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:	**NA**
FY03 ARS Agreement Title:	**Biological Control of Wheat Scab with the Endophytic Bacterium Bacillus mojavensis.**
FY03 ARS Award Amount:	**$ 14,634**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Biological Control of Wheat Scab with the Endophytic Bacterium Bacillus mojavensis.	$ 14,634
	Total Amount Recommended	**$ 14,634**

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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: ***Biological Control of Wheat Scab with the Endophytic Bacterium Bacillus mojavensis.***

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

One major issue was the discovery that under field conditions wheat infected with the *Fusarium graminearum* accumulated a small amount of fusaric acid, which was established as an antibiotic to the endophytic bacterium, preventing its colonization of *Fusarium*-infected plants. The fusaric acid accumulated under conditions of stress, such as drought or poor soil nitrogen levels. This information was unknown, therefore unpredicted. In order to conduct our experiments we had to used high fertilizer levels and maintain proper soil water. This of course, is unrealistic and we now will focus on developing fusaric acid resistant strains of the bacterium.

2. What were the most significant accomplishments?

- Established that under excellent managed field conditions, plants infected with the bacterial endophyte prevented the spread of infection in the head, generally referred to as Type 2 resistance. Infection, Type 1 resistance, was not inhibited. Scab was reduced under field conditions within the range of 50 to 75%, which was similar to control under greenhouse conditions. The wheat varieties included the highly susceptible Norm as a positive control, and four other varieties of wheat, two rated as being tolerant of scab and two as being susceptible to scab.

- *Fusarium graminearum* (along with other *Fusarium* species such as *F. verticillioides* produced fusaric acid *in planta* under stressing conditions, which indicates that any fusaric acid sensitive bacterium used for its biocontrol must be resistant to this antibiotic substance. Data indicates that most bacteria are sensitive, so competition is in favor of the fungus since abiotic stresses are easily encountered under field conditions.

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.

1. Bacon, C. W. and D. M. Hinton. 2004. Potential control for seedling blight of wheat with the bacterial endophyte *Bacillus mojavensis.* Mycopathologia. (accepted)

2. Bacon, C.W., Hinton, D.M., Porter, J.K., Glenn, A.E., and Kuldau, G.A. 2004. Fusaric acid, a *Fusarium verticillioides* metabolite, antagonistic to the endophytic biocontrol bacterium *Bacillus mojavensis*. Can. J. Bot. (accepted)

3. Bacon, C. W., Hinton, D. M., Porter, J.K., Glenn, A. E., Kuldau, G. 2003. Fusaric acid, a *Fusarium* metabolite, useful against the endophytic bacterium *Bacillus mojavensis.* Phytopathology. 93:56.

4. Bacon, C.W., Yates, I.E. Endophytic root colonization by *Fusarium* species: Histology, toxicity and control. *In* Schulz, B., Boyle, J., Sieber, T. (ed.) Microbial Root Endophytes. Springer-Verlag, Heidelberg, Germany. (accepted)

5. Bacon, C.W., and Hinton, D. M. 2003. Techniques for manipulating the bacterial endophyte Bacillus mojavensis. Pp. 359-376. In Spencer, J. F. T. and A. L. Ragout de Spencer (Eds.). Environmental Microbiology, Methods and Protocols. Humana Press, Totowa, NJ.