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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (10): 1697-1699, 2000

Activity of Aflatoxins Adsorbents in Poultry Feed

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Abstract: The Aflatoxins produced by *Aspergillus flavus* and A. *parasiticus* have been detected in various poultry feed resources. They have a negative affect on the performance of birds as the presence of Aflatoxins significantly inhibit the growth and productive performance of birds and even mortality in certain cases. They have also negative effect on the immune response of bird. The toxin binders e.g. Myco-Ad, Sorbatox and Mycofix-Plus have been claimed to adsorb or inactivate Aflatoxins in the body and thus reduce the toxicity effect of Aflatoxins. These toxin binders have also certain reports to adsorb various nutrients along with toxins resulting in their specific deficiency symptoms. The present study was designed to observe the effects of three different toxin binders in two phases on the performance of cross chicken (FAY x RIR) in terms of weekly weight gain, feed consumption, feed conversion ratio and mortality. The results indicated that any product did not affect the performance of birds during five week of age. It showed that Myco-Ad, Sorbatox and Mycofix-Plus had no affect on the nutrient adsorption in poultry feed. During second phase the results indicated that all the three products significantly adsorbed Aflatoxins, which was reflected in terms of improved weight gain, feed conversion ratio and mortality of the birds.

Key words: Aflatoxins, weight gain, feed consumption, feed conversion ratio, mortality

Introduction

At present poultry industry is bitterly facing the deleterious effects of Mycotoxins throughout Pakistan. Mycotoxins are metabolites of molds. Mycotoxins are very harmful to animals, even at low concentration and exert their effect by a derangement of normal metabolic function in various major organs within the body. Mycotoxins pose a significant problem to the poultry industry worldwide. Mycotoxins not only have an effect over feed conversion (FCR) and mortality, but also affect the immunologic system. As a result of these vaccines do not perform as they should and animals are easily affected by bacteria such as Salmonella and *E.coli* etc. (Rizvi *et al.*, 1990).

Research conducted so far has recognized more than 200 types of Mycotoxins. But Aflatoxins (AF) produced by *Aspergillus flavus* and A. *parasiticus* are most important. (Rizvi *et al.*, 1990). Aflatoxins have been detected as contaminants of crops before harvest, between harvest and drying, in storages, and after processing, (Anonymous, 1989). Aflatoxins cause severe economic loses in the poultry and live stock industries in many cases, Aflatoxins contamination may mean the difference between profit and loss to the poultry industry (Jones *et al.*, 1982; Nichols, 1983; Hamilton, 1984).

Important types of Aflatoxins are B1, B2, G1, G2, while B1 is the most common and potent. It damages liver and kidneys thus disturb the entire metabolism in poultry. The affected birds show depressed growth, poor appetite, poor laying performance, Anemia, paleness, embryo development delay, embryo malformations, antibody absorption reduction and increased mortality (Pasteiner, 1998). The deleterious affects of Aflatoxins are more pronounced when its level increases beyond 20PPB.

None of the fungus is harmless and its presence either physically renders the feed unfit for consumptions or contaminate it with Mycotoxins. Fungus growth encouraged when grains, vegetables, protein sources or complete feed with high moisture (more than 13 %) are stored under condition of optimum temperature (25-35°C) and relative humidity (85 % or greater) (Diener and Davis, 1996). Once the fungus infects, it is not possible to render the feed free of Mycotoxins and quantity of toxin keeps on increasing. Certain toxin binders e.g. Myco-Ad, Sorbatox and Mycofix-plus are available in the market which are claimed to adsorb or inactivate Mycotoxins in the body and thus significantly reduce the toxicity effect of Aflatoxins. It is also claimed that these products have also negative effects and blamed to adsorb various nutrients resulting in their specific deficiency syndromes (Scheideler, 1993).

Keeping in view the present project was designed to observe the effects of these three products on the nutrients as well as Aflatoxins in Poultry feed. The effects of different adsorbents was observed by conducting biological trial on poultry. The performance of poultry was observed in terms of their weekly weight gain, feed consumption, feed conversion ratio and mortality.

