USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY07 Final Performance Report (approx. May 07 – April 08)
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Cover Page

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Fiscal Year:	2007
USDA-ARS Agreement ID:	59-0790-4-094
USDA-ARS Agreement Title:	Hastening the Development of Specialty Spring Wheats with Resistance to Fusarium Head Blight.
FY07 ARS Award Amount:	$ 33,476

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
IIR	Pyramiding Host Genes to Reduce DON and Develop Scab Resistant Spring Wheat.	$33,476
	Total Award Amount	**$ 33,476**

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Principal Investigator Date

* CBCC – Chemical, Biological & Cultural Control
EEDF – Etiology, Epidemiology & Disease Forecasting
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GET – Genetic Engineering & Transformation
HGR – Host Genetics Resources
HGG – Host Genetics & Genomics
IIR – Integrated/Interdisciplinary Research
PGG – Pathogen Genetics & Genomics
VDUN – Variety Development & Uniform Nurseries

Project 1: *Pyramiding Host Genes to Reduce DON and Develop Scab Resistant Spring Wheat.*

1. What major problem or issue is being resolved and how are you resolving it?

Spring wheat genotypes which express a single major source of resistance to fusarium head blight (FHB) may not provide the maximum level of resistance or provide the greatest reduction in deoxynivalenol (DON). Hence, using molecular markers, we identified doubled-haploid lines and developed spring wheat breeding lines which combine or pyramid two different sources of FHB resistance. This project was designed to assess whether or not resistance to FHB has been enhanced as a result of combining the Sumai-3 source of FHB resistance with a source of resistance from *Triticum dicoccoides*.

2. List the most important accomplishment and its impact (how is it being used?). Complete all three sections (repeat sections for each major accomplishment):

Accomplishment:

Two related spring wheat lines, designated NDSW0714 and NDSW0715, were developed such that they contained one and two QTL for FHB resistance, respectively. In three separate greenhouse experiments, spikes of NDSW0714 and NDSW0715 were injected with *Fusarium graminearum* and compared for expression of resistance. Resistance to FHB was assessed by measuring disease severity, percent fusarium-damaged kernels (FDK), and DON content. Across all experiments, the mean disease severity rating of NDSW0715 at 21 days after inoculation was 8.3%, which was significantly lower than the 17.6% rating for NDSW0714. Mean FDK and DON content measurements of the lines were not significantly different.

Impact:

Few studies have examined the impact of pyramiding different genes with resistance to FHB into a single genotype. Since pyramiding genes for resistance from different sources and developing acceptable varieties is not necessarily an easily accomplished breeding task, particularly if at least one source derives from alien germplasm, it is important to determine if pyramiding enhances resistance. Results of this study indicate that there could be a significant benefit derived from pyramiding genes, which is demonstrated by a decrease in the level of disease severity over time. It provides information that will help breeders determine if pyramiding genes will be useful in developing host plant resistance to FHB, and it ultimately will result in the release of a spring wheat germplasm line which combines two different genes for resistance to FHB. It also demonstates that molecular markers can be effectively employed to pyramid different genes, despite these genes expressing a similar Type II phenotypic resistance to FHB.

As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:

The scientific community now has a better understanding of how two different genes for resistance to FHB interact in the host wheat plant to enhance the level of resistance to FHB and potentially reduce the production of DON. The use of molecular markers to effectively pyramid different genes validates this approach for plant breeders who might be interested in combining genes that still express a similar type of phenotypic resistance. Seed of NDSW0715 is being increased with plans to release it as germplasm and both NDSW0714 and NDSW0715 are being tested in statewide and regional FHB nurseries. Once released, NDSW0715 will provide wheat breeders with potential parental material in which the Sumai-3 and *Triticum dicoccoides* sources of resistance to FHB have been "packaged" together in an adapted type, similar in phenotype to Alsen spring wheat.

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.

Berzonsky, W.A., B.L. Gebhard, E. Gamotin, G.D. Leach, and S. Ali. A reciprocal backcross monosomic analysis of the scab resistant spring wheat (Triticum aestivum L.) cultivar, 'Frontana'. Plant Breed. 126:234-239.

Berzonsky, W.A., E.L. Gamotin, and G.D. Leach. 2007. Enhancing host resistance to fusarium head blight: Pyramiding genes in spring wheat. ASA-CSSA-SSSA Annual Meetings - New Orleans, LA (Poster presentation).

Berzonsky, W.A., E.L. Gamotin, G.D. Leach, and T Adhikari. 2007. Enhancing host resistance to fusarium head blight: Pyramiding genes in spring wheat. USWBSI Annual Meetings - Kansas City, MO (Poster presentation).