

RESEARCH NOTE

PREVALENCE OF AFLATOXIN B₁ AND B₂ IN POULTRY FEED

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ABSTRACT

A total of 65 poultry feed samples were examined for the detection of aflatoxin (aflatoxin B₁ and aflatoxin B₂) using thin layer chromatography (TLC). Samples were collected from Chitwan and Kavrepalanchok districts. Out of those samples examined a total of 49 (75.38%) samples were found positive. Out of 49 (75.38%) samples positive, 42 (85.71%) samples were found positive both with aflatoxin B₁ and B₂ where as five (10.20%) samples were positive only with aflatoxin B₁ and two (4.08%) samples were positive only with aflatoxin B₂. Among them 13 (20%) samples were found positive having aflatoxin above permissible level. The concentration of aflatoxin in positive samples ranged from trace to 366 ppb (366 µg/kg). Likewise, out of 52 samples examined in rainy season, 40 samples (76.92%) were found positive where as out of 13 samples examined in winter season 9 (69.23%) were found positive.

Key words: Aflatoxin B₁, aflatoxin B₂, feed, mycotoxin, poultry, thin layer chromatography (TLC)

INTRODUCTION

Aflatoxins are naturally occurring highly toxic metabolites produced by the fungi *Aspergillus flavus* and *Aspergillus parasiticus* that cause detrimental effects on animal and human health. They are hepatotoxic, mutagenic, carcinogenic and immunosuppressive. According to World Health Organization – International Agency for Research on Cancer (WHO – IARC 1994, cited by Dwivedi and Patil 2005) aflatoxins are also considered to be a potential human carcinogen. These fungi are mainly found in groundnut cake, maize, wheat, pulses, beans, cotton seed, peanut and rice. However, almost any feed or grain for poultry and livestock support fungal growth and aflatoxin formation. The *Aspergillus* fungus can germinate and grow on feed grains and feed at moisture levels of 15% or above in the presence of warm (70 to 100°F) temperatures. Aflatoxin production by the fungus is optimal at moisture levels above 17.5% and temperatures of 77 to 92°F. Aflatoxins are relatively stable compounds in normal food and feed products. Infection can occur while grain is standing in the field, at and soon after harvest and during storage before or after the grain is processed into feed.

Aflatoxins have emerged as an important problem of economic importance in livestock and poultry industry. Aflatoxin causes clinical illness and death when consumed in high quantity (Sohane and Chaturvedi 2001). Aflatoxins in poultry feeds have long been associated with impaired performance by decreased weight gains, drop in egg production and reduced immunity (Mani and Viswanathan 1999) and vaccination failure (Sohane and Chaturvedi 2001). Aflatoxin is the most common mycotoxins, which is ubiquitous in nature and poultry feed. There are four major types of the aflatoxin molecules referred to as B₁, B₂, G₁ and G₂. Fungi invasion of poultry and livestock feeds results in production of aflatoxins, which are consumed by birds and livestock accounts for serious health hazards. These toxins are usually formed together in various foods and feeds in various proportions; however, aflatoxin B₁ is the predominant and is the most toxic. Due to their high carcinogenic and immunosuppressive properties, these toxins pose a substantial health risk to humans and animals.

Use of poor quality feed ingredients rejected for human consumption in preparing animal and poultry feed can cause serious diseases in animals (Kalorey and Ingle 1999).

Swine, other livestock and poultry are susceptible to aflatoxins at very low levels measured in parts per billion (ppb). Low levels of aflatoxin (20 to 200 ppb) in the diet of pigs can result in decreased feed intake, slower growth rate and decreased ability to resist disease. There are severe economic losses due to aflatoxins in poultry and livestock industry. Aflatoxins present in the feed have been found to interact with salmonellosis (Boonchuvit and Hamilton 1975, Singh et al 1996).

In general younger animals are more susceptible than older market animals or breeding animals. With increasing levels of aflatoxin in the diet, depressions in feed intake and growth rate become severe. If aflatoxin levels are high enough, liver damage can occur.

In Nepal, meager studies on detection and prevalence of aflatoxins in feed have been performed. Therefore this study was conducted to detect the prevalence of aflatoxin in poultry feed.

