

**U.S. Wheat and Barley Scab Initiative
 FY00 Final Performance Report (approx. May 00 – April 01)
 July 30, 2001**

Cover Page

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Grant Number:	59-0790-9-054
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$46,829

Project

Program Area	Project Title	Requested Amount
Chemical & Biological Control	Uniform fungicide trials to identify safe products that are effective against FHB.	\$5,000.00
Variety Development	Developing FHB-resistant wheat cultivars for the Midsouth.	\$35,000.00
	Requested Total	\$40,000.00¹

Principal Investigator

Date

¹ Note: The Requested Total and the Award Amount are not equal.

Project 1: Uniform fungicide trials to identify safe products that are effective against FHB.

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

The objective is to identify fungicides, biological control agents (BCAs) and application techniques that are effective against FHB of wheat. To resolve this objective we are participating in the Uniform Wheat Fungicide and BCA Evaluation Test coordinated by Marcia McMullen, evaluating additional fungicide treatments, and analyzing results of the Uniform Wheat Fungicide and BCA Evaluation Test across locations.

2. What were the most significant accomplishments?

In Arkansas, none of the treatments in the 2000 Uniform Wheat Fungicide and BCA Evaluation Test significantly ($P = 0.05$) reduced any FHB variable compared to the nontreated check, but several strobilurin treatments significantly increased the level of DON in the grain. An additional experimental fungicide significantly reduced the incidence of FHB.

Across all locations with useable data, all treatments in the 2000 Uniform Wheat Fungicide and BCA Evaluation Test significantly ($P = 0.05$) reduced field severity compared to the nontreated check, but none of the treatments significantly reduced the percentage of Fusarium-damaged kernels or the level of DON. When locations that included the extra fungicide “Caramba” were re-analyzed, all fungicides significantly reduced field severity and DON, and Stratego, BAS 500F + Folicur, Quadris + Benlate, and Caramba significantly reduced the percentage of Fusarium-damaged kernels. Caramba significantly reduced the level of DON compared to any of the treatments in the uniform test

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 nearly all 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. We are attempting to transfer head blight 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 each of two adapted cultivars with wide adaptation, identify resistant lines, and then intercross resistant lines to obtain higher levels of resistance. We also screen breeding lines from the northern and southern uniform scab nursery for resistance in the field and greenhouse.

2. What were the most significant accomplishments?

During the 2000 season, 210 F₇ and F₈ lines developed using Chinese, Romanian, and South American resistance sources were yield tested in an inoculated nursery. Seed was limited and the yield trials were un-replicated, but results were promising. The top line produced a yield of 84.1 bu/A compared to 63.5 bu/A for the resistant check, 'Ernie.' Several other selections also yielded more than the resistant check. Most of the high yielding lines were derived from crosses using Romanian lines as the source of Fusarium resistance. The 70 highest yielding lines were selected and put into a replicated trial for the 2000-01 season. This test was planted in Stuttgart, AR and inoculated using infected corn. During the winter these same lines were screened in the greenhouse using the direct floret inoculation technique. Data from the yield trials and the greenhouse screening will be integrated to select lines that have the necessary agronomic traits for the Mid-South as well as Fusarium resistance.

Also during the 2000 season, 548 F₅, backcross F₄, or topcross F₄ lines derived mostly from CIMMYT sources of FHB resistance were selected for advancement. However, selection was based primarily on agronomic characteristics and resistance to new races of stripe rust because stripe rust devastated the screening nursery and little FHB developed even though the nursery was inoculated and irrigated. The selected lines were evaluated in the greenhouse for type 2 resistance (two pots with four plants each per entry) along with entries from the Northern and Southern FHB Winter Wheat Nurseries, and the 70 entries from the Arkansas breeding program described above. All of these selected lines and nursery entries were planted in inoculated, irrigated FHB screening nurseries at Fayetteville and Kibler, AR, for evaluation of FHB resistance during the 2001 season. The selected lines also were planted by Steve Harrison in inoculated, irrigated screening nurseries at Winnsboro and Baton Rouge, LA. Ten of the most resistant land races from Eastern Europe that were identified by Paul Murphy were crossed to the same two adapted parents used earlier. Backcrosses to the adapted parents will be made during the summer of 2001. Entries from the Northern FHB nursery were planted in replicated plots in the screening nursery during 2000, but no FHB data were obtained because insufficient FHB developed.

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.

Bacon, R.K., Milus, E.A., Kelly, J.T., Weight, C.T., and Rohman, P.C. 2000. Development of FHB-Resistant Cultivars for the Mid-South. Page 244 in: Proceedings of the 2000 Fusarium Head Blight Forum.

Kelly, J., R. Bacon, and G. Milus. 2001. Breeding for head scab resistance in the Mid-South. Page 24 in: Abstracts of the Fourth National Wheat Industry Research Forum.

Milus, E.A., Bacon, R.K., Prom, L.K, and Weight, C.T. 1999. Developing FHB-resistant wheat cultivars for the Midsouth. Page 180 in: Proceedings of the 1999 Fusarium Head Blight Forum.

Milus, E.A. and McMullen, M. 2000. Analysis of the 2000 Uniform Wheat Fungicide Trials Across Locations. Pages 100-104 in: Proceedings of the 2000 Fusarium Head Blight Forum.

Milus, E.A., Weight, C.T., and Rohman, P.C. 2000. Accumulating genes for resistance to head blight and foliar diseases in soft red winter wheat. Page 85 in: Proceedings of the Durable Disease Resistance Symposium, Wageningen, The Netherlands.

McMullen, M., Milus, E.A., and Prom, L.K. 1999. Uniform Fungicide trials to identify products effective against Fusarium head blight in wheat. Pages 64-68 in: Proceedings of the 1999 Fusarium Head Blight Forum.

Prom, L.K., Milus, E.A., and Weight, C.T. 2000. Efficacy of fungicides for control of Fusarium head blight of wheat in Arkansas, 1999. Fungicide and Nematicide Tests 54:336.