U.S. Wheat and Barley Scab Initiative
Annual Progress Report
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Cover Page

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Year:	**FY2000**
Grant Number:	**59-0790-9-045**
Grant Title:	**Fusarium Head Blight Research**
Amount Granted:	**$124,960.00**

Project

Program Area	Objective	Requested Amount
Epidemiology	Investigate alternate hosts and moisture effects on inoculum.	$51,538.00
Germplasm	Maintain a germplasm center of scab resistant spring wheat..	$73,422.00
	Requested Total	$124,960.00

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Principal Investigator Date

(Form – PR1)

Project 1: Investigate alternate hosts and moisture effects on inoculum.

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

The overall goal of the project is to understand the sources, production, and survival of scab (Fusarium Head Blight) inoculum to provide a knowledge base for the development of accurate disease forecasting systems and comprehensive disease management strategies. We initiated research to address several specific questions of scab inoculum production and survival: 1) effects of environmental conditions, particularly soil surface moisture/wetness, on inoculum production, 2) inoculum (ascospores) survival and accumulation on plant surface, and 3) the role of alternative hosts in inoculum production.

2. Please provide a comparison of the actual accomplishments with the objectives established.

The levels of moisture/wetness on the soil surface may have the most direct impact on inoculum production because this environmental factor directly interfaces with plant residues on which perithecia are developed. However, we could not measure this important environmental parameter previously because there was a lack of proper instruments. In the past year, we focused on the development of sensors capable of measuring soil surface wetness. A sensor was constructed to measure resistance across a plane between two wires using two sensing elements. When the sensor is placed on, or buried under, soil surface, the measurement of resistance is an indirect measurement of moisture on the soil surface. The sensor is integrated into the CR10X datalogger system, and calibration has been carried out in field and laboratory experiments. The system also monitors other environmental factors, including precipitation, relative humidity, soil and air temperature, solar radiation, and leaf wetness. Daily inoculum levels were monitored by trapping spores, washing and incubating wheat spikes, and by observing disease progression in the field. The data on soil surface moisture will be an important part of the overall environmental data upon which a forecasting system will be based.

3. What were the reasons established objectives were not met? If applicable.

Progress on monitoring perithecial development on over-wintered foxtail seeds was slow because the recovery of over-wintered foxtail seeds from soil surface was difficult. We will conduct further experiments to improve the sampling method.

1. What were the most significant accomplishments this past year?

The construction of a sensor for measuring soil surface moisture and the integration of the sensor into the CR10X datalogger were completed. This system will allow us to monitor an important environmental parameter which may have the most direct impact on scab inoculum production. Positive correlation was found between soil surface moisture and inoculum levels on wheat.

Project 2: Maintain a germplasm center of scab resistant spring wheat.

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

This project confronts the issue of finding additional or new sources of resistance to scab in spring wheat, maintaining and characterizing the resistance, and facilitating the utilization. Spring wheat germplasm from targeted regions of the world are evaluated in a preliminary screening nursery (PSN) in the field. Selections from the PSN are re-evaluated in the greenhouse to make further selections. Field and greenhouse selections are used as test entries for a field elite germplasm nursery (EGN). Elite selections are integrated into the uniform regional scab nursery (URSN) system for testing at multiple locations and for direct access and utilization by users.

1. Please provide a comparison of the actual accomplishments with the objectives established.

The project is planned as a multi-year project. All phases of the project, i.e. germplasm evaluation, establishment of elite germplasm nursery, and introgression, are in progress. In FY'00, 1200 accessions of spring wheat, 150 accessions of Triticale, and 37 accessions of spelta wheat were evaluated in the PSN in field and 152 selections were made for further testing. Selections (224 lines) from the 1998 and 1999's PSN were evaluated in the greenhouse with point-inoculation and spray-inoculation to derive entries for 2000's EGN. One hundred twenty selections were tested in the 2000's EGN. Data on scab index, percent scabby seed, yield, and test-weight were obtained. Five elite selections from 1998 and 1999 were entered into the 2000's URSN for spring wheat. Introgression of resistance from the elite selections into adapted germplasm is in progress. Evaluation data of entries from 1998 and 1999's PSN are available through the GRIN database (USDA-ARS, National Genetic Resources Program, Germplasm Resources Information Network). Evaluation data of elite selections are being prepared for posting in the National Scab Initiative website.

2. What were the reasons established objectives were not met? If applicable. N/A

3. What were the most significant accomplishments this past year?

Critical evaluations of materials in PSN and EGN were achieved because of high and relatively consistent scab pressure during the field evaluation period. One hundred twenty-nine accessions from the 2000's PSN were selected for further testing. Additional criteria, i.e. % scabby seed, test weight, and yield, were used in the evaluation of EGN materials, resulting in more complete information on scab reaction of the selections. Twenty-five lines selected from the 2000's EGN are recommended to breeders as these lines remain effective in various tests. Elite selections were integrated into the Uniform Regional Scab Nursery system which will allow breeders to observe and access the materials directly.

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.

Francl, L., G. Shaner, G. Bergstrom, J. Gilbert, W. Perderson, R. Dill-Macky, B. Corwin, Y. Jin, D. Gallenberg, and J. Wiersma. 1999. Daily inoculum levels of *Gibberella zeae* on wheat spikes. Plant Dis. 83:666.

Jin, Y. and J. Rudd. 2000. Method and progress in scab resistance screening and introgression in spring wheat. A presentation to South Dakota Crop Improvement Association and South Dakota Wheat Commission. June 21-22, 2000, Brookings, SD.

Jin, Y. and X. Zhang. 1998. Mass production of ascospores of *Gibberella zeae*. Phytopathology 88:S44.

Jin, Y. and X. Zhang. 1999. Viability of *Gibberella zeae* ascospores on wheat plant surface. (A poster presentation) *In*: 1999 National Fusarium Head Blight Forum, The U.S. Wheat and Barley Scab Initiative. Dec. 5-6, 1999. Sioux Falls, SD.

Jin, Y., X. Zhang, and J. Rudd. 2000. Spring wheat scab evaluation data from Brookings (SD) in 1998 and 1999. USDA-ARS, National Genetic Resources Program. Germplasm Resources Information Network - (GRIN): www.ars-grin.gov/usr/local/apache/cgi-bin/npgs/html/desc.pl?65066.

Jin, Y., X. Zhang, R. Rudd, and J. Rudd. 1999. A point inoculation method for evaluating scab resistance in wheat. Page 128 *In*: 1999 National Fusarium Head Blight Forum, The U.S. Wheat and Barley Scab Initiative. Dec. 5-6, 1999. Sioux Falls, SD.

Zhang, X. and J. Rudd. 2000. Germplasm evaluation and pre-breeding for scab resistance in spring wheat. A presentation to Monsanto wheat improvement scientists. July 27, 2000, Brookings, SD.

Zhang, X., Y. Jin, and J. Rudd. 2000. Inheritance of scab resistance in Sappora Haru Komugi Jugo. pp. 98-99. *In*: Proc. Int. Symp. Wheat Impr. Scab Resistance. May 5-11, 2000, Suzhou and Nanjing, China.

Zhang, X., Y. Jin, R. Rudd, J. Rudd, and H. Bockelman. 1999. Screening of spring wheat scab resistance from the USDA germplasm collection. pp 140-142. *In*: National Fusarium Head Blight Forum, The U.S. Wheat and Barley Scab Initiative. Dec. 5-7, 1999, Sioux Falls, SD.