MATERIALS AND METHODS

A total of 45 poultry feed samples representing the stock batch were collected directly from farmhouses in winter and rainy seasons from Chitwan and Kavre districts, the two major poultry production pockets. The samples were kept separately in locked polyethylene packet and taken to laboratory for analysis.

Samples were analyzed by thin layer chromatography (TLC) method as described by AOAC (1984) at the laboratory of Department of Food Technology and Quality Control, Babar Mahal and at Animal Health Research Division, Khumaltar.

RESULTS AND DISCUSSION

A total of 65 samples were examined for the detection of mycotoxin (Aflatoxin B₁ and Aflatoxin B₂). Out of those 65 samples examined 45 samples were examined at the Department of Food Technology and Quality Control, Babar Mahal and 20 samples were examined at Animal Health Research Division, Khumaltar and a total of 49 (75.38%) samples were found positive (Table 1). Among them 39 (60%) samples were found traces positive where as 13 (20%) samples were found positive having aflatoxin above permissible level. In a study aflatoxin B₁ was found in 19%

groundnut, in 11% maize and in 50% maize flour whereas only few percentage of aflatoxin B₂ were found (DFTQC 1995). Out of 49 (75.38%) samples positive, 42 (85.71%) samples were found positive both with aflatoxin B₁ and B₂ where as 5 (10.20%) samples were positive only with aflatoxin B₁ and 2 (4.08%) samples were positive only with aflatoxin B₂. The concentration of aflatoxin in positive samples ranged from trace to 366 ppb (366 µg/kg). The findings of the present study are similar to those reported by Khadka et al (2000) where in Kathmandu, Chitwan and Biratnagar observed aflatoxin 300 µg/kg in livestock feeds, 500 µg/kg in poultry feed and 300 µg/kg in feed ingredients. He observed 80% of livestock feeds, 74% of poultry feeds and 72% of feed ingredients were contaminated and the average contamination percentage was observed 75 percent. The high percentage of positive feed samples in the present study may be due to the contamination of fungi *Aspergillus flavus* and *Aspergillus parasiticus* with the poultry feed in these areas due to the favorable environment for the growth of the fungi, use of suitable feed ingredients for the preparation of feed.

Table 1. Prevalence of aflatoxin B₁ and aflatoxin B₂ in poultry feed

Total number of positive samples	Types of toxin	No. of negative samples	No. of samples positive with			
			Traces	1-20 ppb	21-50 ppb	Above 50 ppb
49/65 (75.4)	B ₁	5 (10.2)	15 (23.1)	6 (9.2)	13 (20.0)	12 (18.5)
	B ₂	2 (4.1)	24 (37.0)	16 (24.6)	2 (3.1)	1 (1.5)

Figures in parentheses indicate percent sample.

Likewise out of 52 samples examined in rainy season, 40 samples (76.92%) were found positive where as out of 13 samples examined in winter season 9 (69.23%) were found positive (Table 2). Diener and Davis (1969) mentioned that moisture and relative humidity of the surroundings plays important role for the growth and development of fungus and production of aflatoxin. Animals and poultry consuming aflatoxin contaminated feed can develop serious health problems and pass the aflatoxin into milk, meat and eggs (Mishri et al 1999). Poor harvesting, storage and marketing facilities influence the production of aflatoxin (Sinha et al 1999). Therefore, regular monitoring of these practices and monitoring of aflatoxin could help for the protection of animals, birds and humans from aflatoxicosis.

Table 2. Seasonal occurrence of aflatoxin B₁ and aflatoxin B₂ in poultry feed

Season	No of samples + ve	Types of toxin	Samples positive with			
			Traces	1-20 ppb	21-50 ppb	Above 50 ppb
Summer (July-Oct)	40/52 (76.9)	B ₁	14 (26.9)	3 (5.8)	12 (23.1)	10 (19.2)
		B ₂	18 (34.6)	13 (25.0)	1 (1.9)	1 (1.9)
Winter (Nov-Feb)	9/23 (69.2)	B ₁	2 (15.4)	3 (23.1)	2 (15.4)	2 (15.4)
		B ₂	5 (38.5)	3 (23.1)	1 (7.7)	0 (0)

Figures in parentheses indicate percent samples.

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