TECHNICAL BULLETIN #57

USING ULTRAVIOLET LIGHT TO DETECT POSSIBLE AFLATOXIN CONTAMINATION IN AGRICULTURAL COMMODITIES

What is Aflatoxin? Aflatoxin is an acronym formed from Aspergillus Flavus Toxin and is used generally to describe related heterocyclic metabolites B^1, B^2, G and G^2 of the aspergillus flavus mold. In short, it is a carcinogenic (cancer-producing) toxic chemical, whose most visible effects have been noted on a variety of livestock over many years. This mold, once ingested inhibits protein syntheses within the cells of the animal and also impairs the ability to mobilize fats. Poor growth and adverse organic changes result with the occurrence of anemic conditions, frequent convulsions and sometimes death.

The Problem Each year, aflatoxin is responsible for the contamination of enormous quantities of agricultural commodities, including corn, peanuts, sorghum, copra, pistachio nuts and cottonseed. Early detection of contaminated crops allows the aflatoxin to be isolated and helps prevent its spread, thus saving profits and ensuring the safety of farm products. A simple, convenient ultraviolet (black light) test makes it possible to detect the possible presence of aflatoxin within minutes or, equally important, to tell there is no contamination.

Where Aflatoxin Occurs Aflatoxin contamination is generally not found in the field. It most frequently develops when the harvested crop is stored in damp places at temperatures that are conducive to the growth of the mold. Other factors which contribute to its occurrence are premature harvesting of the crop, bruising or other physical damage caused by draught or insects. In fact, any conditions that lead to a weakening of the crop can intensify the aflatoxin problem.

Rejection of Shipments Rejection of U.S. agricultural shipments by overseas customers on the basis of aflatoxin contamination can have a seriously adverse effect upon future demand for billions of dollars worth of exports. The U.S. Agriculture Department and the Food and Drug Administration have become increasingly concerned and have, consequently, stepped up their inspection efforts. Unfortunately, once the food products have been contaminated, there is no practical way of removing the toxin and it is necessary to divert the products to nonfood uses. Constant vigilance must therefore be maintained at storage facilities to detect contaminated lots. Early detection will allow the aflatoxin contamination to be isolated and can help prevent its spread.

One Grain in a Truckload Renders a Crop Unfit According to the FDA, as little as 20 parts per billion (about on infected kernel in 625 bushels) is sufficient to render corn unfit for human consumption. THe standards used to judge fee for livestock vary between 20 and 100 parts per billion.

The Ultraviolet Test Clears Crops for Sale The ultraviolet test is extremely convenient as a testing procedure because of its capability

of screening large quantities of food material quickly with high sensitivity. The method is inexpensive to use, and can be easily taught to nontechnical personnel. If bright greenish-gold fluorescence is observed in a fresh sample under a long-wave ultraviolet lamp, such as the Spectroline BIB-150P or B-160, aflatoxin may be present — although no necessarily in levels exceeding FDA standards. If no fluorescence is seen, aflatoxin is probably not present in excessive quantities.

Because there are other fungi that product fluorescent but harmless metabolites, detecting fluorescence in a sample does not prove aflatoxin is present. Instead, the appearance of fluorescence indicates that additional tests should be performed in a laboratories to determine if the aspergillus flavus mold is responsible and, if so, to establish the precise levels of aflatoxin present. Care must be taken to ensure that the samples are fresh because the fluorescence is not stable and will eventually disappear, although the toxin itself remains.

Subsequent Screening and Confirmatory Tests Other tests to establish the identity of the fluorescing species generally rely upon a specific chemical seperation which may or may not be chromatographic, followed by chromatographic methods. Both column and thin layer chromatography (TLC) methods may be used. AN estimate of the total aflatoxin content is made by comparison of the sample fluorescence with that of a standard. The major laboratory methods are described in the references below; the SP-100P and B-160 UV lamps are also very useful in these tests.

References

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2. "Aflatoxin in Corn: Evaluation of Filter Fluorometer Reading of Minicolumns," Shotwell, Goulden and William F. Kwoleck, *ibid.*, Vol. 60, September 1977.
3. "Aflatoxin: Comparison of Analysis of Corn by Various Methods," Shotwell and Goulden, *ibid.*, Vol. 60, January 1977.
4. "Methods of Detecting Mycotoxins in Mixed Feeds and Feed Ingredients," Tom Romer, *Feedstuffs*, April 19, 1976.