USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
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Cover Page

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Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-5-078
USDA-ARS Agreement Title:	Screening and Developing Wheat Germplasm with Resistance to Scab.
FY08 USDA-ARS Award Amount:	$ 27,542

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-SWW	Development of Wheat with Resistance to Scab Adapted to the Mid-Atlantic.	$27,542
	Total Award Amount	**$ 27,542**

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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
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: *Development of Wheat with Resistance to Scab Adapted to the Mid-Atlantic.*

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

The major problem being addressed is the need to develop rapidly and effectively host resistance to scab (Fusarium Head Blight) from exotic sources into adapted soft red winter wheat (SRWW) germplasm. The approach to address this problem is to backcross, and to three-way cross the Sumai 3 allele and other exotic resistance alleles into adapted SRWW lines and varieties. Marker-assisted selection (MAS) is being used to rapidly incorporate Sumai 3 (from Ning7840) resistance into SRWW lines such as McCormick, that have wide adaptation in the Southern and Eastern US wheat growing regions and moderate resistance to scab. Over 800 Backcross-2 F2 seedlings were screened for SSR markers at the USDA in Raleigh (NC) in collaboration with Dr. Gina Brown-Guedira at that National Genotyping Center. Of these, a single BC2F3s was selected that had Ning7840 alleles at the 3BS, 5A and 2DL genomic regions. F3 progenies were further screened in 2008, selected homozygous BC2F3s were planted in the field in the fall of 2007 in our inoculated nursery. Incidence and severity of scab were scored in the spring of 2008 and tested for DON.

Additionally, selected BC-1F1s were crossed with the wheat cultivar SS 8641 that has wide adaptation as well as leaf and stripe rust resistance. The BC1 F1 seeds were screened with markers in 2007-2008 and the BC1-F2s selected progenies were advanced in the growth chamber. Selected homozygous BC1F3s for the 3BS, 5A and 2DL genomic regions, were planted in the field in the fall of 2008.

Furthermore, screening of MD (University of Maryland) wheat advanced lines was conducted under field conditions in an inoculated nursery at Salisbury (MD). Conditions favorable for disease development were aided with daily misting before and during wheat flowering. The scab inoculum was scabby corn grain spread in the field a month before flowering. The Southern wheat scab and Northern Uniform Scab Screening nurseries that include new experimental lines were also screened for resistance at Salisbury (MD) with artificial inoculation and misting. Data for all nurseries was obtained for scab incidence, scab severity, Fusarium damaged kernels, seed weight, plant height, heading date, and DON levels.

The complete set of genotypes in the MD wheat state test were screened for resistance at Salisbury (MD) with artificial inoculation and misting. Data for the wheat state test was obtained for scab incidence, scab severity, Fusarium damaged kernels, seed weight, plant height, heading date, and DON levels. Results were published online in 2008.

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 (1): Incorporation of the 3BS, 5A and 2DL quantitative trait loci (QTL) of resistance to scab from Sumai3 into adapted soft red winter wheat germplasm such as McCormick and SS8641. In the fall of 2008, F_4 seed of McCormick and SS8641 derivatives with scab QTLs were distributed to eight breeding programs (AR, GA, KY, LA, NC, VA, Agripro and Westbred) for crossing and further evaluation.

Impact: the availability of these germplasm with resistance will reduce scab negative effects in years favorable to scab development.

Accomplishment (2) Evaluation of the complete set of genotypes in the MD wheat state test screened for Fusarium head blight resistance at Salisbury (MD) and scab resistance data published online.

Impact: the availability of this information regarding the resistance of currently grown wheat varieties will allow farmers to select varieties based on scab resistance.

Accomplishment (3): Identification of MD breeding lines with low DON such as MD01W233-06-1.

Impact: the line is widely available to other breeding program for the development of low DON germplasm.

Accomplishment (4): the combination of scab-resistant QTLs in 3BS and 2DL conferred the lowest deoxynivalenol (DON) content among isogenic lines of wheat.

Impact: this wheat line that combines 3BS and 2DL scab resistant QTLs will be available to other breeding program for the development of low DON germplasm and the availability of this information regarding combination of QTLs will also aid breeders developing low DON germplasm.

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.

Kang, J. And Costa, J. 2008. Development of scab resistant wheat germplasm using molecular marker assisted selection. Field testing of NILs. Bioscience Research and Technology Annual Review Day at the University of Maryland (http://www.bioscienceday.umd.edu)

Costa, J., Kang, J., Clark, A., Van Sanford, D., Griffey, C., and Brown-Guedira, G. 2008. Introgression of Exotic QTL into Soft Red Winter Wheat Using Marker-Assisted Selection and Evaluation of Near-isogenic Lines for Scab Resistance. Proceedings of the 2008 Fusarium Head Blight Forum p.157. Indianapolis, IN.

If your FY08 USDA-ARS Grant contained a VDHR-related project, 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. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

Breeding line MD01W233-06-1 is being considered for release. It has moderate resistance to incidence and severity and low DON.