U.S. Wheat and Barley Scab Initiative
Annual Progress Report
September 15, 1999

Cover Page

PI:	**Frances Trail**
Institution:	**Michigan State University**
Address:	**Dept. of Botany & Plant Pathology** **East Lansing, MI 48824**
Email:	**trail@pilot.msu.edu**
Phone:	**517-432-2939**
Fax:	**517-353-1926**
Year:	**FY1999**
Grant Number:	**59-0790-9-071**
Grant Title:	**Fusarium Head Blight Research**
Amount Granted:	**$34,146.00**

Project

Program Area	Objective	Requested Amount
Epidemiology	To study ascospores and methods of dispersal.	$35,000
	Requested Total	$35,000[1]

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Principle Investigator Date

[1] Note: The Requested Total and the Amount Granted are not equal.

Project 1: To study ascospores and methods of dispersal.

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

We are studying the production and distribution of the primary inoculum head blight of wheat and barley. *Gibberella zeae*, the causal agent of this disease, produces perithecia in the field on crop debris. Ascospores are produced in fruiting bodies, called perithecia, on the crop debris left in the field after harvest. The spores are forcibly discharged into the air where they are carried to infect the next year's flowers. Little is known of the process of formation of perithecia on crop debris, the timing of formation, or the mechanism of forcible discharge of ascospores. We had three objectives to study these issues. Objective 1 was to characterize the pattern of colonization of stalk tissue in the mature infected plant, as this tissue will become the debris and eventually yield perithecia. Our second objective was to continue the characterization of timing and appearance of mature perithecia on field debris. Our final objective was to screen 5000 random mutants of *G. zeae*, created in our lab, for loss of the ability to discharge ascospores. An understanding of the production and distribution of inoculum is vital to designing strategies for disease control.

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

Objective 1: We have collected stalks from plants showing symptoms in naturally infected and inoculated fields. Tissue samples have been removed the nodes and internodal regions of these plants, fixed and embedded in paraffin for histological examination. Preliminary data suggests that mycelia that colonize the epidermal cells before harvest may be important overwintering tissue for the fungus and may give rise to the perithecia in the spring. The embedded samples will be sectioned and examined microscopically this fall and winter to formulate a picture of the infection pattern of the tissue that will become the crop debris.
Objective 2: The attached figure shows the pattern of appearance of the perithecia on wheat and corn debris from the previous field season over the last 3 years. Flowering of wheat occurred on average at each of the following dates in our area: June 14, 1997, May 24 1998, May 29 1999. Note that in the last 2 years flowering has been quite early, before our collections showed perithecium production in the field. In all three years the disease incidence has been low. We will continue to collect monthly through at least 2 more years. Data will be added as the samples are analyzed.
Objective 3: We have screened over 2500 mutants to date for loss of discharge. Twenty of the isolates have shown a loss of discharge in preliminary trials. These putative mutants need to be tested for stability of the phenotype through meiosis. We are in the process of this analysis and continue to screen other mutants for possible loss of discharge.

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

We are on schedule and will likely fulfill our objectives by the end of this funding cycle.

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

Strikingly, perithecia appear around the time of flowering of wheat and continue to be produced through the summer and at least in some years into the fall. This pattern is important, because if perithecial formation could be delayed, infection would be avoided. Isolation of mutants that have lost their ability to discharge will be important to understanding the process of distribution of primary inoculum. This information will be used to limit inoculum distribution in novel ways.

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.

Trail, F. and R. Common. 1999. Perithecial development by *Gibberella zeae*: A light microscopy study. Mycologia, in press. Related to this study, not funded directly by this grant.

Andries, C.L., and F. Trail 1999. Ascopore discharge in *Gibberella zeae*. Phytopathology 89 (6): S3.

Trail, F., Gadoury, D., and Loranger, R. 1998. Environmental parameters of ascospore discharge in Gibberella zeae. The 1998 National Fusarium Head Blight Forum, Proceedings, pp. 11-14.

Andries, C. and Trail, F. 1998. Ascospore development and discharge in Gibberella zeae, the causal organism of head blight of wheat. Phytopathology 88: S4.

Gaffoor, S. and Trail, F. 1998. Wheat head culture to screen for pathogenicity mutants of Gibberella zeae. 1998 National Fusarium Head Blight Forum, Michigan State University, East Lansing.