USDA-ARS / USWBSI
FY03 Final Performance Report (approx. May 03 – April 04)
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Cover Page

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Year:	**FY2003 (approx. May 03 – April 04)**
FY03 ARS Agreement ID:	**59-0790-3-079**
FY03 ARS Agreement Title:	**Aerial Applied Fungicide and Application Technology for Improved Efficacy of Fungicide.**
FY03 ARS Award Amount:	**$ 22,099**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Performance Evaluation of Aerial Applied Fungicide.	$ 13,816
CBC	Spray System, Spray Volume, and Spray Orifice Orientation for Improved Efficacy of Fungicide.	$ 8,283
	Total Amount Recommended	**$ 22,099**

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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: ***Performance Evaluation of Aerial Applied Fungicide.***

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

Aerial fungicide application is used on approximately 50% of the acreage fungicides are applied to small grains in North Dakota. Aerial application offers advantage over ground application in both speed to accommodate large acreages and application timings to maximize fungicide efficacy for control of FHB. Additionally, aerial application is the only means possible when the soil becomes too wet to support ground application equipment. Improvement in performance of the aerial applied fungicides by adjusting application technology parameters needs to be evaluated.

Trials were conducted in 2003 at two locations in northeast and east central North Dakota to evaluate two sets of fungicide application technology parameters for their effect on spike coverage and control of FHB. Two drop sizes, large and small, and two application techniques, applying the fungicide to one side of the spike and both sides of the spike, were compared in a trial. The trial was designed as a randomized complete block arranged as a 2 x 2 factorial to address these issues. The objective was to evaluate the influence of application technologies with typical commercial aerial application units on the efficacy of fungicide and the coverage of the grain spike.

2. What were the most significant accomplishments?

The study had two objectives; 1) To determine if increases in spike coverage could be achieved by spraying the spike from opposite directions and fungicide efficacy could be improved. 2) To determine if drop size affects fungicide efficacy and spike coverage. FHB disease levels were very low under natural conditions in 2003 at both sites. A slight decrease in yield occurred at one location with two applications fungicide with small drops compared to other technique. Greater spike coverage was achieved with large drops and one sided application but no differences were determined by applications with small drops. Application of fungicide to the back side of the spike was near zero regardless of direction of application indicating the contributing influence of the wind to aerial application in the region.

Volume mean diameters (VMD) of the drops ranged from 235-340 and 267-439 on the front side of cards with an area of coverage on the cards ranging from 4.1-7.3 and 2.6 to 10.5% on the front side of the card, respectively for the two locations. Back side of the cards had little coverage and much smaller size drop deposition.

The study indicated the difficulty in obtaining fungicide efficacy results in large scale field trials where it is impractical to supplement natural infection with prepared FHB inoculum. The trial did identify the influence wind direction has on performance of aerial application equipment. The study also showed the range of drop sizes attainable by commercial aerial equipment and several limits of the field research. The study was a very good beginning point for aerial fungicide research.

Project 2: ***Spray System, Spray Volume, and Spray Orifice Orientation for Improved Efficacy of Fungicide.***

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

Several ground sprayer systems are used by growers and commercial applicators for applying fungicide for control of FHB. The spray systems offer several differing technologies in the delivery mechanism for the fungicides. Three types of drop size determinants are available and three types of spray delivery mechanisms can be purchased for application. The different technologies offer alternatives for fungicide application and growers often ask about the potential benefit of the technologies for fungicide efficacy and performance both before purchases and during fungicide application season. Little information is available on several of the technologies for fungicide application and growers need this information before they make their purchases of sprayers with these technologies. The growers also need information on how each of the technologies can most effectively be operated to maximize fungicide performance.

2. What were the most significant accomplishments?

The objectives of the study were to evaluate field scale spray systems with differing application technologies for enhanced control of FHB in HRSW. The study demonstrated that operation and adjustment of sprayers with differing solution delivery systems (electrostatic, air stream, and hydraulic) and differing spray atomization methods (hydraulic, wind sheer, and rotary) could affect fungicide performance through improved spike coverage. Disease levels were low and excellent yields were produced in the studies. One spray system, air sheer with air stream delivery, improved yield over the control at both configurations tested. A second system, rotary and hydraulic delivery, improved yield over the control by one of the configurations.

Spike coverage, measured by fluorescent dye deposition on the head, was greater on the front side of the spike with all spray systems. Some spray systems had three times greater coverage than other spray systems. Coverage between individual spray configurations were as much as four times greater indicating the critical importance of operation of the spray systems. A wide range of drop sizes, measured as volume mean diameter (VMD), were produced by the spray systems ranging from 146 to 577 VMD on the front side of water sensitive paper. Area coverage on the front side paper ranged from 2.7 to 38.7 % indicating the advantage of some spray systems. Backside area coverage ranged from 0.4 to 18.2 %. A half rate of fungicide effectively controlled FHB at these low levels making differentiating between sprayers difficult. Further modification of research techniques and study is needed.

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.

PUBLICATIONS:

Halley, S. 2004. Adjuvants to Enhance the Efficacy of Folicur Fungicide for Control of Fusarium Head Blight, 2003. Fungicide and Nematicide Tests. Report 59:CF009.

Halley, S., Van Ee, G., Hofman, V., Panigrahi, S. and Gu, H. 2003. Ground Spray Systems and Spray Parameter Evaluation for Control of Fusarium Head Blight on a Field Scale Basis. 2003 National *Fusarium* Head Blight Forum Proceedings. p. 69-75.

Halley, S. 2003. Spring wheat and durum wheat response to fungicide application of AMS21619 with additives for the control of Fusarium head blight and leaf disease, 2002. Fungicide and Nematicide Tests. Report 58:CF009.