USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY09 Final Performance Report
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Cover Page

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Fiscal Year:	2009
USDA-ARS Agreement ID:	59-0206-9-052
USDA-ARS Agreement Title:	Spring Wheat Breeding Scab Resistance in South Dakota.
FY09- USDA-ARS Award Amount:	$ 72,659

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-SPR	Spring Wheat Breeding Scab Resistance in South Dakota.	$ 72,659
	Total Award Amount	**$ 72,659**

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 Winter Wheat Region
SWW – Southern Sinter Wheat Region

Project 1: *Spring Wheat Breeding Scab Resistance in 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) is a serious wheat disease that continues to pose a threat to production within South Dakota as well as the North Central region of the USA. In an attempt to alleviate this threat, development of resistant cultivars has became a high priority within the spring wheat breeding program at South Dakota State University. An aggressive program was initiated to speed development of spring wheat cultivars with improved FHB resistance and desirable agronomic traits. Established off-season nurseries and mist-irrigated greenhouse and field screening nurseries are utilized to accelerate breeding efforts to improve resistance along with desirable agronomic characteristics. Three early generations of breeding materials are evaluated for resistance each year: two generations in the greenhouse and one in the field. Approximately 8,000 individual hills are evaluated in the greenhouse nurseries and 3,000 head-rows are screened in the field nursery. Both the field and greenhouse nurseries are inoculated with infested corn and conidial suspensions. A mist-irrigation system is used to provide a favorable environment for infection and disease development. Each year we approximately 400 crosses to introduce new resistance genes and create new resistance gene combinations. Sources of resistance used in the crosses include material from the Uniform Regional Scab Nursery (URSN) for spring wheat parents, (a cooperative regional effort to identify and utilize sources of scab resistance) newly identified germplasm provided through introduction and evaluation efforts, other introduced sources, as well as both cultivars and advanced breeding lines with various levels of resistance. The off-season nursery aids in the simultaneous selection for resistance and desirable agronomic characteristics.

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:

Our program has provided elevated levels of resistance to FHB in the form of Hard Red Spring Wheat (HRSW) cultivars and germplasm made available to regional growers and other breeders that wish to utilize the germplasm Within the past several years, four cultivars have been released to growers by our program. Over four years of simultaneous testing, the FHB disease index ratings recorded for ‘Briggs’, ‘Granger’, ‘Traverse’, ‘Brick’, and ‘Select’ were 30.2, 37.0, 31.4, 17.9, and 27.0, respectively, compared to ‘Sumai 3’, (16.8) the resistant check.

Impact:

Elevated resistance levels in released cultivars are immediately utilized by the most apparent beneficiaries of our work; HRSW producers. Through utilizing cultivars with elevated resistance levels, growers are more able to protect themselves from suffering complete devastation of fields in the presence of a severe FHB epidemic. Elevated resistance levels in germplasm is also quite often utilized by a less immediately apparent group; HRSW

breeders. Through utilizing both germplasm and released cultivars, other breeding programs strive to further increase FHB resistance among germplasm pools that will eventually result in the release of continually improved cultivars.

Include below a list all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance.

Glover K. D., J. C. Rudd, R. N. Devkota, R. G. Hall, Y. Jin, L. E. Osborne, J. A. Ingemansen, J. R. Rickertsen, D. D. Baltensperger, and G. A. Hareland. 2010. Registration of 'Brick' Wheat. Journal of Plant Registrations 4:22-27.

Brick HRSW is our most FHB resistant cultivar release. Over four years of simultaneous testing, the FHB disease index ratings recorded for 'Briggs', 'Granger', 'Traverse', 'Brick', and 'Select' were 30.2, 37.0, 31.4, 17.9, and 27.0, respectively, compared to 'Sumai 3', (16.8) the resistant check.

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.

Stein, J.M., L.E. Osborne, K.D. Bondalapati, K.D. Glover, and C.A. Nelson. 2009. Fusarium Head Blight Severity and Deoxynivalenol Concentration in Wheat in Response to Gibberella zeae Inoculum Concentration. Phytopathology. 99:759-764.

Rosyara, U.R., J.L. Gonzalez, K.D, Glover, K. Gedye, and J.M. Stein. 2009. Family-based mapping of quantitative trait loci in plant breeding populations with resistance to Fusarium head blight in wheat as an illustration. Theor. Appl. Genet. 118:1617-1631.

Malla, S., A.M.H. Ibrahim, and K.D. Glover. 2009. Diallel analysis of Fusarium head blight resistance in wheat. J. Crop Improvement. 23:213–234.

Malla, S., A.M.H. Ibrahim, Y. Yen, W. Berzonsky, K.D. Glover and J. Stein. 2010. Quantitative trait loci analysis of novel Fusarium head blight resistance in Tokai 66. Am. J. of Agric. and Biol. Sci. 5:62-69.