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ORIGINAL ARTICLES

Effect of Aflatoxicosis on Immune Status of Broiler Breeders

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ABSTRACT

A experiment was performed to study the effect of feeding aflatoxin B_1 (AF) contaminated diets with different levels viz., 0, 300, 400 and 500ppb on the immune status of broiler breeders. The breeder hens aged 28 weeks were fed with four treatment diets: Control (0ppm), (300 ppb), (400 ppb) and (500 ppb) for three periods, each with a duration of three weeks from 28 to 36 weeks of age. Feeding of AFB_1 at all 3 levels showed significant ($P \leq 0.05$) does dependent reduction in ND titer values. IBD titer values also showed a significant ($P \leq 0.05$) dose dependent reduction in values. The results indicated a significant ($P \leq 0.05$) effect of AF on immune status parameters of broiler breeder hens.

Key words: Aflatoxin, Broiler breeder, Immune status.

Introduction

During the past few decades there has been a steady increase in global production of poultry meat and eggs. Although the high nutritive value of eggs and poultry meat has resulted in increasing demand, food quality and safety factors are becoming increasingly significant in determining market value of poultry products. As mycotoxins are one of the major factors suppressing poultry productivity and also product quality, control of their impact is critical.

According to the United Nation's Food and Agriculture Organization (FAO), approximately 25% of world's grain supply is contaminated with mycotoxins. The greatest economic impact of mycotoxin contamination is felt by crop and poultry producers, as well as food and feed producers (Manafi *et al.*, 2010).

Mycotoxins of importance in poultry are mainly produced by the fungi of the genera *Aspergillus*, *Fusarium* and *Penicillia*, either pre-harvest, during harvest, or in storage or during feed processing whenever conditions are favorable. No region of the world escapes these silent killers; and their negative impact on poultry productivity and human health is enormous (Denli *et al.,* 2008).

Among the different known mycotoxins, aflatoxin, ochratoxin and T-2 toxin pose significant threat to poultry and are frequently encountered in animal feeds (Devegowda et al., 1998a). Among aflatoxins (AF), AFB1, a metabolite of *Asperigillus flavus* and *Asperigillus parasiticus*, is an extremely hepatoxic (Stephen *et al.,* 1991) and carcinogenic compound (Verma*et al.,* 2004). AF causes a variety of effects in poultry including poor performance, altered organ morphology, serum biochemistry and haematology (Pasha *et al.,*, 2007).

Cereal grains and their by-products are important ingredients in poultry diets. There are lucid evidences that global supplies of cereal grains for animal feed and feedstuffs are frequently contaminated with mycotoxins. Among the several mycotoxins, aflatoxins are ubiquitous in nature and continually encountered in feed ingredients. Aflatoxins are secondary toxic metabolites produced by certain strains of fungi, e.g. *Aspergillus flavus* and *Aspergillus parasiticus* species (Manafi *et al.* 2010). Economic losses associated with AF exposure include in the form of poor growth and feed conversion, increased mortality, decreased egg production, leg problems, and carcass condemnations in poultry (Smith and Hamilton, 1970; Hamilton and Garlich, 1971; Huff *et al.,* 1983). The objective of the current experiment was to study the effects of graded levels of aflatoxin on immune status of broiler breeders.

Materials and Methods

Froty-eight 28-wk-old broiler breeder hens and eighteen 28-wk-old broiler breeder cocks of a commercial strain were weighed and randomly assigned to individual cages, in a Completely Randomized Design manner forming a total of 4 dietary treatments with 3 replicates consisting 4 birds per replicate in each group.

AF was produced using the pure culture of *Aspergillus parasiticus* MTCC 411 (Source: Microbial Type Culture Collection and Gene Bank, IMT, Chandigarh, 160 036, India) grown on potato dextrose agar. Then the AF produced on rice and toxin was extracted as described by Rukmini & Bhat (1978) and quantified by thin layer chromatography (TLC) as described by AOAC. (1995).

