Biocontrol of Aflatoxin Contamination and Selection of Atoxigenic Strains in California Almonds

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PROJECT SUMMARY

Objectives:

The focus of this research is to provide background for obtaining an almond registration for the atoxigenic *Aspergillus flavus* strain AF36 to use as a biocontrol agent to reduce aflatoxin potential in the orchard. AF36 is currently registered and being used successfully in other crops, such as cotton seed, corn, and pistachios. Current objectives are:

- Identify risk factors and spatial patterns associated with aflatoxin development in California almonds.
- Determine the spread and survival of the atoxigenic *Aspergillus flavus* strain AF36 previously applied to orchards.
- Obtain a registration for AF36 in almonds.
- Identify other endemic, well adapted, efficient atoxigenic strains for registration to supplement AF36's efficacy using a multi-strain biological control strategy.

Background and Discussion:

Aflatoxin is a carcinogenic contaminant produced by the fungi *Aspergillus flavus and A. parasiticus* which occur in nut crop orchards. The almond industry has taken extensive measures to control aflatoxin. This project seeks to further this effort with the objectives outlined above.

Of note, the bio-control technique of "seeding" the atoxigenic (non-aflatoxin producing) AF36 strain of *A. flavus* is already showing promising results in almonds. This strain is inoculated into the field and displaces the naturally present aflatoxin-producing fungal strains. This approach in other crops like pistachio, cotton, and corn has led to a substantial reduction in aflatoxin contamination.

Other key findings include the following. The incidence of *A. flavus* and *A. parasiticus* in orchards of all growing regions presents a risk of aflatoxin contamination. The almond industry has taken a number of measures pre- and post-harvest to assure control and compliance with aflatoxin standards. These measures include: 1) Good agricultural practices like insect pest management and product handling; 2) Sorting of insect damaged kernels; and 3) Aflatoxin sampling, testing and certification of processed almonds.

This work continues to document insect feeding and damage, particularly by the navel orangeworm (NOW), which contributes to the transmission, invasion, and development of *Aspergillus* fungi and the production of aflatoxin. Almond mummies—the overwintering source for NOW—show high levels of infection by *A. flavus* and *A. parasiticus*.

Aspergillus growth and aflatoxin production in the new crop can occur throughout crop maturation and harvest, starting after hull split and through the harvest steps.

Several atoxigenic (non-aflatoxin producing) strains of *Aspergillus* commonly inhabit orchards of almond and other susceptible crops. These isolates can compete and displace the toxin-forming strains of *Aspergillus to* reduce aflatoxin accumulation and can supplement and may be more efficacious than the current AF36 strain. This opens up the possibility of registering a multi-crop, multi-strain strategy using endemic, well adapted, efficient strains a biocontrol product for use in almond and other susceptible crops.

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For More Details, Visit

- Poster location 26, Exhibit A + B during the Almond Conference; or on the web (after January 2015) at Almonds.com/ResearchDatabase
- 2013-2014 Annual Reports CD (13-AFLA1-Michailides); or on the web (after January 2015) at Almonds.com/ResearchDatabase
- Related project: 12-AFLA2-Lampinen