

**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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| <b>PI:</b>                    | <b>Frances Trail</b>  |
| <b>Institution:</b>           | <b>Michigan State University</b>  |
| <b>Address:</b>               | <b>Dept. of Botany &amp; Plant Pathology<br/>East Lansing, MI 48824</b> |
| <b>Email:</b>                 | <b>trail@pilot.msu.edu</b>  |
| <b>Phone:</b>                 | <b>517-432-2939</b>   |
| <b>Fax:</b>                   | <b>517-353-1926</b>   |
| <b>Year:</b>                  | <b>FY2000 (approx. May 00 – April 01)</b>                               |
| <b>Grant Number:</b>          | <b>59-0790-9-071</b>  |
| <b>Grant Title:</b>           | <b>Fusarium Head Blight Research</b>                                    |
| <b>2000 ARS Award Amount:</b> | <b>\$68,780</b>   |

**Project**

| <b>Program Area</b>               | <b>Project Title</b>   | <b>Requested Amount</b>        |
|-----------------------------------|--|--------------------------------|
| Epidemiology & Disease Management | Inoculum development and dispersal in <i>Gibberella zeae</i> . | \$46,000.00                    |
| Epidemiology & Disease Management | Genomics of <i>Gibberella zeae</i> , the head scab fungus.     | \$51,800.00                    |
|                                   |  |                                |
|                                   |  |                                |
|                                   | <b>Requested Total</b>   | <b>\$97,800.00<sup>1</sup></b> |

\_\_\_\_\_  
Principal Investigator

\_\_\_\_\_  
Date

<sup>1</sup> Note: The Requested Total and the Award Amount are not equal.

**Project 1: Inoculum development and dispersal in *Gibberella zeae*.**

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

A. We characterized the timing of appearance of mature perithecia in field debris. We are interested in determining when these appear, and on corn or wheat, to learn something of the development of the primary inoculum-- ascospores-- for the head blight disease.

B. We wish to understand the development and dispersal of ascospores, the primary inoculum of the disease.

C. Ascospores are forcibly discharged from the sacs (the asci) inside the fruiting structures (perithecia). We wish to understand the basis of the force behind this event.

2. What were the most significant accomplishments?

A. We have shown that perithecium formation is limited by average daily temperatures below 9oC, and that corn stubble may be the predominant substrate for perithecium formation in Michigan.

B. We had previously developed 5000 genetically marked strains that were randomly mutated by insertion of a DNA tag. We found that one of these was morphologically normal, but failed to discharge its ascospores. When crossed with *nit* mutant lines (requiring reduced nitrogen sources), the discharge minus phenotype cosegregated with the genetic marker. This is proof that the mutation is tagged by the genetic marker. We are in the process of isolating and characterizing the tagged gene.

C. We have identified mannitol as the major sugar component of the ascus sap. In addition, mannitol dehydrogenase, an enzyme involved in mannitol biosynthesis, is most prominent in mature, actively-discharging perithecia, as opposed to other tissues. We have identified K<sup>+</sup> as the predominant ion present in the ascus sap. K<sup>+</sup> ion channel inhibitors inhibit discharge from mature perithecia.

**Project 2: Genomics of *Gibberella zeae*, the head scab fungus.**

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

Study of genomics of the scab pathogen will reveal much about the biology of this fungus that would not be revealed by other modes of study.

2. What were the most significant accomplishments?

We have sequenced 3500 cDNA clones from mature perithecia and identified potential function. Together with the sequencing from other stages of development and pathogenic interactions, many genes important to inoculum development have been identified. These will now be used to study the effects of various conditions and compounds on the expression of these genes, *en masse*, and to identify genes that are regulated or expressed during stages important to disease development. These genes can then be used to identify new targets for control of the pathogen.

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., Xu, H., Loranger, R. and Gadoury, D.. Physiological and environmental aspects of ascospore discharge in *Gibberella zeae*. *Mycologia*. *Submitted*

Andries, C., Jarosz, A., and Trail, F. 2000. Effects of rainfall and temperature on production of perithecia by *Gibberella zeae* in field debris in Michigan. In, Proceedings of the 2000 National Fusarium Head Blight Forum, Dec 10-12, Erlanger, KY. Wheat Scab and Barley Initiative, pp.118-123.