USDA-ARS / USWBSI
FY04 Final Performance Report
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Cover Page

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Year:	**FY2004** (approx. May 04 – April 05)
FY04 ARS Agreement ID:	**59-0790-4-127**
FY04 ARS Agreement Title:	**Accelerating the Development of FHB-Resistant Soft Red Winter Wheat Varieties.**
FY04 ARS Award Amount:	**$ 50,566**

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.	$ 50,566
	Total ARS Award Amount	**$ 50,566**

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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

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?

Problem: The problem being resolved is the lack of resistance to Fusarium head blight (FHB) in soft red winter wheat. Most cultivars grown in the eastern wheat region are susceptible to FHB and therefore wheat producers and end users are at risk for severe economic losses.

Methods of resolution: Our approach to solving this problem is to develop FHB-resistant wheat varieties. This multi-stage process involves: 1) characterizing germplasm and breeding lines as parents in terms of their ability to contribute FHB resistance genes to crosses; 2) making crosses with elite, high yielding lines and cultivars, and 3) evaluating resistance in the progeny of the crosses. We are also evaluating recurrent selection in populations that contain the Sumai 3 resistance at a low frequency so that resistance is maintained without reducing adaptation and productivity. This material is screened for FHB resistance in the greenhouse and at multiple field locations. For the period covered by this grant, we carried out and evaluated **among** and **within**-family selection in three recurrent selection populations at two locations, evaluated 12 FHB isolates at a third location and in the greenhouse, and screened hundreds of lines and populations for combined Type I/ Type II resistance using the scabby corn method of inoculation in the field.

2. What were the most significant accomplishments?

Accomplishment: One of the problems with using the Sumai 3 source of resistance is that because it comes from a spring wheat background, it is often not associated with desirable end use quality for a SRW wheat background. Further, there is concern about extensive reliance on this one source of resistance, due to the issue of genetic vulnerability. Therefore, we have been using three populations, one of which segregates for the Sumai 3 resistance (based on marker genotype) for recurrent selection studies to compare progress in selecting for FHB resistant Sumai 3 and non-Sumai 3 populations. Among and within-family recurrent selection was conducted and evaluated at two locations in the field in 2004. The results for within-family selection were 13.8%, 21.9% and 5.8% reduction in FHB severity for populations 1,2 (the Sumai 3 population), and 3 respectively. For the among-family selection, the 20% of the lines with the lowest severity in 2003 were evaluated in 2004. In population 1, only 3 of these had lower severity than the unselected population; in population 2, 7 of 8 were better than the check, and population 3, 6 of 8 were better than the unselected check population.
Impact: This is the first time that recurrent selection has been shown to be effective in this sort of breeding material. It is important to show that selection for resistance can be effective in populations that are not segregating for the Sumai 3 resistance, because that gives them more breeding options. However the data shows that selection response is enhanced by the Sumai 3 resistance.

As a result of this accomplishment: Breeders now have knowledge about the effectiveness of recurrent selection in SRW populations that they did not have before, and they have some evidence that non-Sumai 3 populations may produce viable FHB resistant lines.

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 you grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Virginia Verges, A. J. Stewart, Dave Van Sanford. 2004. Fusarium Head Blight of Wheat: Breeding for Resistance. Presentation at the 2004 Wheat Science Field Day, May 18, Princeton, KY.

Verges, V.L. and D.A. Van Sanford. 2004. Improvement of Fusarium head blight resistance in three winter wheat populations using a recurrent selection scheme. Proceedings of the 2004 National Fusarium Head Blight Forum, December, 11-15, Orlando, FL.

Stewart, A.J., C. Knott, and D. A. Van Sanford. 2004. Screening for FHB resistance in an Epidemic Year. Proceedings of the 2004 National Fusarium Head Blight Forum, December, 11-15, Orlando, FL.

D. A. Van Sanford. 2005. Genetics of head scab resistance. Presented at the UK Wheat Science Winter Meeting, January 11, Princeton, KY.

A. J. Stewart and D. A. Van Sanford. 2005. DON Analysis and sampling. Presented at the UK Wheat Science Winter Meeting, January 11, Princeton, KY

Argyris, J., D. TeKrony, D. Hershman, D. Van Sanford, M. Hall, B. Kennedy, M. Rucker, C. Edge. 2005. Fusarium head blight infection following point inoculation in the greenhouse compared to movement of *Fusarium graminearum* in seed and floral components. Crop Sci. 45: (626-634).

Browne, R. A., J. P. Murphy, B. M. Cooke and D. Devaney, C. A. Griffey, J. A. Hancock, S. A. Harrison, P. Hart, F. L. Kolb, A. L. McKendry, E. A. Milus, C. Sneller, D. A. Van Sanford. 2005. Identification of Fusarium Head Blight Resistance in Soft Red Winter Wheat Germplasm Using a Detached Leaf Assay. Plant Dis. 89:404-411.