

**U.S. Wheat and Barley Scab Initiative
 FY01 Final Performance Report - NCE
 July 01 – July 02
 August 30, 2002**

Cover Page

| | |
|-------------------------------|--|
| PI: | Richard Zeyen |
| Institution: | University of Minnesota |
| Address: | Dept. of Plant Pathology 495 Borlaug Hall/1991 Upper Buford Circle St. Paul, MN 55108 |
| Email: | richz@puccini.crl.umn.edu |
| Phone: | 612-625-4754 |
| Fax: | 612-625-9728 |
| Year: | FY2001 July 01 – July 02 (NCE-FY01) |
| Grant Number: | 59-0790-9-076 |
| Grant Title: | Fusarium Head Blight Research |
| 2000 ARS Award Amount: | \$34,146 |

Project

| Program Area | Project Title | Requested Amount |
|---------------------|---|--------------------------------|
| Biotechnology | Develop rapid testing of anti-fungal proteins against Fusarium graminearum. | \$56,355.00 |
| | | |
| | | |
| | | |
| | Requested Total | \$56,355.00¹ |

 Principal Investigator

 Date

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

Project 1: Develop rapid testing of anti-fungal proteins against *Fusarium graminearum*.

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

Conventional breeding for FHB resistance in wheat and barley has progressed slowly. There was clearly a need for new, novel and durable resistances. Genetic engineering for FHB resistance provides a potential mechanism for obtaining new and novel resistances. To speed genetic engineering we developed:

1. A unique plasmid construct driven by the sugarcane badnavirus promoter. This construct also has the flexibility to quickly insert any eukaryotic antifungal cDNA.
2. Two rapid, plant-cell based protocols for testing antifungal proteins (APFs). Using these protocols we observed the development of the fungal pathogen of wheat and barley (*Fusarium graminearum*) against the activity of seven different AFP genes (transgenes) using a genetically transformed plant suspension cell culture.

2. What were the most significant accomplishments?

Our most successful microassay protocol revealed that *F. graminearum* contact was repelled by the antifungal proteins Arabidopsis PR5, Fusarium Tri 101 and wheat WIR 2. However the barley chitinase, barley glucanase, rice chitinase and oat Tlp1 APFs were ineffective in repelling *F. graminearum* contact. Also, combinations of chitinase/glucanase or chitinase/Tlp 1 were ineffective. The three APFs promising APFs identified by the microassay protocol were engineered into wheat and barley by G. Muehlbauer's group at Minnesota to create new and perhaps novel scab disease resistance. The AFP's placed in wheat and barley late this year and their resultant plants will be screened for FHB resistance.

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. Hilburn KLB. 2001. A Plant Suspension Cell Assay for Anti-Fungal Transgene Efficacy. MS. Thesis. University of Minnesota 281 pp. R. Zeyen advisor.
2. Hilburn KLB, Baldrige GD, Bushnell WR, **Zeyen RJ**. 2000. A Visible Fungal Growth Approach to Rapid Antifungal Protein Gene Pretesting. National Fusarium Headblight Forum 2000. Pp. 33-36 Cincinnati Ohio, Dec. 10-12, 2000.
3. Hilburn, K.L.B., W.R. Bushnell, G.D. Baldrige, **R.J. Zeyen**. 2000. Toward a plant suspension cell assay for eukaryotic antifungal protein constructs used in cereal transformation. *Phytopathology* S (Abstract).
4. Smith, L, M. Wyckoff, G. Baldrige, **R. Zeyen** and G.J. Muehlbauer. 2000 Antifungal protein gene expression in transgenic wheat (*Triticum aestivum*). *Agronomy Abstracts*
5. Wyckoff M, Smith L, Baldrige G, **Zeyen R**, Muehlbauer "G.J. 2000. Genetic Engineering Wheat for Scab Resistance. National Fusarium Headblight Forum 2000. P 61. Cincinnati Ohio, Dec. 10-12, 2000.
6. **Zeyen RJ**, Baldrige GD, Bushnell WR, Hilburn KLB. 2000. A Microassay Approach to Rapid Antifungal Protein Gene Pretesting. National Fusarium Headblight Forum -2000. Pp. 64-76 Cincinnati Ohio, Dec. 10-12, 2000.
7. Van de Mortel, M., Baldrige, G., Bushnell, W., Somer, D., Tobert, K., and **Zeyen R**. 1999. Apparent partial powdery mildew resistance in transgenic oat genetically engineered to express rice or barley chitinases. *Phytopathology* **89** 6:S80.