

USDA-ARS / USWBSI
FY03 Preliminary Final Performance Report (approx. May 03 – April 04)
July 15, 2004

Cover Page

PI:	Thomas Scherer
Institution:	North Dakota State University
Address:	Agricultural & Biosystems Engineering Department Box 5626 Fargo, ND 58105
E-mail:	tscherer@ndsuext.nodak.edu
Phone:	701-231-7239
Fax:	701-231-1008
Year:	FY2003 (approx. May 03 – April 04)
FY03 ARS Agreement ID:	59-0790-2-085
Agreement Title:	Automated Control of a Misting System for FHB Field Research.
FY03 ARS Award Amount:	\$ 2,561

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Automated Control of a Misting System for FHB Field Research.	\$ 2,561
	Total Amount Recommended	\$ 2,561

Principal Investigator

Date

* BIO – Biotechnology
CBC – Chemical & Biological Control
EDM – Epidemiology & Disease Management
FSTU – Food Safety, Toxicology, & Utilization
GIE – Germplasm Introduction & Enhancement
VDUN – Variety Development & Uniform Nurseries

Project 1: Automated Control of a Misting System for FHB Field Research.

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

During the 2002 growing season, the misting system for the uniform fungicide trial plots at Fargo, ND was operated by a feedback control automated system. Relative humidity sensors placed at flag leaf height were monitored and used to turn on the misting system for a set period each hour during the night. The system operated as designed and there was significant differences of FHB field severity levels between untreated check plots and plots applied with fungicides. Some limitations we observed were: we did not measure the amount of time the misting systems was on (as opposed to normal situations where the RH was naturally above the set point), we were not able to compare FHB severity levels with inoculated dry land plots and we did not know the amount of time the wheat heads were wet naturally in the dryland plots. During 2003, we addressed these limitations by setting out replicated inoculated dryland plots and monitoring the RH, leaf wetness and temperature in these plots. We also installed a pressure sensor in the sprinkler system.

2. What were the most significant accomplishments?

Due to unusual amount and frequency of rain, prior to, and during the FHB infection period (July 1 –20) we could not accomplish all our goals. However, we did verify that the misting system protocol that we are using produces the right conditions for FHB development. The average FHB field severity value for the dryland inoculated plots was 0.6% which is much less than the 10.2% for the inoculated untreated check plots under the misting system.

Analysis of the leaf wetness sensor data shows that these relatively inexpensive devices could be used to control the misting system with the right decision protocols. Instead of expensive and hard to calibrate relative humidity sensors, the leaf wetness sensors would make a more robust and reliable sensor for controlling the misting system. The decision protocol would be based on monitoring the status of the leaf wetness sensor at a particular time (say at the beginning of the hour) and if it is dry then turn on the misting system. If the leaf wetness sensor reads below a certain resistance value (wet range), then don't turn on the misting system.

The passive sensor data continues to show humidity stratification in both the misted and dryland plots. Six inches above the soil, the relative humidity was greater than 90% more than 75% of the time in the misted plots and around 60% for the dryland plots during the infection period. At the top of the canopy (where the wheat heads are located) the relative humidity in both the misted and dryland plots was greater than 90% about half the time during the infection period.

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.

Technical Papers

Scherer, T.F., V.H. Hofman and M.P. McMullen, 2000. Design of a Microsprinkler system for Fusarium Head Blight (Scab) research on wheat and barley. Paper No. RRV00-203, ASAE/CSAE North Central Region Intersectional Meeting, Moorhead, MN, Sept. 29-30. 8 pgs.

Scherer, T.F., D. Kirkpatrick and M.P. McMullen, 2002. Automated control of a watering system for Fusarium Head Blight (Scab) research. Paper MBSK02-305, North Central Region Intersectional Meeting of the ASAE/CSAE, Saskatoon, SK, Canada, Sept. 27-28. 11 pgs.

Presentations

Poster: Automated Control of a Misting System for Scab Research, 2002 National Fusarium Head Blight Forum, Cincinnati, OH, Dec 6-7.