

**U.S. Wheat and Barley Scab Initiative
Annual Progress Report
September 18, 2000**

Cover Page

PI:	Elias Elias
Institution:	North Dakota State University
Address:	Dept. Plant Sciences Loftsgrad Hall, Rm 374A Fargo, ND 58105
Email:	elias@prairie.nodak.edu
Phone:	701-231-8159
Fax:	701-231-8474
Year:	FY2000
Grant Number:	59-0790-9-033
Grant Title:	Fusarium Head Blight Research
Amount Granted:	\$83,600.00

Project

Program Area	Objective	Requested Amount
Germplasm	Maintain a germplasm center.	\$20,000.00
Variety Development & Uniform Nurseries	To enhance variety development of scab resistant varieties.	\$63,600.00
	Requested Total	\$83,600.00

Principal Investigator

Date

Project 1: Maintain a germplasm center.

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

Durum wheat is very susceptible to Fusarium head blight (FHB) caused by the fungus *Fusarium graminearum* Schwabe (teleomorph *Gibberella zeae* (Schw.) Petch. In previous studies 1991 to 1999 several durum wheat genotypes representing germplasm from North Africa, Middle East, and North America; Langdon *Triticum dicoccoides* substitution lines; and accessions from the world collection were screened for FHB. Variation in infection existed among these genotypes, and a few lines had moderate resistance to the disease. The level of resistance present in the above germplasm is not adequate to develop highly resistant durum cultivars. Our objective is to identify better sources of resistance that can be utilized by durum plant breeders to develop FHB resistant cultivars.

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

In 1998-99, 500 durum wheat accessions from the world collections were evaluated for FHB resistant at the Academy of Agricultural Science, Plant Protection Institute (AASPPI) in Shanghai, China. 2% of these accessions were selected as a potential source of resistance. However, these lines did not show to have resistance when re-evaluated the Fall 1999 and Spring 2000 greenhouses at North Dakota State University. In 1999 we obtained 2,000 durum accessions from the National Small Grain Collection, Aberdeen, ID for FHB evaluations. We evaluate these accessions in the 1999-00 FHB screening nursery at AASPPI. We identified thirty accessions to have a very moderate level of resistance to FHB. In 1999, we also obtained 115 lines from ICARDA for FHB evaluations. 10% of these lines had a moderate level of resistant when evaluated in the Fall 1999 greenhouse. Lines with the moderate level of resistance were re-evaluated in the Spring 2000 greenhouse. Of these lines, only five maintained the same level of resistance of the first evaluation, the remaining lines were more susceptible.

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

One limitation of the proposed procedure is the limited greenhouse space for evaluations.

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

The thirty identified resistant accessions will be re-evaluated in the Fall and/or Spring greenhouse to confirm there resistance. If these accessions prove to be resistant, at the current time they and the five lines from ICARDA should be a valuable source of resistance to researchers working on durum wheat improvement. They could be used as parents in crosses to develop improved FHB resistant elite durum germplasm. We are in need of additional and better sources of FHB resistance in durum wheat. We have obtained a new set of accessions from the National Small Grain Collection to be evaluated in the 2000-01 FHB screening nursery at AASPPI.

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?

Durum wheat is very susceptible to Fusarium head blight (FHB) caused by the fungus *Fusarium graminearum* Schwabe (teleomorph *Gibberella zaeae* (Schw.) Petch. Fungicides may reduce the disease but the most environmentally safe and economical way to control the disease is with genetic resistance. Resistant durum cultivars or lines are not available yet. Our objective is to develop FHB resistant durum wheat cultivars/germplasm with good agronomic and quality traits. Resistant durum wheat cultivars should stabilize durum wheat production in North Dakota and the surrounding states and should provide good quality durum wheat for the national pasta industry and the international export market. This is a long term project because developing resistant durum cultivars requires 10 to 12 years of research.

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

Langdon *dicoccoides*-3A substitution line, a line from a FHB recurrent selection established in 1995, and a double haploid line were identified in previous studies to have a level of resistance to FHB. These three lines were used as parents to develop segregating populations. In the summer of 2000 we evaluated 3930 lines from these population in the FHB screening nursery in Propser, ND. Some of these lines had a moderate level of resistance. We are intending to re-evaluate the moderately resistant lines in the coming Fall and Spring greenhouse screenings. In addition to these, since 1990 we have developed several populations using the Sumai-3 as a source of FHB resistance. These populations were evaluated in 1998-99 FHB screening nursery at the Academy of Agricultural Science, Plant Protection Institute (AASPPI) in Shanghai, China. Several lines were identified to have a moderate level of resistance and therefore they were re-evaluated in the Spring 2000 greenhouse in Fargo, ND. Some of these lines also were moderately resistant when tested in the greenhouse. We will be testing them for the third time in the Fall 2000 greenhouse to confirm there resistance.

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

Developing and releasing durum wheat cultivars is a lengthy process that requires 10-12 years of research. We don not expect to release a FHB resistant cultivar before 2005.

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

We have identified twenty lines to have a moderate level of resistance to FHB form segregating populations especially from crosses with Sumai-3. Unfortunately, 20% of these lines have red seed color which makes them unsuitable for making good quality pasta. We are increasing all the identified

Year: 2000

Progress Report

PI: Elias Elias

Grant: 59-0790-9-033

resistant lines in New Zealand in the coming growing season (2000-01) to obtain adequate seed for disease and yield trials evaluations in 2001 growing season in North Dakota.

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.

Elias E.M., 1999. Durum Wheat Varieties and Research. 23rd International Durum Growers Forum. Minot, ND, 15-16 Nov., 1999. Invited Presenter.