USDA-ARS / USWBSI
FY03 Final Performance Report (approx. May 03 – April 04)
July 15, 2004

Cover Page

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Year:	**FY2003 (approx. May 03 – April 04)**
FY03 ARS Agreement ID:	**59-0790-9-054**
FY03 ARS Agreement Title:	**Fusarium head blight management in the Midsouth.**
FY03 ARS Award Amount:	**$ 57,561**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Chemical and Biological Control of FHB on Wheat in Arkansas.	$ 6,829
VDUN	Developing FHB-Resistant Wheat Cultivars for the Midsouth.	$ 50,732
	Total Amount Recommended	**$ 57,561**

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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: ***Chemical and Biological Control of FHB on Wheat in Arkansas.***

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

The objective is to identify fungicides and biological control agents that are effective against FHB of wheat. To resolve this objective I am participating in the Uniform Fungicide Test coordinated by the Chemical and Biocontrol Committee. I also participate in the analysis of results across locations for the Uniform Fungicide Test that is presented at the Scab Forum.

2. What were the most significant accomplishments?

For the Uniform Fungicide Test conducted in Arkansas, five treatments (JAU6467 at 3.6 fl oz + Folicur at 4 fl oz, Folicur at 4 fl oz, V-10116 at 8 fl oz, JAU6467 at 5.7 fl oz, and JAU6467 at 5 fl oz) significantly reduced FHB plot severity compared to the non-treated control. These five treatments also significantly increased yield. Heavy rainfall after plot severity data were recorded caused FHB to increase on all treatments late in the season. Consequently, there were no differences among treatments for percentage of scabby grain. These results support previous findings that several fungicides effectively control FHB symptoms on winter wheat for 3-4 weeks after application, but that no fungicide applied at early flowering can protect wheat through harvest when conditions are favorable for FHB late in the season.

For the Uniform Fungicide Test results analyzed across locations, efficacy on spring wheat was found to be greater than efficacy on winter wheat. Percent control values for all variables (results made relative to the non-treated control) ranged from 32 to 67% and from 7 to 48% for spring and winter wheat, respectively. Percent control values for DON (the most important variable) averaged 43% and 26% for spring and winter wheat, respectively. These differences may be due to the longer grain-filling period for winter wheat compared to spring wheat that requires a longer period of protection. This may explain why efficacy on spring wheat generally has been higher than on winter wheat since the beginning of the Uniform Fungicide Tests. JAU6467 and V-10116 generally were more effective than Folicur (current standard), indicating that efficacy in commercial fields would improve if these fungicides were registered.

Project 2: ***Developing FHB-Resistant Wheat Cultivars for the Midsouth.***

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

The major problem is that most wheat cultivars adapted to the Midsouth are susceptible to head blight. A few cultivars have some FHB resistance, but these are not widely grown because they lack other essential characteristics. The Arkansas program is transferring FHB resistance into adapted genotypes using short-term and long-term approaches. The short-term approach is to cross sources of resistance with adapted lines and identify progeny with resistance and high yield. The long-term approach is to cross or backcross sources of resistance to adapted cultivars with wide adaptation, identify resistant lines, and then intercross resistant lines to obtain higher levels of resistance. We screen wheat breeding lines from the northern and southern uniform scab nurseries for resistance in the field at two locations and for type 2 resistance in the greenhouse. We developed a recurrent selection program for combining resistances from the most resistant and adapted lines that were identified and developed partial diallel populations involving six of the most resistant lines developed in Arkansas.

2. What were the most significant accomplishments?

Nine advanced lines from the Arkansas program were entered in the 2002-03 Uniform Southern Scab Nursery. Averaged across all locations, the best five lines for FHB index were from Arkansas. More importantly, seven of the best eight lines for DON accumulation in the grain were from Arkansas. Marker data (provided by Gina Brown-Guedira in the report for the 2002-03 Uniform Southern Scab Nursery) suggest that the Arkansas lines do not have the resistance QTL on chromosome 3BS, indicating that the Arkansas lines have resistance genes that are different from those in the Sumai 3 and Ning 7840 that are used in many programs. Some of the resistant lines had high yields and were resistant to stripe rust, leaf rust, and/or leaf blotch. These results indicate that the Arkansas program is making excellent progress in the development of FHB-resistant lines that are adapted to the Mid-South.

Other significant accomplishments include a full pipeline of early-generation lines developed for FHB resistance and local adaptation and facilitating the development of FHB-resistant winter wheat cultivars by evaluating lines in the Uniform Northern and Southern Winter Wheat Scab Nurseries for resistance to FHB and foliar diseases.

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.

Hershman, D. E, and E. A. Milus. 2003. Analysis of 2003 Uniform Wheat Fungicide Trials across locations and wheat classes. Pages 76-80 in Proceedings of the 2003 Fusarium Head Bight Forum.

Hershman, D. E, and E. A. Milus. 2003. Performance of Folicur in Uniform Wheat Fungicide Trials, 1998-2003. Pages 81-82 in Proceedings of the 2003 Fusarium Head Bight Forum.

Milus, E. A., Bacon, R. K., Rohman, P., Markell, S., and Kelly, J. 2003. Developing FHB-resistant soft red winter wheat varieties for the Mid-South. Pages 269-274 in Proceedings of the 2003 Fusarium Head Bight Forum.

Milus, E. A., Rohman, P., and Markell, S. 2003. Efficacy of fungicides on FHB of soft red winter wheat in Arkansas, 2003. . Pages 102-103 in Proceedings of the 2003 Fusarium Head Bight Forum.