USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY05 Final Performance Report (approx. May 05 – April 06)
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Cover Page

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Fiscal Year:	**2005**
FY05 ARS Agreement ID:	**59-0790-4-127**
Agreement Title:	**Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.**
FY05 ARS Award Amount:	**$ 56,203**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
VDUN	Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.	$ 56,203
	Total Award Amount	**$ 56,203**

7/14/06

Principal Investigator Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

(Form – FPR05)

Project 1: *Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.*

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

The problem being resolved is the lack of resistance to Fusarium head blight (FHB) or head scab in soft red winter wheat varieties adapted to Kentucky. Most varieties grown in our region are susceptible to FHB. Kentucky wheat producers and end users are at risk for severe economic losses as a result of head scab epidemics.

We are attempting to resolve this problem by breeding scab-resistant wheat varieties. After enduring back-to-back natural epidemics in 2003 and 2004, much of the very susceptible material was discarded from the breeding program. This enhanced selection pressure was a good thing in that it affected material at all stages of development, from F_1s to advanced lines. The negative consequences of the severe pressure were manifest in the reduced number of lines that we had to work with and the reduced genetic diversity at our disposal. In other words, the breeding program is in something of a rebuilding phase.

This breeding process involves every year: 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 are also evaluating F_2 and F_3 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. We have been working with the USDA-ARS genotyping lab in Raleigh, NC to identify single seed descent lines from a number of crosses which are homozygous for the Sumai 3 resistance.

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. We also use the greenhouse, but primarily for confirmation of type II resistance

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: A major accomplishment has been the development of a successful working relationship with the Raleigh genotyping lab to identify single seed descent lines that are homozygous for the Sumai 3 type II resistance. We were able to combine the genotyping with a fast-track summer greenhouse program so that we will have seed to plant in replicated tests this fall from a number of lines.

Impact: This will have a big impact on our breeding program in terms of the way we approach population and line development. By tracking the resistance genes with markers we will take to the field only those lines which we know have the resistance genes of interest. It will also allow us to combine the Sumai 3 resistance with “native” resistance.

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?:

Breeders will begin to adopt this technology more widely as they become aware that it is being used successfully and routinely in the development of scab resistant germplasm and varieties.

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.

Knott, C. and D. A. Van Sanford. 2005. Evaluation of Fusarium head blight resistance in soft red winter wheat. Proceedings of the 2005 National Fusarium Head Blight Forum, December, 11-13, Milwaukee, WI, p. 53.

Brown-Guedira, G., L. Perugini, C. Sneller, F. Kolb, D. Van Sanford, C. Griffey, and H. Ohm. 2005. Phenotypic and genotypic analysis of scab resistance in soft red winter wheat germplasm. Proceedings of the 2005 National Fusarium Head Blight Forum, December, 11-13, Milwaukee, WI, p. 19.

D. A. Van Sanford. 2006. Wheat breeding update. Presented at the UK Wheat Science Winter Meeting, January 10, Princeton, KY.

Verges, V. L., D. A. Van Sanford, and G. Brown-Guedira. 2006. Heritability Estimates And Response To Selection For Fusarium Head Blight Resistance In Segregating Populations Of Soft Red Winter Wheat. Crop Sci. 46: 1587-1594.

Van Sanford, D. A., J. Connelley, C. S. Swanson, B. Kennedy, C. R. Tutt, L. J. Tomes, D. E. Hershman, C. Gaines, Y. Jin, H. E. Bockelman, and S. E. Cambron. 2006. Registration of 'Allegiance' wheat. Crop Sci. 46 (*In Press*).