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

**Cover Page**

<table>
<thead>
<tr>
<th>PI:</th>
<th>Bernd Friebe</th>
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<tbody>
<tr>
<td>Institution:</td>
<td>Kansas State University</td>
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</table>
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| 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)**

<table>
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<tr>
<th>USWBSI Research Category*</th>
<th>Project Title</th>
<th>ARS Award Amount</th>
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<tr>
<td>HWW-CP</td>
<td>New sources of Resistance to FHB and DON in Wheat.</td>
<td>$ 19,546</td>
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| FY14 Total ARS Award Amount | $ 19,546 |

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June 3, 2015
Principal Investigator Date

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* 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\1Ets\1S. The FHB resistance gene present in T1AL\1AS\1Ets\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.


KS14WGRC61 is homozygous for a distal wheat-\textit{E. tsukushiensis} recombinant chromosome TWL-WS-1E\textsuperscript{b}\#1S, consisting of the complete long arm and most of the short arm of a wheat chromosome and a distal segment derived from 1E\textsuperscript{b}\#1S. The E\textsuperscript{b}\#1S segment in this translocation has a gene that confers type-2 resistance to FHB. The TWL-WS-1E\textsuperscript{b}\#1S stock is a novel source of FHB resistance and may be useful in wheat improvement. Small quantities (3 grams) of seed of KS14WGGR61 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.

