

**USDA-ARS/  
U.S. Wheat and Barley Scab Initiative  
FY05 Final Performance Report (approx. May 05 – April 06)  
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**Cover Page**

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<b>Fiscal Year:</b>	<b>2005</b>
<b>FY05 ARS Agreement ID:</b>	<b>59-0790-3-080</b>
<b>Agreement Title:</b>	<b>Investigating Fungicide and Application Strategies for Increased FHB Control.</b>
<b>FY05 ARS Award Amount:</b>	<b>\$ 43,610</b>

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
CBC	2005 FHB Uniform Fungicide Trials on Winter Wheat, Spring Wheat and Barley.	\$ 19,512
CBC	2005 Aerial Application of Fungicide for Improved Control of FHB on Wheat.	\$ 24,098
	<b>Total Award Amount</b>	<b>\$ 43,610</b>

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Principal Investigator

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Date

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\* 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:** *2005 FHB Uniform Fungicide Trials on Winter Wheat, Spring Wheat and Barley.*

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

Fusarium head blight (FHB) disease development is dependent on environmental conditions prior to, and during the period when wheat and barley are susceptible to infection.

Commercially-available wheat varieties have low to moderate levels of disease resistance, while varieties of malting barley and winter wheat are susceptible. This project tested disease control efficacies of three experimental fungicide products at different application rates comparatively against the current industry standard control.

**2. List the most important accomplishment and its impact (how is it being used?).**

**Complete all three sections (repeat sections for each major accomplishment):**

**Accomplishment:**

This information is critical to obtain and release to the small grain production community. Producers often inquire how well the next generation of fungicides perform against FHB and when those products will be commercially available. Many growers in the Red River Valley are poised to grow wheat varieties with have increased resistance to FHB and to apply fungicides with better control activity than the product available to them now. Overall, the next generation of experimental fungicides suppress FHB symptoms and deoxynivalenol (DON) content in grain more than the product in current use. Test results from 2005 indicate that disease response from fungicide application differed by cropping species. Fungicides appeared to be more effective at suppressing disease when applied on spring wheat compared to winter wheat or spring barley. While disease control was not as great on winter wheat or spring barley, the economic outcome was not analyzed and may result in added benefits for producers that are not reported here.

**Impact:**

Overall, the Uniform Fungicide Trial effort provides data on how well fungicide products performed during 2005 from a number of states, growing environments, crop species, and disease pressures. Cooperating states in the Upper Midwest experienced FHB epidemics, while others had less severe disease. A primary strength of the uniform fungicide trial effort is multi-state participation. This data enables industry to adjust active ingredient rates and/or formulations to achieve the best disease control outcome, resulting in fewer grain yield and quality losses when fungicides are commercialized.

**As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:**

Data from this test was included in the State of Minnesota's successful 2006 Section 18 Specific Exemption request for the use of tebuconazole fungicide on wheat and barley to manage FHB. In addition, Minnesota data contributed to the success of at least three other Section 18s submitted by other states. Data from this project is responsible, in part, for 1.0 million acres of wheat and 100,000 acres of barley being permitted for fungicide application by the EPA in Minnesota during 2006.

**Project 2:** *2005 Aerial Application of Fungicide for Improved Control of FHB on Wheat.*

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

Fusarium head blight continues to be a yield-limiting factor of wheat and barley in the Upper Midwest small grains production region. Suppression of the disease in spring wheat has been achieved by timely application of fungicides and through increased fungicide deposition on heads by using forward and backward angled flat fan nozzles. New experimental fungicide chemistries offering greater FHB disease control are not available commercially for producers via Section 3 registrations. Repeated grain yield and quality reductions make it imperative that existing fungicides be used in such a way as to achieve maximum disease suppression. This project was conducted to determine if current aerial application strategies were the most efficacious for maximum disease suppression. A commercial spring wheat production field of approx. 120 acres was used in the Minnesota trial. Aerial application research efforts were conducted cooperatively with North Dakota State University (NDSU) researchers from Fargo and Langdon, ND. A total of six aircraft-applied treatments, including 5 treatments and a nontreated control, were tested in a replicated, statistically designed field experiment. At question were the effects of spray solution dilution and droplet size on disease and yield responses. Three fungicide dilutions (3, 5, 7 gallons/acre) and three droplet sizes (200, 275, 350  $\mu\text{m}$ ) were tested. The current industry standard of 5 gallons/acre applied with 275  $\mu\text{m}$  droplets was included.

