

**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>59-0790-5-076</b>
<b>Agreement Title:</b>	<b>Effect of Inoculum Levels, Host Resistance, Fungicide and Weather on FHB.</b>
<b>FY05 ARS Award Amount:</b>	<b>\$ 26,001</b>

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
EDM	Effect of Inoculum Levels, Host Resistance, Fungicide and Weather on FHB.	\$ 26,001
	<b>Total Award Amount</b>	<b>\$ 26,001</b>

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Principal Investigator

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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: Effect of Inoculum Levels, Host Resistance, Fungicide and Weather on FHB.****1. What major problem or issue is being resolved and how are you resolving it?**

Fusarium head blight (FHB) of wheat has caused multiple disease epidemics and significant economic loss in North Dakota over the last thirteen years. Wheat breeders and plant pathologists have focused on more of their resources to develop resistant cultivars and various other disease management strategies to combat this disease. The regional farming community has adopted an integrated approach to managing the disease using: cultivars with the best available tolerance or resistance; crop rotation; and fungicide protection.

Fungicides are available to manage FHB, but there are two major constraints for their use: 1) increase in cost of production; and 2) appropriate timing of application when needed. A decision support system is necessary to accurately predict when an economic threshold of disease will occur. Epidemiology researchers based at Indiana, Ohio, North Dakota, Pennsylvania, and South Dakota land grant universities are collaborating to provide growers and agricultural industry with timely and reliable disease forecasts for Fusarium head blight (FHB). Knowledge about sources of inoculum, inoculum levels, host resistance, fungicide application, and weather conditions favorable for FHB development is crucial in devising a reliable disease forecaster. In 2005, effect of inoculum levels, host resistance, and fungicide application on wheat head scab under North Dakota field conditions was studied. Two wheat cultivars Alsen (FHB moderately resistant and early flowering) and Argent (FHB susceptible and early flowering) and white wheat spring cultivar Granite (late flowering) were planted at NDSU Experimental Research Farm at Fargo, ND. Two inoculum levels (low and high) were applied, using *G. zea* infested corn kernels, at 6-leaf stage. Half of the experimental plots were sprayed with fungicide Folicur at flowering stage. The disease incidence and severity data were recorded in all treatments. The fungal populations present on heads in all inoculum level treatments were assayed daily. Placing one Burkard cyclone air sampler in each inoculum level treatment also monitored *G. Zeae* population present in the air. One hundred wheat heads from each treatment were monitored from Feeks scale 10-11.2 three times a week to observe the synchrony of heads development.

FHB incidence was significantly different between the inoculum level treatments. The disease incidence and severity range was 21 to 21% and 10 to 32%, respectively. Fungicide application significantly decreased FHB severity and increased the seed test weight. The cultivars exhibited significant differences in FHB severity, but not in incidence. The disease severity was significantly lower (8 to 11%) in FHB resistant cultivar Alsen then in the susceptible Argent (25 to 33%). As expected, both air samples and head washes collected from high inoculum and no inoculum level plots resulted in high number and low number *G. zea* spores (CFU), respectively. The majority (>97%) of the plants began and ended flowering in 3 to 4 days in all three cultivars.

**2. What were the most significant accomplishments and impact?**

**Accomplishment:** The following information has been accomplished from the first year (2005) project. The results indicate that, i) under favorable weather for FHB, locally available *G. zea* inoculum could play a significant role in disease development under North Dakota condition; ii)

fungicide application at flowering stage could reduce disease severity, and iii) host resistance helps in decreasing diseases severity, but not disease incidence. Additionally, on an average, wheat heads take 3-4 days to begin and complete flowering, a crucial stage for scab infection.

**Impact:** The information obtained in this research would ultimately speed up the efforts in the development of effective and précised forecaster, and would help wheat producers better manage disease.

### **3. A list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles.**

1. Ali, S., and T. Adhikari 2005. Effect of host resistance, fungicide application and inoculum levels on Fusarium head blight of wheat in North Dakota. In: Proceedings of the 2005 National Fusarium Head Blight Forum, Milwaukee, Wisconsin, pp 113.
2. Nita, M., E. DeWolf, L. Madden, P. Paul, G. Shaner, T. Adhikari, J. Stein, and L. Osborne. 2005. Effect of corn residue level on the incidence of Fusarium head blight. In: Proceedings of the 2005 National Fusarium Head Blight Forum, Milwaukee, Wisconsin, pp 124.