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:	**59-0790-3-081**
FY03 ARS Agreement Title:	**Role of dioxygenases in Fusarium graminearum sporulation.**
FY03 ARS Award Amount:	**$ 42,927**

USWBSI Individual Project(s)

USWBSI Research Area*	Project Title	ARS Adjusted Award Amount
EDM	Role of dioxygenases in Fusarium graminearum sporulation.	$ 42,927
	Total Amount Recommended	**$ 42,927**

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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: ***Role of dioxygenases in Fusarium graminearum sporulation.***

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

Gibberella zeae (anamorph *Fusarium graminearum)* is the causal agent of scab of wheat, barley and other small grains. This fungus not only destroys host tissue but also produces mycotoxins such as deoxynivalenol and zearalenone in infected seed thus causing considerable monetary and health loss. This fungus produces two spores, asexual conidia and sexually derived ascospores, both of which are important for disease development. Impediments to spore production would be useful in controlling this disease. Biochemical and genetic studies suggest that oxylipins, oxygenated derivatives of unsaturated fatty acids, are conserved signaling and structural molecules modulating fungal sporulation. Our goal is to test this hypothesis by cloning and then disrupting the *F. graminearum ppo* genes which encode dioxygenases required for oxylipin production. We will examine *Δppo* strains of *F. graminearum* for asexual and sexual spore production. Preliminary data of putative *Fusarium Δppo* strains indicate that asexual reproduction is severely decreased in comparison to wild type. Abberations in spore production or virulence of the *Δppo* strains will suggest that *ppo* genes and/or their products could be targeted for control strategies. These efforts will help in developing efficient control measures to minimize scab outbreaks and spread in the USA and other affected countries.

2. What were the most significant accomplishments?

a. **Identification of dioxygenase genes in *Fusarium* spp.** We have identified three *ppo* genes in *Fusarium graminearum* by (i) probing a *Fusarium graminearum* genomic library with a *F. verticilliodes* EST clone with high identity to the *Aspergillus ppo* genes and by (ii) examining the Whitehead (now Broad Institute) website with the *Fusarium graminearum* genome.
b. **Northern blot analysis of gene transcript profiles for the *ppo* genes in *F. graminearum and F. sporotrichioides.*** We have determined all three *ppo* genes are expressed in *F. graminearum* and have also shown expression of one *ppo* in *F. sporotrichioides.*
c. **Disruption of the *ppo1* gene in *F. sporotrichioides* reduces asexual spore, oxylipin production and trichothecene production.** This is published as shown in next page.
d. **We have cloned and sequenced the *ppoA* gene in *F. graminearum.*** We are currently waiting for a new post doc to arrive in Sept 2004to continue this project.

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. McDonald T, Devi T, Shimizu K, Sim S-C, Keller NP (2004) Signaling events connecting mycotoxin biosynthesis and sporulation in *Aspergillus* and *Fusarium spp.* In New Horizon of Mycotoxicology for Assuring Food Safety, (Editor: Takumi Yoshizawa) pp 139-147.

Posters

1. Food Research Institute Annual Meeting, May, 2004. T. McDonald, Daren Brown, Nancy Keller and Tom Hammond. Use of RNAi to control toxin production in *Fusarium graminearum*.
2. APS 2004 Annual Meeting: T. McDonald, Daren Brown, Nancy Keller and Tom Hammond. Use of RNAi to control toxin production in *Fusarium graminearum*.
3. Annual SCAB Meeting Dec 2003, Minneapolis, MN: T. McDonald, K. Devi and Keller NP. Role of dioxygenases in *Fusarium graminearum* sporulation