

**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:	59-0790-9-037
Grant Title:	Fusarium Head Blight Research
2000 ARS Award Amount:	\$82,927

Project

Program Area	Project Title	Requested Amount
Variety Development & Uniform Nurseries	To screen varieties for scab resistance in a uniform nursery.	\$10,000.00
Variety Development & Uniform Nurseries	Accelerate the development of resistant varieties.	\$70,211.00
	Requested Total	\$80,211.00¹

Principal Investigator

Date

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

Project 1: 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?

Fusarium head scab continues to be a severe limitation to wheat production in the Midwest and other regions of the US. The purpose of our work is to accelerate the development of scab resistant varieties through the use of disease screening procedures as well as the development and use of molecular marking technology. In the field, germ plasm is evaluated for improved disease resistance by artificially creating epidemics by providing sufficient inoculum and adequate moisture to enhance infection and disease development. Secondly, we are screening domestic as well as exotic germ plasm for scab resistance in order to obtain improved levels of resistance, ultimately for incorporation into soft red winter wheat adapted to Ohio and the Great Lakes region. We are also attempting to develop varieties with resistances to multiple head and leaf diseases. Our aim is to develop varieties with improved partial resistance to *Stagonospora nodorum* as well as to *Fusarium graminearum*.

Scab resistance screening was accomplished using a number of different field nurseries and greenhouse inoculation screening tests. The following material was screened in the field (no. entries/nursery): Advanced breeding lines (200), Resistant by Susceptible crosses (128), Resistant by Resistant crosses (101), Scab resistant by *Stagonospora* resistant crosses (443), Yugoslavian germ plasm (189), and Early generation head row selections (1428). Additionally, the Yugoslavian germ plasm and populations of the Resistant by Susceptible crosses were evaluated in the greenhouse. Molecular markers are being produced using lines from the Resistant by Susceptible cross material. Significant polymorphism has been detected in the populations that correlate with disease severity data.

2. What were the most significant accomplishments?

Our main objective this year was to screen the advanced and early generation germ plasm to identify the more susceptible material and discard it from the program. Only 32% of the advanced material in the program was retained for future variety development. We were also able to make significant progress in selecting the most resistant material from early generation breeding lines from the head row nurseries. Ten Yugoslavian lines from the 189 tested had high levels of resistance and adequate agronomic characters for incorporation into the breeding program. Evaluation of the RXR and RXS populations has been used to determine the inheritance of FHB resistance.

Project 2: Accelerate the development of resistant varieties.

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

The widespread nature of Fusarium head scab and the regional adaptation of wheat varieties requires many scab resistant wheat cultivars to be developed across the winter wheat growing regions of the US. Since scab does not occur in all regions each year, wheat breeders need to have their most promising lines evaluated at numerous locations before releasing them for commercial production. A nursery was established for screening the most elite lines from contributing breeding programs throughout the northern soft red and white winter wheat growing region.

Data from the 1999 evaluations were compiled into a report that was distributed to cooperating breeding programs and interested parties. For 2000, twenty nine breeding lines and cultivars were submitted for testing from seven different breeding programs (New York, Illinois, Virginia, Nebraska, Missouri, Kentucky, Ohio). The submitted lines were organized into a nursery at Ohio State University and distributed to 22 locations (public and private breeding programs) for evaluation. At this time cooperators are submitting results from the 2000 evaluations which was collated into a report for distribution at the annual Fusarium Head Blight Forum in December 2000.

2. What were the most significant accomplishments?

The establishment of the Uniform Wheat Fusarium Head Blight Screening Nursery furthered the assessment of elite breeding lines for resistance to FHB and various agronomic characters including heading date, yield and plant height. The mean incidence for locations ranged from 85.7% to 5.9%. Mean severity for locations ranged from 32.7% to 3.1%. Mean scab index for location ranged from 28.5 to 1.1. Comparison of the overall disease assessments indicated that certain lines had lower incidence, severity index, scabby seed and/ or DON levels (IL95-4162, IL96-3073, IL97-2954, IL96-7654, NY87047W-7387, NY870448-7388 and Ernie).

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.

- 1) Campbell, K. G. and Franchino, B. 1999. Uniform Winter Wheat Fusarium Head Blight Screening Nursery 1999 Nursery Report. The Ohio State University/ OARDC, Horticulture and Crop Science Series 690. 21 p.
- 2) Gupta, A., Campbell, K. G., and Lipps, P. E. 1999. Evaluation of Yugoslavian wheat accessions for resistance to Fusarium head blight. Agronomy Abstracts 91:163 (Abstract).
- 3) Gupta, A., Campbell, K. G. and Lipps, P. E. 1999. Evaluation of Yugoslavian wheat germ plasm for resistance to head scab of wheat. 1999 National Fusarium Head Blight Forum, Sioux Falls, SD. Dec 5-7, 1999. P#53. (Abstract)
- 4) Campbell, K. G., Lipps, P. E., Gupta, A. and Johnston, A. 1999. Truncation selection in the F3 generation for head and kernel symptoms. 1999 National Fusarium Head Blight Forum, Sioux Falls, SD. Dec. 5-7, 1999.
- 5) Lipps, P. E. and Engle, J. S. 2000. 2000 Northern Uniform Winter Wheat Scab Nursery Report. Plant Pathology Department Series 110. November, 2000. The Ohio State University, OARDC.