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

Cover Page

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Year:	**FY2003 (approx. May 03 – April 04)**
FY03 ARS Agreement ID:	**59-0790-1-079**
FY03 ARS Agreement Title:	**Biocontrol of Fusarium Head Blight.**
FY03 ARS Award Amount:	**$ 19,229**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
CBC	Biocontrol of Fusarium Head Blight.	$ 19,229
	Total Amount Recommended	**$ 19,229**

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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: *Biocontrol of Fusarium Head Blight.*

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

This project focused on a bacterial agent *Lysobacter enzymogenes* C3 that exhibited promise in greenhouse experiments for suppressing Fusarium head blight. Preliminary experiments suggested that, in addition to producing antifungal enzymes and antibiotics, the bacterium induced resistance in wheat against *Fusarium graminearum*. There were two main questions addressed in this project.

I. What is the potential for *L. enzymogenes* C3 to control Fusarium head blight under field conditions?
Two sets of field tests were conducted in sites in Nebraska. C3 also was evaluated in field tests conducted by collaborators in South Dakota and Ohio. Because previous greenhouse tests and a preliminary field experiment suggested that biocontrol efficacy of C3 is cultivar dependent, the objective of one set of experiments was to determine if C3 could provide Fusarium head blight control on different cultivars of spring wheat. The second set of field experiments was designed to compare C3 with other known antagonists of *Fusarium graminearum* (*Bacillus subtilis* TrigoCor 1448, *Bacillus* sp. 1BA, and *Cryptococcus nodaensis* OH182.9) for biocontrol efficacy.

II. How is induced resistance involved in the suppression of Fusarium head blight by *L. enzymogenes* C3.
Greenhouse experiments were conducted in which C3 was applied to different parts of wheat plants prior to inoculation of wheat heads with the pathogen to determine if resistance to FHB induced by C3 is localized or systemic.

2. What were the most significant accomplishments?

Evidence was obtained that Lysobacter enzymogenes C3 is as efficacious in controling scab in the field as other biocontrol agents, but its efficacy can be affected by the cultivar to which it is applied. In two experiments conducted in Ohio, C3 was found to be equally effective as the other tested biological agents, i.e, all reduced scab severity in a moderately resistant soft red winter wheat 'Freedom' while none were effective in controling scab in a susceptible cultivar 'Pioneer 2545'. Confirmation of these results, however, could not be obtained from Nebraska and South Dakota field trials because disease levels were too low to yield conclusive data.

The potentials and limitations of induced resistance by C3 were found in greenhouse experiments. When C3 was applied to wheat leaves or to specific spikelets, the bacterium provided only a localized protective effect, suppressing infection of only those spikelets to which the bacterium was deposited. When C3 was applied uniformily to all spikelets in a wheat head, the spread of *F. graminearum* from a point inoculum through the rachis was inhibited, presumably via localized induced resistance. Thus, while suppression of the infection process is dependent on the spatial distribution of C3 on wheat heads, treatment with C3 potentially can limit pathogen spread from an infection point in a manner analogous to type 2 resistance.

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.

Non-peer reviewed article

Yuen, G.Y., C.C. Jochum, B.H. Bleakley, K.R. Ruden, M. Draper, D.A. Schisler, S. Zhang, M.J. Boehm, P.E. Lipps, and G.C. Bergstrom. 2003. Cooperative multistate field tests of biological agents for control of Fusarium head blight in wheat and barley. Proceedings of the 2003 National Fusarium Head Blight Forum: 113-115.

Published abstracts

Yuen, G.Y, Jochum, C.C., Osborne, L.E. and Jin, Y. 2003. Biocontrol of Fusarium head blight in wheat by *Lysobacter enzymogenes* C3. Phytopathology 93:S93.

Yuen, G.Y and Jochum, C.C. 2003. Control of Fusarium head blight via induced resistance elicited by *Lysobacter enzymogenes* C3 - Potentials and limitations. Proceedings of 2003 National Fusarium Head Blight Forum:112.

Presentations

Yuen, G.Y, Jochum, C.C., Osborne, L.E. and Jin, Y. Biocontrol of Fusarium head blight in wheat by *Lysobacter enzymogenes* C3. Poster presented at 2003 Annual Meeting of the American Phytopathological Society.

Yuen, G.Y and Jochum, C.C. Control of Fusarium head blight via induced resistance elicited by *Lysobacter enzymogenes* C3 - Potentials and limitations. Poster present at the 2003 National Fusarium Head Blight Forum.