Phone:	(785) 532-2364
Fax:	
Fiscal Year:	FY14
USDA-ARS Agreement ID:	59-0206-4-022
USDA-ARS Agreement Title:	New Sources of Resistance to FHB and DON.
FY14 USDA-ARS Award Amount:	$ 19,546

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
HWW-CP	New sources of Resistance to FHB and DON in Wheat.	$ 19,546
	FY14 Total ARS Award Amount	**$ 19,546**

June 3, 2015

Principal Investigator 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: *New sources of Resistance to FHB and DON in Wheat.*

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

There are only a few sources of resistance to FHB available for wheat improvement. The proposed research is aimed at identifying new sources of FHB resistance in wild relatives of wheat and using directed chromosome engineering to produce agronomically useful compensating wheat-alien translocations, which are then being transferred into adapted wheat cultivars.

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:

We have identified a novel source of FHB resistance from *Leymus racemosus*, *Fhb3*, that was transferred to wheat in the form of the Robertsonian translocation T7AL·7Lr#1S and the recombinant chromosomes rec124 T7AL·7Lr#1S-7AS and rec989 T7AL·7AS-7Lr#1S. *Fhb3* has been transferred into the adapted wheat cultivar Fuller. A second new source of FHB resistance was derived from *Elymus tsukushiensis* and transferred to wheat in the form of the compensating translocation T1AL·1AS-1E^{ts}#1S. The FHB resistance gene present in T1AL·1AS-1E^{ts}#1S was designated as *Fhb6*. Molecular markers were developed that will allow to monitor the transfer of *Fhb6* into adapted wheat cultivars.

Impact:

Fhb3 and *Fhb6* have been transferred to the winter wheat cultivars Fuller and Everest and have been made available to more than 20 wheat breeding programs in the US and also worldwide, together with the molecular marker information, which will allow to transfer these genes into locally adapted wheat cultivars.

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?**

   If yes, how many? None

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?**

   If yes, how many? Joey Cainong, PhD defended in 2014

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?**

   If yes, how many? None

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?**

   If yes, how many? Dr. Lili Qi, Research Geneticist, USDA-ARS, Fargo, ND

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.

NOTICE OF RELEASE OF KS14WGRC61 FUSARIUM HEAD BLIGHT-RESISTANT WHEAT GERM PLASM, THE KANSAS AGRICULTURAL EXPERIMENT STATION MANHATTAN, KANSAS, 2014.

KS14WGRC61 is homozygous for a distal wheat-*E. tsukushiensis* recombinant chromosome TWL·WS-1E^{ts}#1S, consisting of the complete long arm and most of the short arm of a wheat chromosome and a distal segment derived from 1E^{ts}#1S. The E^{ts}#1S segment in this translocation has a gene that confers type-2 resistance to FHB. The TWL·WS-1E^{ts}#1S stock is a novel source of FHB resistance and may be useful in wheat improvement. Small quantities (3 grams) of seed of KS14WGGRC61 are available upon written request. We request that the appropriate source be given when this germ plasm contributes to research or development of new cultivars. Seed stocks are maintained by the Wheat Genetics Resource Center, Throckmorton Plant Sciences Center, Kansas State University, Manhattan, KS 66506.

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.

Qi LL, Pumphrey MO, Friebe B, Chen PD, Gill BS. Molecular cytogenetic characterization of alien introgressions with gene *Fhb3* for resistance to Fusarium head blight disease of wheat. Theor Appl Genet 117: 1155-1166.

Bockus WW, Friebe B, Gill BS. 2010. Reaction of winter wheat accessions containing *Fhb3* and selected cultivars to Fusarium head blight, 2009. Plant Disease Management Reports. Report 4:CF012. DOI: 10.1094/PDMR04. The American Phytopathology Society, St. Paul, MN.

Cainong JC, Bockus WW, Feng Y, Chen PD, Qi LL, Sehgal SK, Danilova TV, Koo D-H, Friebe B, Gill BS, 2015. Chromosome engineering, mapping, and transferring of resistance to Fusarium head blight disease from *Elymus tsukushiensis* into wheat. Theor Appl Genet 128:1019-1027.