

The High Cost of Aflatoxins

Aflatoxins are naturally occurring chemicals produced by certain molds, mainly *Aspergillus flavus* and *A. parasiticus*. The main health concern of aflatoxins is their potential carcinogenicity. Chronic exposure to aflatoxins can increase the risk of developing liver cancer.



Aflatoxin-producing molds are common in nature affecting a number of crops. In almonds, the source of the contamination is from the soil, previously infested almonds (mummy nuts), and navel orangeworm (NOW) or other pests.

Spores of the molds can be transferred by the NOW and grow on nutmeats which have been damaged. Favorable conditions for mold growth include high moisture content and high temperatures.

Because they are a potent carcinogen, tolerances for aflatoxins have been established to reduce risk of exposure. When almonds are tested in the lab for aflatoxins and are found to have levels above the allowable limits, the consignment will have to be reconditioned or rejected with significant monetary losses to the grower and handler.

Cost of Rejection

One of the largest markets for California almonds—the European Union (EU)—also has one of the lowest allowable limits for aflatoxin contamination on almonds.

Increased rejections of California almond consignments led to additional import monitoring in the EU.

For shipments after September 1, 2007, the EU implemented Special Measures, which called for mandatory testing of California almonds imported to EU member countries. When almonds are rejected, significant costs are involved; industry estimates suggest that each rejected consignment can cost as much as \$10,000 for demurrage, warehousing, replacement shipments and other expenses. The costs climb higher if the almonds must be reprocessed to reduce the level of aflatoxins. It is also possible that the consignment will be destroyed, leading to significant economic impact on both the grower and the handler.

The California almond industry developed a voluntary aflatoxin sampling plan (VASP) comparable to the EU sampling procedures so that almonds can be uniformly tested before shipment to the EU. These procedures

Handler costs due to rejected consignments will likely be passed back to the grower.

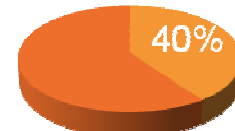
are considered to provide sufficient assurances such that almonds shipped with a VASP certificate are subject to approximately 5% testing on import in Europe, whereas without a VASP certificate almonds will be subject to 100% control.

Due to the random nature of aflatoxin contamination, it is unavoidable that some consignments of California almonds with a VASP certificate have continued to be rejected—although at a much lower rate than before implementation of the VASP program. As other countries become more concerned about food safety issues, stricter standards for aflatoxins in other markets could impact the California almond industry.

Loss of Markets

The European Union alone represents 55% of export shipments; in addition, the EU is expected to absorb an estimated 40% of the projected production increase anticipated by 2010. To preserve this and other valuable markets, the industry must continue to demonstrate the high quality of California almonds.

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Another sector at risk as a result of aflatoxin contamination is the almond by-product markets, including animal feed and oil. Inedible almonds, almond hulls, and press cake, the meal leftover after pressing almonds for oil, are used in animal feed as they provide a good source of fiber and sugars. These by-products are subject to scrutiny because aflatoxins can be concentrated in the inedible almonds and meal.

California has stricter feed requirements than any other state in the U.S. due to the importance of the dairy

industry; in fact feed tolerances are equivalent to tolerances of products intended for human consumption at 20 parts per billion.

Preventing Aflatoxin

The almond industry needs to minimize aflatoxins at every stage of production—not only depending on testing, sampling, and processing, but focusing on the orchard environment where aflatoxin contamination begins and where it must be stopped.

Growers can reduce the potential for aflatoxin growth by minimizing navel orangeworm damage. NOW prevention can be accomplished by:

- **Winter sanitation.** The removal of mummy nuts—those that remain on the tree after harvest—before budswell, on or by February 1. They are a prime harborage of overwintering NOW and their removal is the most effective control method. After removal, they should be destroyed by March 15.
- **Early harvest.** Secondly, when nuts are harvested as soon as possible after they mature and promptly removed from the orchard, a third generation of egg-laying is avoided. *Eggs of the navel orangeworm on a black egg trap that are about to hatch.*
- **In-season treatment.** If winter sanitation and early-harvest guidelines are followed, an in-season treatment for NOW may not be necessary. A harvest sample can help determine if treatments are required.



Photo by Jack Kelly Clark

Mummy nuts that remain on the tree after harvest are a prime harborage of overwintering navel orangeworm. Poling mummies and then destroying them once they are on the ground is the most effective control method for NOW.



ABC photo.



Photo by Jack Kelly Clark

Navel orangeworm pupae encased in woven cocoons within webbing and frass inside nuts.



Photo by Jack Kelly Clark

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Complete NOW management guidelines, including treatment options, can be found on the Web at the UC IPM site: www.ipm.ucdavis.edu under Year-Round IPM Program for Almonds.

With NOW damage to kernels minimized in the orchard and increased surveillance for aflatoxins by handlers, the California almond industry can continue to provide high quality product that meets stringent tolerances for aflatoxin contamination in the U.S. and key export markets. For more information visit www.almondboard.com