**2. List the most important accomplishment and its impact (how is it being used?).  
Complete all three sections (repeat sections for each major accomplishment):**

**Accomplishment:**

Information generated from this collaborative trial is being used to support aerial application of fungicide in suppressing FHB in Minnesota and North Dakota. An aircraft application and technology trial of this scope has never been conducted in the Upper Midwest. Aerial applicators have had to rely on observation and customer input concerning the disease control efficacy resulting from their fungicide applications. This test supplies scientific, replicated data that supports the best combination of fungicide dilution and droplet size of those that were tested.

**Impact:**

Aerial application businesses in Minnesota and North Dakota now have access to replicated, statistically significant data that can be used to support the current industry standard fungicide application. This confirms that aerial applicators are achieving the best disease control possible. This will impact small and large aerial applicator businesses as well as increase grower acceptance of aerial application of fungicides.

**As a result of that accomplishment, what does your particular clientele, the scientific community, and agriculture as a whole have now that they didn't have before?:**

The entire fungicide application industry has scientific, replicated data that support current aerial application technologies.

**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.**

**PUBLICATIONS:**

- Fritz, B.K., I.W. Kirk, I.C. Hoffman, D.E. Martin, V. L. Hofman, C.R. Hollingsworth, M. McMullen and S. Halley. 2006. Aerial application methods for increasing spray deposition on wheat heads. American Society of Agricultural and Biological Engineers (ASABE) Applied Engineering in Agriculture 22(3): 357-364.
- Hollingsworth, C.R., C.D. Motteberg, and W.G. Thompson. 2005. 2005 FHB uniform fungicide trial on hard red spring wheat in Minnesota. Pages 200-202 in: Proc. 2005 Natl. Fusarium Head Blight Forum. 11-13 Dec. 2005. Milwaukee, WI.
- Hollingsworth, C., M. McMullen, S. Halley, V. Hofman, C. Motteberg, and S. Meyer. 2005. Cooperative study for improved management of Fusarium head blight using aerial application of fungicide. Pages 205-208 in: Proc. 2005 Natl. Fusarium Head Blight Forum. 11-13 Dec. 2005. Milwaukee, WI.
- Hollingsworth, C.R. 2005. Deoxynivalenol levels in wheat and barley following application of fungicide for Fusarium head blight control. Pages 41-42 in: Proc. Assoc. Analytical Chemists International Midwest Sect. 23-26 May 2005. Kansas City MO.
- Hollingsworth, C.R., C.D. Motteberg, and W.G. Thompson. 2005. 2005 FHB uniform fungicide trial on hard red winter wheat in Minnesota. Pages 203 in: Proc. 2005 Natl. Fusarium Head Blight Forum. 11-13 Dec. 2005. Milwaukee, WI.
- Hollingsworth, C.R., C.D. Motteberg, and W.G. Thompson. 2005. 2005 FHB uniform fungicide trial on spring barley in Minnesota. Pages 204 in: Proc. 2005 Natl. Fusarium Head Blight Forum. 11-13 Dec. 2005. Milwaukee, WI.
- Hollingsworth, C.R. 2005. Evaluating fungicides for controlling FHB. Prairie Grains 69:34-35.
- Hollingsworth, C.R., C.D. Motteberg and W.G. Thompson. 2006. Efficacy of fungicides in controlling Fusarium head blight on spring wheat in Minnesota, 2005. Fungic. Nematicide Tests 61:CF010.
- Hollingsworth, C.R., C.D. Motteberg and W.G. Thompson. 2006. Efficacy of fungicides in controlling Fusarium head blight on spring barley in Minnesota, 2005. Fungic. Nematicide Tests 61:CF009.
- Hollingsworth, C.R., C.D. Motteberg and W.G. Thompson. 2006. Efficacy of fungicides in controlling Fusarium head blight on winter wheat in Minnesota, 2005. Fungic. Nematicide Tests 61:CF011.

**PRESENTATIONS:**

- Hollingsworth, Charla. Wheat Production Issues in the Red River Valley. 2006 Advanced Crop Advisors Workshop. Fargo, ND. 23-24 Feb. 2006.
- Dill-Macky, Ruth. Management Options for Fusarium Head Blight. 2005 Crop Pest Management Short Course. St. Paul, MN. 21-22 Nov. 2005.