

**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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Year:	FY2000 (approx. May 00 – April 01)
Grant Number:	59-0790-9-056
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$51,707

Project

Program Area	Project Title	Requested Amount
Germplasm Introduction & Enhancement	Maintain a germplasm center.	\$19,960.00
Variety Development & Uniform Nurseries	To enhance variety development of scab resistant varieties.	\$14,513.00
Variety Development	To screen varieties for scab resistance in a uniform nursery.	\$9,784.00
	Requested Total	\$44,257.00¹

Principal Investigator

Date

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

Project 1: Maintain a germplasm center.

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

Southeastern U.S. wheat breeders, producers and end-users are anxious that pro-active measures be taken to avoid a repeat of the Northern Soft Winter and Hard Spring Wheat experiences with Fusarium Head Blight (FHB) during the 1990s. Almost all varieties currently grown in the Southeast are very susceptible. The problem that is being resolved is to find new and diverse sources of resistance to FHB that plant breeders can utilize in their variety development programs. Southeastern breeders have primarily utilized Chinese spring wheat germplasm as their resistance source during the past two years. A basic tenet of breeding for host resistance is to avoid the use of a single, or few, sources of resistance. In addition, the Chinese germplasm has very poor agronomic characteristics for the Southeastern U.S.; thus, it is timely to try to find additional sources of FHB resistance, particularly in a winter background. We are resolving this problem by evaluating cultivated winter wheats from The Balkans where resistance has previously been identified.

2. What were the most significant accomplishments?

We obtained Type 2 and Type 3 resistance data on 513 cultivated wheats from The Balkans. Data were obtained on four heads per line and compared to the best U.S. soft red winter wheat variety Ernie. Approximately 16% of the Balkan materials expressed resistance equal to or superior to Ernie. The Balkan materials were evaluated simultaneously at the University of Missouri by Dr. Anne McKendry and data summarization across locations is not complete. Most of the resistant materials were landraces and came from diverse geographical regions of Serbia. These data will provide U.S. breeders with additional sources of FHB resistance that can be combined with Chinese and U.S. germplasm.

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Project 2: To enhance variety development of scab resistant varieties.

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

Southeastern U.S. wheat breeders, producers and end-users are anxious that pro-active measures be taken to avoid a repeat of the Northern Soft Winter and Hard Spring Wheat experiences with Fusarium Head Blight (FHB) during the 1990s. Almost all varieties currently grown in the Southeast are very susceptible. The problem that is being resolved is to infuse southeastern wheat breeding populations with resistance genes from a diverse array of adapted and exotic sources to increase the overall levels of FHB resistance in Southeastern varieties. The populations are advanced to the F₃ generation when they undergo selection in field nurseries inoculated with scabby corn and spore suspensions under a mist irrigation system.

2. What were the most significant accomplishments?

The most significant accomplishment is that we are operating at the 'critical mass' necessary for a reasonable probability of success in developing FHB-resistant varieties. Greenhouse: 92 three-way F₁ hybrids made combining diverse sources of FHB resistance of Chinese, CIMMYT, Italian, Serbian and U.S. origins with germplasm of southeastern U.S. adaptation and end-use quality. In addition, 36 three-way F₁s were advanced to the F₂ generation. Field nurseries: Visual selection made among F₂ bulks of similar parentage for BYDV tolerance and mildew and leaf rust resistance. Head selections taken from 34 F₂ bulks. Head selections made among 18 F₃ and 5 F₄ populations for propagation of F_{3:4} and F_{4:5} head rows next season. Selection among 2300 F_{4:5} head rows in a misted nursery resulted in 320 lines being advanced.

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Project 3: To screen varieties for scab resistance in a uniform nursery.

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

Southeastern U.S. wheat breeders, producers and millers are anxious that pro-active measures be taken to avoid a repeat of the Northern Soft Winter and Hard Spring Wheat experiences with Fusarium Head Blight (FHB) during the 1990s. Almost all of the current varieties adapted to the Southeast are very susceptible. There is little or no information available to breeders with respect to levels of FHB resistance in their elite, advanced generation breeding lines which would assist them in releasing varieties to growers with improved levels of FHB resistance. To resolve this situation, the First Uniform Southern Soft Red Winter Wheat Fusarium Head Blight Nursery was coordinated out of North Carolina State University during the 1999-2000 growing season. Twenty-two elite breeding lines and varieties submitted by five public and private breeding programs were distributed to nine states for evaluation. Six states returned greenhouse and/or field nursery data. These data were summarized in a nursery report which was distributed to wheat breeders and pathologists in Dec. 2000. The second Uniform Nursery was distributed in fall 2000 to nine public and private cooperators. The number of entries increased to 29 breeding lines and varieties. Data will be summarized and distributed in fall 2001.

2. What were the most significant accomplishments?

Although FHB can be a difficult fungus to work with initially, fully 66% of all cooperators provided greenhouse and/or field data for the first nursery. We strongly recommended that the nursery be grown only if irrigation/misting systems were in place and this advice was followed by cooperators. The cooperators that failed to initiate field epidemics noted that very hot and dry weather accompanied flowering. Significant variation was observed in both greenhouse and field nursery estimates of resistance to FHB among these varieties and elite breeding lines adapted to the Southeast. For example, the two varieties Roane and Coker 9474 and the North Carolina elite line NC96-13965 compared favorably to the most resistant soft wheat standard, Ernie. The nursery report provided southeastern breeders with a comprehensive set of solid data on the performance of their elite breeding materials in the presence of FHB epidemics and identifies adapted materials with reasonable levels of resistance that can be used as parents in trait improvement. For the second nursery distributed in fall 2000, we had an increase in number of cooperators growing the nursery and in the number of entries.

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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.

Murphy, J. P., R. A. Navarro, and G. Sronic. 2000. Uniform Southern Soft Red Winter Wheat Fusarium Head Blight Screening Nursery. Dept. of Crop Science, N. C. State University, Raleigh.

McKendry, A. L., J. P. Murphy, K. Bestgen, and R. Navarro. 2000. Evaluation of Yugoslavian winter wheat germplasm for resistance to Fusarium Head Blight, pp. 215-219. *In* R. W. Ward, S. M. Canty, J. Lewis, and L. Siler (eds.) Proc. of the 2000 National Fusarium Head Blight Forum. The U.S. Wheat & Barley Scab Initiative, Michigan State Univ., East Lansing.