USDA-ARS / USWBSI
FY04 Final Performance Report
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Cover Page

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Year:	**FY2004** (approx. May 04 – April 05)
FY04 ARS Agreement ID:	**59-0790-4-112**
FY04 ARS Agreement Title:	**Splash Dispersal, Inoculum Level and Fungicide Effects on Fusarium Head Blight.**
FY04 ARS Award Amount:	**$ 54,634**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Uniform Fusarium Head Blight Fungicide and Biological Control Agent Testing in Ohio, 2004.	$ 5,854
EDM	Effect of Inoculum Level on Fusarium Head Blight and Splash Dispersal of Gibberella zeae.	$ 48,780
	Total ARS Award Amount	**$ 54,634**

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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: ***Uniform Fusarium Head Blight Fungicide and Biological Control Agent Testing in Ohio, 2004.***

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

No single disease management protocol has been highly effective in preventing yield reductions or DON accumulation in grain affected by Fusarium head blight. Results of fungicide testing for efficacy against Fusarium head blight indicate that certain triazole products have better efficacy when used on spring wheat in the Northern Great Plains regions than on winter wheat in the Midwest and Eastern wheat growing regions of the US. Continued testing of new chemistry is essential in providing efficacy data to justify labeling new products for use on wheat for Fusarium head blight control. The Chemical and Biological Control Research Committee of the Wheat and Barley Scab Initiative establishes protocols for evaluation of fungicides each year. These protocols are used by researchers in a number of states in several different classes of wheat in order to develop a data base to be used for possible federal registration of experimental fungicides and on which recommendations for their use can be made. Ohio has been a cooperator in Fusarium head blight fungicides evaluations since 1998.

2. What were the most significant accomplishments?

Field plots were established at Wooster, Ohio in the fall of 2004 using the susceptible cultivar Elkhart. Daily mist irrigation favored disease development during and 1 wk following anthesis. Rain occurred on 16 of the 27 days between when disease assessments were made and plots were harvested resulting in very high disease incidence (69 to 90%). Frequent rain events kept the heads almost continuously wet during grain maturation. By harvest, the deterioration of grain resulted in very low yields (25 to 33 bu/A) and test weights (43.3 to 46.1 lb/bu). Based on analysis of variance, the effect of treatment was significant for all disease assessments, percentage damaged kernels, yield and test weight. Only the JUA6476 5.0 fl oz /A treatment significantly reduced FHB incidence, FHB severity, FHB index, and percentage damaged kernels and significantly increased yield and test weight compared to untreated control. Folicur and Tilt were similar in their effect in reducing disease and impacting yield and test weight. Plots treated with the combination of JUA6476 and Folicur had the lowest disease levels(FHB index =9), but these were not always significantly lower than other treatments. JUA6476 (5.0 fl oz/A), V10116 (6.0 fl oz/A) and the combination of JUA6476 plus Folicur reduced the level of DON in grain as compared to the untreated control, but the DON levels detected were very high regardless of the treatment applied (22 to 31 ppm). Results indicate that none of the fungicides or fungicide combinations were effective in reducing Fusarium head blight or DON levels to acceptable amounts.

3. Impact: The lack of fungicide consistency in achieving lowered DON levels and yield improvements has limited some winter wheat growing states from requesting Section 18 emergency labels for Folicur. Our results, and those of other cooperating states, indicate that fungicides currently available for testing have limited efficacy in the soft red winter wheat areas of the eastern U.S. Not requesting section 18 registration for these fungicides have saved growers from increased production costs that in all likelihood would not result in an economic return.

Project 2: ***Effect of Inoculum Level on Fusarium Head Blight and Splash Dispersal of Gibberella zeae.***

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

Several factors influence the development of Fusarium head blight (FHB). Among these factors, crop residue (a local source of inoculum) is thought to be one of the most important because *Gibberella zeae* (causal agent of the disease) overwinters in the residue left on the soil surface, providing a readily available source of inoculum for the development of the disease. However, the importance of a local source of inoculum relative to an external source in an area (such as Ohio) with high background levels of inoculum has been the subject of debate among researchers. In addition, it is unclear whether the relative importance of local inoculum is dependent on other key factors such as planting date, cultivar maturity (flowering), and weather conditions. To address these questions, two experiments were conducted during the 2003-2004 growing season. In the first experiment, plots were planted to obtain three levels of corn residue (0, 15 and 80% soil coverage), two planting dates (Oct 3 and Oct 20) and three cultivars varying in relative maturity (flowering date). In one plot of each residue level, Burkard cyclone spore samplers were used to monitor daily numbers of airborne spores from Feekes growth stage 10 through 11.2. During the same period, wheat spikes were collected and assayed directly for spores using head washing. The incidence and severity of FHB was assessed three times each week within each plot.

In the second experiment, the development of FHB and the abundance of propagules of *G. zeae* relative to distance from a local source of inoculum was investigated in field plots. Maize kernels infested with *G. zeae* were placed on the soil surface at the corner of each plot. Disease intensity was assessed and samples of wheat spikes and rain splash (at 30 and 100 cm above the soil surface) were collected at regular intervals in three directions from the source of inoculum. Rain splash and wheat spikes were assayed for spores of *G. zeae*.

2. What were the most significant accomplishments?

Residue level, planting date, and cultivar maturity all had a significant effect on the development of FHB. However, interactions involving residue level and the other two factors were not significant, suggesting that under the conditions of this study, the role of residue in the development of FHB was independent of planting date and cultivar maturity. Mean disease intensity was higher in plots with 80% residue than in plots with 15 and 0% residue on the soil surface. Very similar levels of disease occurred in plots with 15 and 0% residue. Similar patterns of spore recovery from air samples (Burkard) were observed in each residue plot. The mean number of spores per spike was slightly higher in plots with 80% residue than in plots with 15 and 0% residue. Peaks in the number of spores per spike coincided with major rainfall events.

Spores were recovered from rain splash and wheat spikes at each distance and direction from the local source of inoculum. Distance, height, and their interaction significantly affected the number of spores recovered per ml of splashed rain and spore flux density (spores recovered per square cm per hour). FHB intensity and number of spores per spike decreased by 30 and 12%, respectively, with increasing distance from the source of inoculum.

3. Impact

In spite of the fact that background levels of (airborne) spores of *G. zeae* is generally very high in Ohio due to the high acreage of reduced-tillage corn, our results showed that local (within field) sources of inoculum still play a key role in the development of FHB. Head wash spore counts and disease intensity were higher in plots with higher levels of inoculum, and both spore counts and disease intensity decreased as distance from the local source of inoculum increased. This suggests that crop residue on the soil surface beneath the wheat canopy contributes more inoculum for the development of FHB than spores blown in from outside sources. The use of crop residue as a predictor (along with weather) of Fusarium head blight risk is currently being evaluated in 23 states as part of a web-based risk assessment model.

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 you grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

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Sneller, C., Lipps, P. Herald, L. and Johnston, A. 2004. FHB resistance in soft red winter wheat adapted to the eastern US. Page 165 in: Proceedings 2nd International Symposium on Fusarium Head Blight, Orlando, FL. Dec. 11-15, 2004.

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