

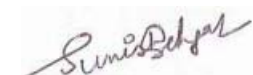
**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY14 Final Performance Report  
July 15, 2015**

**Cover Page**

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<b>Fiscal Year:</b>	FY14
<b>USDA-ARS Agreement ID:</b>	59-0206-4-004
<b>USDA-ARS Agreement Title:</b>	Breeding Winter Wheat for FHB Resistance in South Dakota.
<b>FY14 USDA-ARS Award Amount:</b>	\$ 41,367

**USWBSI Individual Project(s)**

<b>USWBSI Research Category*</b>	<b>Project Title</b>	<b>ARS Award Amount</b>
HWW-CP	Enhancing FHB Resistance and Reducing DON in Winter Wheat for South Dakota.	\$ 41,367
	<b>FY14 Total ARS Award Amount</b>	<b>\$ 41,367</b>



Principal Investigator

7/14/15

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:** *Enhancing FHB Resistance and Reducing DON in Winter Wheat for South Dakota.*

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

Fusarium head blight (FHB) epidemics are frequent in South Dakota. Scab infected wheat exhibit reduced yield and grain quality which can lead to significant economic losses. Strong FHB resistance must be combined with high yield and high quality to impact the hard winter wheat industry. Several native sources of resistance are being combined with *Fhb1* to develop new genotypes with improved FHB resistance. Hard winter wheat germplasm and experimental breeding lines are evaluated in a mist-irrigated FHB inoculated field nursery. Only the most resistant breeding lines with the lowest disease index, FDK, and DON content are being advanced. Crosses are being developed based on the FHB screening data. The scab data from inoculated nursery is shared with other breeding programs, and level of FHB resistance of released and currently grown cultivars is reported to producers during field days.

**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:** Approximately 100 hybridizations were made involving locally adapted native sources of resistance such as Lyman, Overland, and Everest, and other adapted genotypes with QTL *Fhb1*. Wesley-Fhb1 backcrosses were evaluated for yield and other agronomic characteristics in the field in Brookings and Dakota Lakes, SD and in the mist-irrigated inoculated FHB nursery. Three breeding lines resulting from crosses with Wesley-FHB1 were advanced in Preliminary Yield Trials and one entry showed better scab resistance when compared to Lyman and will be screened again in following year. Approximately 1,000 rows were screened in a mist-irrigated and inoculated field nursery in Volga, SD, including breeding lines and DH lines from SDSU breeding programs and materials from regional nurseries (Northern Hard Winter Wheat FHB Public and Private Nurseries, Northern Regional Performance Nursery, and Regional Germplasm Observation Nursery). A total of 264 samples were analyzed for DON content and one SDSU experimental had lower DON when compared to Lyman. The breeding line will be tested again in the consecutive year 2015.

**Impact:** Breeding materials with better scab resistance and superior yield will be moved to next breeding cycle and parents for new crosses identified. In latest Regional FHB Evaluation Nursery, of 48 entries evaluated for FHB resistance by Kansas State University SDSU breeding lines SD8080, SD9140, SD9227 showed moderate level of resistance comparable to that of Everest. Ultimately this effort is expected to lead to the release of FHB resistant winter hardy cultivars and result in reducing grower losses due to FHB epidemics across the region.

Dr. Sehgal, new winter wheat breeder at SDSU took over the grant from October 2014.

### **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? No**

**If yes, how many?**

- 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? N/A**

**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? N/A**

**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.**

Cainong JC, Bockus WW, Feng Y, Chen P, Qi L, Sehgal SK, Danilova TV, Koo D, Friebe B, Gill BS (2015) Chromosome engineering, mapping, and transfer of native grass resistance to Fusarium Head Blight disease into wheat. *Theor Appl Genet* **128**:1019-27

Thurston Y, Eckard JT, Glover KD, Anderson JA, Mergoum M, Caffè M, Ali S, Sehgal SK, Marais FG, Gonzalez-Hernandez J (2014) Validation of Fusarium Head Blight resistance QTLs in wheat using double haploids derived from four-way crosses, National Fusarium Head Blight Forum, December 7-9, 2014, St. Louis, MO

Gill BS, Cainong J, Feng Y, Chen PD, Qi LL, Danilova TV, Koo D-H, Sehgal SK, Bockus W, Friebe B (2014) Chromosome engineering and next generation sequencing assisted transfer and deployment of alien grass species resistance to FHB in wheat. National Fusarium Head Blight Forum, December 7-9, 2014, St. Louis, MO