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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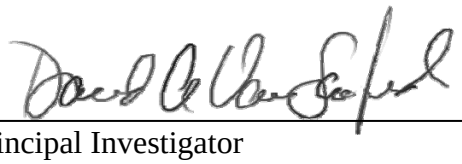
Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-4-127
USDA-ARS Agreement Title:	Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.
FY08 USDA-ARS Award Amount:	$ 62,784

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
VDHR-NWW	Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.	$60,495
VDHR-NWW	Mapping Fusarium Head Blight Resistance in Truman Wheat.	$ 2,289
	Total Award Amount	**$ 62,784**



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: *Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.*

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

   This project addresses the need for FHB resistance in soft red winter wheat varieties adapted to Kentucky. Many varieties grown in our region are susceptible to FHB; thus, Kentucky wheat producers and end users are at risk for severe economic losses as a result of head scab epidemics.

   This breeding process involves: 1) evaluating germplasm and breeding lines as parents for FHB resistance; 2) incorporating known resistance into crosses with elite, high yielding lines and cultivars, and 3) evaluating resistance in the progeny of the crosses. We evaluate early generation populations in inoculated nurseries so that only resistant segregates are brought forward and developed into lines that can be evaluated for the usual array of traits at multiple locations.

   Field evaluation is carried out at two locations: Lexington, under mist irrigation with inoculum provided by the scabby corn method, and at Princeton in a non-irrigated nursery with a combination of conidial spray and scabby corn as inoculum sources.

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): Approximately 37 single seed descent lines homozygous for *Fhb*1 resistance were planted in replicated 2nd year yield tests at multiple locations for during the period covered by this grant.

   Impact: These lines will provide breeders with additional germplasm and parental lines to use in crosses for the development of scab resistant germplasm and varieties. The combination of *Fhb*1 and native resistance QTL will be especially useful.

   Accomplishment (2): Approximately 40 breeding lines and varieties were grown at two locations, Lexington and Princeton in inoculated scab nurseries in the presence and absence of Prosaro fungicide.

   Impact: There is no more critical decision for growers than the choice of a resistant variety. This must be coupled with the decision to use fungicides when conditions warrant. This study addresses these decisions head on and gives KY growers valuable information.

   Accomplishment (3): Approximately 69 breeding lines in the cooperative Mason Dixon nursery (VA, MD, NC, KY) were grown in a mist irrigated, inoculated scab nursery at Lexington for purposes of FHB phenotyping.

Impact: The data generated from this type of nursery allows breeders to compile a reliable scab profile for their breeding lines and facilitates more informed selection and release decisions.

Accomplishment (4): Approximately 3500 rows including UK breeding lines, varieties, populations, accessions and recombinant inbred lines were grown in a mist irrigated, inoculated scab nursery at Lexington for purposes of FHB phenotyping.

Impact: This procedure allows us to eliminate very susceptible lines from the breeding program early on and allows us to increase resistance in segregating populations prior to line derivation. There is no substitute for accurate phenotyping

Accomplishment (5): Approximately 20 populations were subjected to recurrent phenotypic selection in the mist irrigated, inoculated scab nursery at Lexington.

Impact: This procedure increases resistance in the population by the time we are ready to derive inbred lines.

Accomplishment (6): Approximately 796 crosses were made in the winter greenhouse. All of them involved at least 1 scab resistant parent.

Impact: This will generate populations and lines with increased and diverse resistance that will benefit other breeding programs as well as our own.

Accomplishment (7): Fhb1 was backcrossed (BC2) into seven different recurrent parent backgrounds.

Impact: This effort will combine outstanding yield potential with known, QTL derived resistance.

Project 2: *Mapping Fusarium Head Blight Resistance in Truman Wheat.*

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

   Truman is one of the best examples of native resistance that we have in soft winter wheat. To use it successfully as a parent however, we must be able to recover that resistance in the progeny of crosses with other lines. DNA markers that are linked to the resistance genes would greatly aid the process.

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:

   We phenotyped approximately 225 recombinant inbred lines from a cross of Truman x a susceptible parent.

   Impact:

   This phenotypic data will expedite the mapping process and allow us to determine in a relatively short time if there are DNA markers that can be used to tag the resistance genes and thus speed up the breeding process.

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.

Peer Reviewed:

Brown-Guedira, Gina, Carl Griffey, Fred Kolb, Anne McKendry, J. Paul Murphy and David Van Sanford. 2008. Breeding FHB-Soft Winter Wheat: Progress and Prospects. In Zoltan Dertesz (Eds), *Cereal Research Communications*, 36(B). Budapest, Hungary: Akademiai Kiado. pp. 31-35.

Non-Peer Reviewed:

Andres Agostinelli, Anthony Clark, Gina Brown-Guedira, Yanhong Dong and David Van Sanford. 2008. Genotypic and Phenotypic Selection for Head Scab Resistance in Wheat. In: Canty, S., A. Clark, J. Mundell, E. Walton and D. Van Sanford (Eds.). 2008. *Proceedings from the 2008 National Fusarium Head Blight Forum*, Indianapolis, IN; December 2-4. Lexington, KY: University of Kentucky. p .129.

Andres Agostinelli, Nicki Mundell and David Van Sanford 2008. Percentage of Fusarium Damaged Kernels Measured by Air Separation. In: Canty, S., A. Clark, J. Mundell, E. Walton and D. Van Sanford (Eds.). 2008. *Proceedings from the 2008 National Fusarium Head Blight Forum*, Indianapolis, IN; December 2-4. Lexington, KY: University of Kentucky. p. 133.

Jose M. Costa, Jing Kang, Anthony Clark, David Van Sanford, Carl Griffey and Gina Brown-Guedira. 2008. Introgression of Exotic QTL into Soft Red Winter Wheat using Marker-Assisted Selection and Evaluation of Near-Isogenic Lines for Scab Resistance. In: Canty, S., A. Clark, J. Mundell, E. Walton and D. Van Sanford (Eds.). 2008. *Proceedings from the 2008 National Fusarium Head Blight Forum*, Indianapolis, IN; December 2-4. Lexington, KY: University of Kentucky. p. 157.

Shuyu Liu, Marla D. Hall, Carl A. Griffey, Anne L. McKendry, Jianli Chen and David Van Sanford. 2008. Mapping QTL for Scab Resistance in the Virginia Wheat Cultivar Massey. In: Canty, S., A. Clark, J. Mundell, E. Walton and D. Van Sanford (Eds.). 2008. *Proceedings from the 2008 National Fusarium Head Blight Forum*, Indianapolis, IN; December 2-4. Lexington, KY: University of Kentucky. pp. 178-179

Invited Talks:

Van Sanford, David. 2008. Breeding FHB-Resistant Soft Winter Wheat: Progress and Propectus. 3rd International Symposium on Fusarium Head Blight and 10th European Fusarium Seminar. Szeged, Hungary. September 1-5, 2008.

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.

'Pembroke' soft red winter wheat was released to growers for the first time in the fall of 2008. Release notice is in preparation.