

**FY00 Preliminary Final Performance Report**  
**(approx. May 00 – April 01)**  
**July 30, 2001**

**Cover Page**

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<b>Year:</b>	<b>FY2000 (approx. May 00 – April 01)</b>
<b>Grant Number:</b>	<b>59-0790-9-058</b>
<b>Grant Title:</b>	<b>Fusarium Head Blight Research</b>
<b>2000 ARS Award Amount:</b>	<b>\$9,756</b>

**Project**

<b>Program Area</b>	<b>Project Title</b>	<b>Requested Amount</b>
Chemical & Biological Control	Improved spray application and objective evaluation system for control of FHB.	\$19,854.00
	<b>Requested Total</b>	\$19,854.00 <sup>1</sup>

Suranjan Panigrahi                      7-27-01  
Principal Investigator                      Date

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

**Project 1: Improved spray application and objective evaluation system for control of FHB.**

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

The overall goal of this project is the further improvement of the fungicide application system and fungicide coverage evaluation system against FHB (Scab).

The fungicide coverage evaluation system is based on computer-based fluorescence imaging technology. A fluorescence dye is mixed with spray chemical (fungicide) and the image of the sprayed grain head is acquired with a computer imaging system. One important aspect of this computer imaging system is the development of image processing and analysis techniques for quantifying the coverage on grain (barley/wheat) heads. A hybrid optimum algorithm (based on two different histogram based automatic segmentation techniques) has been developed and it provided an error of 2% as compared to visual evaluation (test on 530 sprayed images). Work is further planned to increase its capability to determine the total number of droplets.

Investigation was also conducted to evaluate the possibility of using GFP (Green Fluorescence Protein) to replace fluorescence dye. The images of sprayed heads acquired by the computer imaging system provides information of spatial distribution of droplets on grain head. The visual observation of those raw and segmented images (only showing the droplets) can be very informative regarding the performance of a given spray application system and its associated parameters. Thus, a technique was developed to store those images in computer in an efficient manner while containing significant information. Wavelets transformations were evaluated to compress sprayed grain head (wheat and barley) images. Four different parameters were used to evaluate the performance of different wavelet techniques. Wavelets transforms (such as Haar, db6, db4 and Sym4) showed satisfactory performance for compressing grain head images.

Another aspect of the fungicide coverage evaluation system is to determine effect of the different dye concentrations on spray coverage on grain heads and subsequently determine the optimum dye concentration. Data were statistically analyzed for determining the effect of different dye concentrations with a common fungicide on total spray coverage of wheat and barley heads. Work is continuing to study further the effect of different dye concentration (with common fungicide) and to determine optimum dye concentration. Work is also planned to use high speed computer imaging for determining the effect of selected spray application parameters on spray coverage.

For fungicide application system, a prototype was built for air-assisted fungicide spray in greenhouse. It allows the chemical (fungicide) to mix within a stream of forced air. Chemical is sprayed on the plant (grain heads) in an angular fashion (with respect to grain head) using forward and backward mounted nozzles. Work is planned to evaluate its performance this year.

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2. What were the most significant accomplishments?

An optimized algorithm was developed for objective quantification of spray coverage of sprayed wheat/barley heads. This work has been presented in International ASAE summer meeting in 2000 at Milwaukee, Wisconsin. The prototype for air-assisted sprayer configuration (for greenhouse) shows promises for increased spray coverage on grain heads.

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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.

V. Hofman, M. McMullen, T.Gregoire, J. Lukach, S.Halley, J.Pederson, J. Moos, S. Panigrahi, and D. Gu. 2000. Application for fungicides for suppression of Fusarium Head Blight (Scab). May 2000. NDSU Extension Service Publication AE-1148. NDSU, Fargo.

S. Panigrahi, H. Gu, V. Hofman, M.McMullen, S. Halley. 1999. 'SCES" An objective fungicide coverage evaluation system for control of Fusarium head blight. 1999 National Fusarium Headblight Forum, Sioux Fall, SD.

S. Panigrahi, H. Gu, V. Hofman, M.McMullen, S. Halley. 2000. 'SCES" An objective fungicide coverage evaluation system for control of Fusarium head blight. ASAE Paper No. 001115. ASAE International meeting (2000), Milwaukee, WI.

H. Gu, S. Panigrahi, and V.Hofman. 1999. Evaluation of image processing techniques for Spray coverage evaluation. ASAE Paper No. MBSK99-131, North Central Regional ASAE/CSAE Conference, Winnipeg, Manitoba, Canada.

V.Hofman, M.McMullen, S. Panigrahi, T. Gregoire, and H. Gu. 1999. Application equipment for the control of Fusarium Head Blight (Scab). ASAE Paper No. MBSK99-119, North Central Regional ASAE/CSAE Conference, Winnipeg, Manitoba, Canada.

M.McMullen, S.Halley, J. Pederson, V.Hofman, J. Moos, and S. Panigrahi. D. Gu, T. Gregoire. 1999. Improved fungicide spraying for wheat/barley Head Scab control. NDSU Extension Report 56. NDSU. Fargo.