Some Mycotoxin Levels in Farm-Stored Corn

Samples obtained during feeding of grain after storage were analyzed for three mycotoxins. The samples were frozen from time of sampling until they were analyzed for aflatoxin, zearalenone, and T-2 toxin. All three mycotoxins were found in the stored grain. The results underscore the need for "normal" samples to be analyzed to establish a context for the diagnosis of mycotoxicosis in field situations.

Mycotoxin analysis is most often done on feed specimens from the field when toxicosis is occurring. Typically, it is impossible to get normal control samples. The toxicologist has to make the assessment of feed involvement in a disease based only on contaminated feed obtained at the outbreak. We obtained stored samples which were kept frozen from the time of feeding until analysis. The samples were retained to study nutrition changes due to storage under different conditions by Doug Ware and Dr. H. L. Self.

METHOD OF TEST

Samples were obtained from grains (1) in dry (forced drying) condition, (2) stored frozen immediately in field condition, (3) stored in Harvestore, and (4) stored in silo. Samples were frozen to stop further loss of moisture and nutrients and to prevent microbial action. Analyses were made on randomly identified samples.

Samples were analyzed for T-2 toxin, zearalenone, and aflatoxin by the Veterinary Diagnostic Laboratory Analysis Method (Stahr, 1977). The method consists of extraction with acetonitrile, defatting with petroleum ether, decolorization with ferric gel, and partitioning into chloroform. The chloroform is concentrated to near dryness under nitrogen. The volume is measured accurately, and the sample extracts are spotted on thin-layer chromatographic (TLC) plates and developed in toluene–ethyl acetate–acetone, 3:2:1 (v/v/v) and subsequently in acetone–chloroform–2-ropanol, 85:10:5 (v/v/v). The TLC plates were examined for aflatoxins under long-wavelength UV light (85:10:5), and zearalenone (3:2:1) was searched for under short-wave UV. Sensitivity for spiked mycotoxins in the samples was 2 ppb for aflatoxins and 0.5 ppm for zearalenone. The T-2 toxin was analyzed by TLC (anisaldehyde spray) and by gas chromatography (Stahr, 1979). The sensitivity was less than 1 ppm for T-2 toxin. All samples were spiked with the mycotoxins to assure that the methodology was working properly.

RESULTS

Table I summarizes the results from the study. None of the samples of aflatoxin were found to be over 20 ppb. One-half of the samples which were positive for zearalenone were greater than 4 ppm, and the others were over 0.5 and less than 4 ppm. All of the positive T-2 toxin samples were less than 2 ppm.

Generally, levels of mycotoxins in the samples were extremely low. There seemed to be less zearalenone in the Harvestor silo and surprisingly more in the dried and stored samples (Table I). These results should not be interpreted as a statistically significant representation of storage systems. Our goal was to try to get information on "normal" commodities for reference. The sample extracts which contained aflatoxin were pooled and confirmed by spectrofluorodensitometry and chick embryo tests. They did give positive response for aflatoxin by both tests.

Table I. Summary of Analysis for Mycotoxins in Farm-Stored Grain

sample source	toxin-positive samples, %[a] afla-toxin	T-2 toxin	zeara-lenone
concrete stave silo	20	8	11
harvestor silo	21	8.7	0
dried stored	8.6	16	17.4
dried unstored	10	14	0

[a] Lower limits of detection: 2 ppb for aflatoxin and 0.5 ppm for T-2 toxin and zearalenone were chosen as lower limits for screening.

CONCLUSION

Even "normal" commodities contain traces of mycotoxins. These samples had been fed to livestock without any significant effect on their health or growth rate. It is concluded that field sampling is very significant in mycotoxins disease and "normal" samples should be analyzed in conjunction with "suspect" samples whenever possible. The toxicologist can then make a better judgment on disease.

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