

**USDA-ARS / USWBSI
FY04 Final Performance Report
July 15, 2005**

Cover Page

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Year:	FY2004 (approx. May 04 – April 05)
FY04 ARS Agreement ID:	59-0790-4-115
FY04 ARS Agreement Title:	Management of FHB in Arkansas.
FY04 ARS Award Amount:	\$ 66,678

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Chemical and Biological Control of FHB on Wheat in Arkansas.	\$ 11,707
VDUN	Developing FHB-Resistant Wheat Cultivars for the Midsouth.	\$ 54,971
	Total ARS Award Amount	\$ 66,678

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 and Biological Control Tests coordinated by the Chemical and Biocontrol Committee.

2. What were the most significant accomplishments?

In spite of inoculation and misting, Fusarium head blight developed only to low severities late in the season, and there were no differences among fungicide or biological treatments for any component of the disease. These results indicate that current treatments applied at the beginning of flowering do not protect soft red winter wheat from the adverse effects of FHB when conditions favor FHB near the end of the season.

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 Fusarium 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 evaluate wheat breeding lines from the 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. We crossed resistant germplasm with adapted varieties to transfer resistance.

2. What were the most significant accomplishments?

We identified four lines that yielded higher than all the check varieties (Pat, Bess, and Truman). All four of these lines had P88288C1-6-1-2, which is reported to be a source of type 1 resistance, as one of the parents. One of these lines, AR97124-4-2, had a two year average yield of 73.6 bu/A compared to 68.9 bu/A for Pat. Data from 2004 indicated it had resistance equal to our germplasm line, AR857-1-2. We have used AR857-1-2 as resistant check because it showed higher levels of resistance than Ernie in the Uniform Southern Scab Nursery.

The Wisconsin Crop Improvement Association requested enough seed of AR93027-3-2 to evaluate state-wide. In a test in 2004 in Wisconsin, this line showed excellent scab resistance, yield and winter hardiness. A small amount of breeder seed was produced in anticipation of a joint release.

A proposal to release six FHB-resistant germplasm lines has been written and will be submitted to the Director's office later this summer. Seed will be freely available and the lines will be registered in *Crop Science*.

Other accomplishments include a full pipeline of early-generation lines developed for FHB resistance, facilitating the development of FHB-resistant winter wheat varieties by evaluating lines in the Uniform Southern Scab Nursery for resistance to FHB and foliar diseases, and recruiting a graduate student to work on the project.

Most important accomplishment and its impact (how is it being used?):

Accomplishment:

FHB resistance from diverse sources, and likely involving several genes different from the Sumai 3 gene on chromosome 3BS, has been incorporated into several breeding lines with reasonable yield, quality, and resistance to other important diseases. Unfortunately, the yields of these lines are not competitive with current varieties that are susceptible to FHB.

Impact:

FHB resistance is now in more suitable genetic backgrounds, and this should facilitate the development of FHB-resistant varieties.

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?:

Winter wheat breeders have access to sources of FHB resistance that are much improved for adaptation, yield, and resistance to other important diseases relative to sources of resistance that were available at the beginning of this project.

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

Browne, R., Murphy, P., Griffey, C., Hancock, J., Harrison, S., Kolb, F., McKendry, A., Milus, E., Sneller, C., and Van Sanford, D. 2004. Evaluation of Fusarium head blight resistance in soft red winter wheat germplasm using a detached leaf assay. *Plant Dis.* 88:1107-1114.

Milus, E.A., Rohman, P.C., and Markell, S.G. 2004. Evaluations for Fusarium head blight resistance as measured by field severity, percentage of scabby seed, DON level, severity in greenhouse inoculations, and resistance to stripe rust and foliar diseases. Pages 11, 13, 18, 19, and 23, respectively. In: Uniform Southern Soft Red Winter Wheat Fusarium Head Blight Screening Nursery Report, 2004. Paul Murphy, Rene Navarro, and Dave Van Sanford, editors. NC State University.

Milus, E.A., Rohman, P.C., and Markell, S.G. 2004. Evaluations for Fusarium head blight resistance as measured by field severity, percentage of scabby seed, DON level, severity in greenhouse inoculations, and resistance to stripe rust and leaf blotch. Pages 13, 15, 17, 18, and 22, respectively. In: Northern Uniform Winter Wheat Scab Nursery Report, 2003-2004. Clay Sneller, Pat Lipps, and Larry Herald, editors. Ohio State University.

Milus, E., Bacon, R., Rohman, P., Markell, S., and Kelly, J. 2004. Contributions of the Arkansas Wheat Program toward the development of FHB-resistant soft red winter wheats. Pages 127-130 in: Proceedings of the 2nd International Symposium on Fusarium Head Blight. Orlando, FL.

Browne, R.A., Murphy, J.P., Cooke, B.M., Devaney, D., Walsh, E.J., Griffey, C.A., Hancock, J.A., Harrison, S.A., Hart, L.P., Kolb, F.L., McKendry, A.L., Milus, E.A., Sneller, C. and Van Sanford, D.A. 2004. Evaluation of Fusarium head blight resistance in US soft red winter wheat germplasm using a detached leaf assay. Page 22 in: Proceedings of the 2nd International Symposium on Fusarium Head Blight. Orlando, FL.

Milus, E.A., Rohman, P., and Markell, S.G. 2004. Efficacy of fungicides and biological control agents in Arkansas, 2004. Pages 359-360 in: Proceedings of the 2nd International Symposium on Fusarium Head Blight. Orlando, FL.

Yuen, G.Y., Bleakley, B.H., Draper, M.A., Jochum, C.C., Milus, E.A., Ruden, K.R., and Sweets, L.E. 2004. Pages 380-382 in: Proceedings of the 2nd International Symposium on Fusarium Head Blight. Orlando, FL.