U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
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Cover Page

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Grant Number:	**59-0790-1-067**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 42,367**

Project

Program Area	Project Title	Requested Amount
Epid/Dis. Mgt.	Determination of Wetness Duration Using Radar-Derived Precipitation Estimates	$ 45,036
	Total Amount Requested	**$ 45,036**

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Principal Investigator Date

Project 1: Determination of Wetness Duration Using Radar-Derived Precipitation Estimates

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

Fusarium head blight (FHB) of small grains tends to be associated with certain environmental conditions, especially rain-induced wetness periods occurring near anthesis. Attempts to monitor and predict the risk FHB over large areas have been limited by the measurement of precipitation, which is among the most spatially discontinuous of all environmental variables. In this study, 4 km resolution precipitation estimates from National Weather Service weather radar are employed in a Geographic Information System-based model simulation of the crop canopy energy balance to estimate wetness duration periods for small grains. This method of estimating wetness duration over large areas should enhance the ability of researchers to correlate specific weather data with the occurrence of FHB epidemics in specific areas, and ultimately allow producers and processors of small grains to make decisions critical to the management and use of grain during epidemics.

2. What were the most significant accomplishments?

Work on two portions of the project began during the summer of 2001: Testing and validation of the raw radar precipitation estimates and the initial development of a prototype GIS-based leaf wetness duration scheme. In order to test the accuracy of the precipitation estimates, two types of comparison were carried out, one for validation of estimated precipitation frequency, and the other for the amount of precipitation (if precipitation was recorded at the observing station). Overall, the initial tests show the radar-derived precipitation to have promise in the estimation of leaf wetness duration. For hourly data at 43 observing stations across the state of Michigan during the 1999 and 2000 growing seasons, the radar estimates correctly categorized wet or dry conditions 96.1% of the time and were in error 3.9%. The overall mean difference between observed and estimated hourly precipitation for the same period and stations was 0.06mm, indicating very low bias. Mean absolute error was 1.8 mm. Given the radar-derived precipitation estimates, an initial version of the GIS-based leaf wetness duration scheme was developed within for an area encompassing Michigan's Lower Peninsula. The wetness duration simulations at each 4 X 4 km grid box are based on a modified energy balance approach. Fluxes of net radiation, latent heat, sensible heat, and soil heat were estimated for each grid cell. All wetness duration simulations were run on an hourly time step, with the amount of liquid water present on the canopy surface and resulting wetness duration output as dependent variables. Initial testing and evaluation of the wetness duration scheme was carried out with data from the 2001 growing season. Wetness duration estimates were compared with observations based on electrical grid resistance measurements of leaf wetness at a height of 1m from 18 stations in a statewide automated network. Overall, the leaf wetness duration scheme correctly estimated leaf wetness in 75% of the hours analyzed, but estimated leaf wetness when none was observed in 8% of the hours and missed wetness when it was observed in 17% of the cases. The simulations tended to lag the initiation and end of observed leaf wetness by an hour or two. Work is currently underway to reduce or eliminate this lag.

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.

Presentation:

Andresen, J.A., 2002. The Michigan Automated Weather Network, Plant Disease Management Section. Presentation at the MESONET 2002 Symposium on Automated Weather Station Networks. 23-26 June, 2002, Oklahoma City, OK.