

**USDA-ARS / USWBSI**  
**FY03 Final Performance Report (approx. May 03 – April 04)**  
**July 15, 2004**

**Cover Page**

<b>PI:</b>	<b>Lloyd Bullerman</b>
<b>Institution:</b>	<b>University of Nebraska - Lincoln</b>
<b>Address:</b>	<b>Department of Food Science 349 Food Industry Building Lincoln, NE 68583</b>
<b>E-mail:</b>	<b>lbullerman1@unl.edu</b>
<b>Phone:</b>	<b>402-472-2801</b>
<b>Fax:</b>	<b>402-472-1693</b>
<b>Year:</b>	<b>FY2003 (approx. May 03 – April 04)</b>
<b>FY03 ARS Agreement ID:</b>	<b>59-0790-3-077</b>
<b>FY03 ARS Agreement Title:</b>	<b>Inhibition of Fusarium graminearum and Fusarium Head Blight by Bacillus pumilus.</b>
<b>FY03 ARS Award Amount:</b>	<b>\$ 4,878</b>

**USWBSI Individual Project(s)**

<b>USWBSI Research Area*</b>	<b>Project Title</b>	<b>ARS Adjusted Award Amount</b>
CBC	Inhibition of Fusarium graminearum and Fusarium Head Blight by Bacillus pumilus.	\$ 4,878
	<b>Total Amount Recommended</b>	<b>\$ 4,878</b>

Lloyd B. Bullerman  
Principal Investigator

July 14, 2004  
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: *Inhibition of Fusarium graminearum and Fusarium Head Blight by Bacillus pumilus.***

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

The major problem that we were attempting to resolve was the prevention of Fusarium Head Blight or Scab in wheat using a potential biological control agent. Therefore the purpose of this research project was to utilize the antifungal properties of *Bacillus pumilus* NE B1, which had previously been shown to exhibit strong antifungal activity against *Fusarium graminearum*, the cause of Fusarium Head Blight (FHB) or scab in wheat. The use of biological control agents has increased in importance as concerns have grown over the use of chemical preservatives, fungicides and other agrochemicals to produce food. There is the potential for *B. pumilus* NE B1 to have applications in the food and agricultural industries to diminish monetary losses for farmers and processors from fungi as well as ensure the safety of food to consumers. To determine the potential feasibility of using *B. pumilus* as a biological control agent of FHB, greenhouse trials on wheat plants were conducted in collaboration with Dr. Gray Yuen of the Plant Pathology Department at the University of Nebraska-Lincoln. The results of these trials are presented in this report.

The objective of this research project was to determine the ability of live cells and cell free supernatants of cultures of *B. pumilus* NE B1 to prevent the development of Fusarium Head Blight by *F. graminearum* on inoculated wheat plants in greenhouse trials.

This was accomplished by planting wheat in 5 sets, 30 pots per set. At approximately 6-9 weeks after planting, when the wheat was in the flowering stage, the wheat heads were inoculated with *B. pumilus* cells or cell-free supernatants from *B. pumilus* cultures and spores of *F. graminearum*. After a 14-16 day period the treated wheat was rated visually for the presence and severity of FHB. Results were then analyzed by analysis of variance (ANOVA) with design of treatment and incidence of disease being the factors. Results were evaluated in collaboration with Dr. Yuen of the UNL Plant Pathology Department.

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

Experimental trials were analyzed by SAS using randomized complete block design to perform an analysis of variance (ANOVA). Comparing the mean averages of each pot per treatment the ANOVA showed there was a significant difference between the wheat treated with the supernatant and the control. The wheat treated with the supernatant had significantly fewer heads that developed FHB than the control. There was also a significant difference between wheat treated with the cells and the control. Again wheat treated with cells of *B. pumilus* had significantly fewer heads that developed FHB than the control. When ANOVA was determined on the number of infected heads per pot per treatment a significant difference was also shown between the supernatant treatment and the control and between the cell treatment and control. Again both supernatant and cell treatments resulted in fewer wheat heads infected with FHB than the controls. While the analysis of variance showed significant differences between the treatments and the controls, those differences may not be sufficient to have any real practical significance, since the reductions in the amount of FHB were at best only about 30% for either the supernatant or cell treatment.

FY03 (approx. May 03 – April 04)

PI: Bullerman, Lloyd

ARS Agreement #: 59-0790-3-077

FY03 Final Performance Report

**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.**

No publications have been developed nor published that resulted from this project. One peer reviewed publication and a portion of a M.S. thesis will be developed as a result of this work.