

USDA-ARS / USWBSI
FY03 Preliminary Final Performance Report (approx. May 03 – April 04)
July 15, 2005

Cover Page

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Year:	FY2003 (approx. May 03 – April 04)
FY03 ARS Agreement ID:	59-0790-1-067
Agreement Title:	Determination of Wetness Duration Using Radar-Derived Precipitation Estimates.
FY03 ARS Award Amount:	\$ 25,902

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
EDM	Determination of Wetness Duration Using Radar-Derived Precipitation Estimates: FY2003.	\$ 25,902
	Total Amount Recommended	\$ 25,902

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: *Determination of Wetness Duration Using Radar-Derived Precipitation Estimates: FY2003.***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 particular 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 wetness duration periods for small grains using a crop canopy energy balance approach. 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 assist producers and processors of small grains in making decisions critical to the management and use of grain during epidemics

2. What were the most significant accomplishments?

Work continued on two portions of the project during 2004 and 2005 (No-cost extension periods): Testing and validation of a GIS-based leaf wetness duration scheme and of a fusarium risk algorithm of DeWolf et al., 2002 applied on a regional basis across the Lower Peninsula of Michigan. Leaf wetness estimates were evaluated with observed data taken from 6 miniature automated weather stations (monitoring air and soil temperatures, precipitation, and leaf wetness) placed in commercial wheat fields from early May through early July of the 2003, 2004, and 2005 seasons. Results thus far are encouraging. For example, during May and June of 2004, the leaf wetness scheme was correct in 78.7% of the total hours. For duration of wetting events associated with precipitation, a mean error of only 0.57 hours was obtained for the same time frame, which is within the temporal resolution of the scheme (hourly radar data are used as a proxy for precipitation). A tendency for the scheme to underestimate the duration of dew-related events was noted, which appears to be associated mainly with erroneously late onsets of dew events. Evaluation of the fusarium risk scheme was carried out with field disease observations taken during the 2000 and 2004 growing seasons. The results so far have been mixed, largely due to difficulty in estimating the date of wheat anthesis, an essential input variable in the disease scheme. Further testing is currently underway. Finally, work proceeded on a climatological portion of the project involving long term temporal changes in environmental variables associated with fusarium (e.g. hours of precipitation, relative humidity). Results thus far suggest that increases in precipitation and other variables may have led to an overall increasing risk of fusarium in some parts of the central U.S. during the past 30-40 years.

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.

Presentations:

Andresen, J.A. and T.M. Aichele, 2003. Simulation of plant disease risk on a regional basis. Proc. American Society of Agronomy Annual Meeting, 5 Nov 2003, Denver, CO. Am. Soc. Ag., Madison, WI.

Andresen, J.A., T.M. Aichele, and A.Pollyea, 2003. Determination of wetness duration using radar-derived precipitation estimates. 2003 National Fusarium Head Blight Forum, 13-15 December 2003, Bloomington, MN. US Wheat and Barley Scab Initiative, Michigan State University, East Lansing, MI.

Andresen, J.A., T.M. Aichele, and A.Pollyea, 2005. Determination of Wetness Duration for Regional Plant Disease Management Using a Geographic Information System. Am. Meteorological Society 15th Conf. on Applied Climatology. Savannah, GA. 20-24 June 2005. American Meteorological Society, Boston, MA.

Publication:

Andresen, J.A. T.M. Aichele, and A. Pollyea, 2003. Determination of wetness duration using radar-derived precipitation estimates. Proceedings from 2003 National Fusarium Head Blight Forum, 13-15 December 2003, Bloomington, MN, p. 122. US Wheat and Barley Scab Initiative, Michigan State University, East Lansing, MI.