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Hens and cocks were fed with the diet containing maize, soybean meal, de-oiled rice bran and sunflower extraction following standard breeder diet. The diet was fed to different groups as follows: (1) control, (2) 300ppb AF and (3) 400ppb AF and (4) 500ppb AF for 3 periods of each 3 weeks. Compounded feed was analyzed for the presence of AF before including the rice culture material, then the diets (table 1) were prepared by incorporating required quantities of rice culture powder containing AF into the diet so as to give the different levels of AFB_1. The given toxin levels were finally cross checked by TLC method of analysis. Basal diet was formulated and compounded to meet the nutrient requirements of commercial broiler breeders (2690 Kcal/kg ME and 17.42% CP) feed. All birds received the control diet for 2 weeks to become environmentally acclimated and then were fed experimental diets. A restricted daily feeding regimen, with unlimited access to water from channel drinkers, was followed throughout the experiment. The hens were provided 130 g/bird per day and increased based on the recommendation of the primary breeder to 160 g/bird per day by the end of the experiment. The corresponding values for roosters were 135 and 145 g/bird per day, respectively.

Experimental Parameters Measured:

Serum antibody titers for ND and IBD:

The serum samples were assayed for antibody titers against Newcastle disease (ND) and Infectious Bursal Disease (IBD) using ELISA technique on the last day of each period. Treatment-wise means of titers were computed.

Statistical analysis:

The data were analyzed using the General Linear Model procedure of Statistical Analysis System (SAS®) software (SAS Institute, USA, 2000). Period wise data were analyzed by 2 x 2 factorial manner. Overall period data were analyzed by repeated measurement design (Gill, 1985). Duncan multiple range test at 0.05 probability level was employed for comparison of the means (Duncan, 1955).

Results:

Serum antibody titers for ND and IBD:

Results concerning the ND and IBD titer values on broiler breeder hens fed with different levels of aflatoxin are shown in table2. There was a significant ($P \leq 0.05$) decrease in ND and IBD antibody titers at all three periods in birds fed varying levels of AF compared to controls.

Discussion:

Serum antibody titers for ND and IBD:

The antibody titers against ND and IBD were reduced significantly ($P<0.05$) upon inclusion of different levels of AF in the diet during all the three periods. The data revealed a dose dependent decrease in antibody titers as the dietary level of AF increased. It is presumed that reduced plasma proteins might be responsible for this lowered ND and IBD titers observed during aflatoxicosis (Verma *et al*., 2004).

Table 1: Per cent nutrient composition of basal diet of breeder's ration

Particulars	Analytical values
Calculated Values	
Metabolizable Energy (Kcal/kg)	2690
Crude protein (%)	17.42
Crude fibre (%)	5.61
Crude fat (%)	2.63
Calcium (%)	2.87
Av, Phosphorous (%)	0.45
Lysine (%)	0.88
Methionine (%)	0.34
Analyzed values	
Crude protein (%)	17.50
Crude fat (%)	2.5
Crude fibre (%)	5.4

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Table 2: Effect of dietary Aflatoxin on feed ND and IBD titers of f broiler breeders

Item	P I	P II	P III
IBD antibody titers			
Control	3697.53±6.95[a]	3744.63±12.46[a]	3178.47±23.87[a]
300ppb AF	2866.31±15.55[b]	2872.67±3.01[b]	2674.70±12.72[b]
400ppb AF	2404.80±16.03[c]	2148.87±12.78[c]	1964.00±11.73[c]
500ppb AF	2078.93±15.26[d]	1581.47±3.88[d]	1230.50±13.00[d]
IBD antibody titers			
Control	6523.10±2.32[a]	7257.40±11.36[a]	7646.23±6.71[a]
300ppb AF	6071.60±9.22[b]	6188.37±3.85[b]	6037.17±12.39[b]
400ppb AF	5961.93±7.73[c]	6043.63±9.69[c]	5348.20±12.50[c]
500ppb AF	5470.23±12.95[d]	5360.53±10.95[d]	5159.07±7.78[d]
P = Period			
AF = Aflatoxin			

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