Materials and Methods

The present research study was conducted on Fayoumi (FAY) x Rhode Island Red (RIR) cross chickens which is, highly recommended by the poultry experts as productive rural chicken. This study was conducted in two phases.

First Phase: During this phase four hundred and twenty numbers of FAY x RIR cross chicks were divided into four group (A, B, C, D). Each group was further sub divided into three replicates, each having 35 chicks. All the chicks were reared in the experimental house of Nutrition Section Poultry Research Institute Rawalpindi, in such a way that the chicks belonging to each replicate was assigned a separate pan. The chicks were vaccinated against all viral diseases.

Four different experimental rations (I, II, III and IV) were prepared from local feed resources having the same chemical composition and minimum level of Aflatoxin (AF). The proximate composition of experimental ration was crude protein 21%, crude fate 2.5%, crude fiber 4.5%, total ash 1.5%. The calculated metabolisable energy of the ration was 2800 kcal/kg, while the AF content of the ration was 8 PPB, which is a highly safe level and normally present in the poultry feed. Ration I served as control and was offered to the chicks belonging to group A.

Ration II, III and IV were additionally supplemented with AF binders, Myco-AD (2.5 kg/ton of feed), Sorbatox (3 kg/ton of feed) and Mycofix-plus (1 kg/ton of feed) respectively. The supplementation dose of each product was fixed according to the recommendation of concerned firm. The chicks were reared upto 5 weeks on the allotted ration.

Composition of experimental ration is given in Table 1.

Second Phase: During second phase of the experiment 5 weeks old 405 cross (FAY x RIR) birds were divided into 3 replicates having 27 chicks on average per replicate. All the chicks were reared at the same premises. The chicks were vaccinated according to the prescribed schedule. Four different experimental ration (I, II, III and IV) were formulated on the basis of ingredients containing high toxin level. The total AF level of these ration was more than 50 PPB. Ration I served as control while ration II, III and IV were additionally supplemented with Myco-ad (2.5 kg/ton), Sorbatox (3 kg/ton) and Mycofix-plus (1 kg/ton) respectively. Ration V was formulated on the basis of ingredients containing minimum toxin level and contain total AF content of less than 10 PPB. All the chicks were reared upto 8 weeks of age.

Data Collection: During both phases of the experiment weekly body weight gain, feed consumption, feed conversion ratio and mortality loss of the chicks belonging to each replicate of group were recorded. The data so collected was subjected to statistical analysis using analysis of variance, technique of Snedecor and Cochran (1967). The comparison of mean differences was made by multiple range test (LSD) following the method of Steel and Torrie (1981).

Table 1: Composition of expeimental rations (%)

Feed ingredients	Low toxin	High toxin
Maize	-	33
Rice broken	35	17
Wheat	22	-
Rice polishing	-	10
Cotton seed meal	4.5	4
Corn gluten meal 60 %	-	5
Corn gluten meal 30 %	-	4
Rape seed meal	6.0	2
Guar meal	4.5	3.5
Sun flower meal	-	5
Soybean meal	18	5
Fish meal	2	6.5
Vegetable oil	1	-
Molasses	3.6	3.0
Bone meal	1	-
Marble chips	2	2
Lysine	-	0.13
Methionine	0.15	0.08
Vitamin mineral premix	0.25	0.25
Chemical Composition		
Crude protein (%)	21.0	20.8
Met. Energy (KCAL/kg)	2798.0	2800.0
Fat %	2.5	2.5
Total minerals (%)	6.0	6.0
Aflatoxin (PPB)	8.0	60.0

Results

First Phase: The results of the experiment are given in the Table 2 and 3. During first phase of the experiment the effect of toxin binders or adsorbents was observed on the performance of cross chicken. The average weight gain of chicks belonging to group A, B, C and D were 0.197, 0.200, 0.190, 0.198 kg respectively (Table 2). The maximum weight gain was observed in group B where the chicks were fed on ration containing low toxin plus Myco-Ad while the minimum weight gain was observed in group C where ration containing low toxin was supplemented with Sorbatox. However, there was not a great difference in the weight gain of the chicks belonging to different groups. The results showed that there was statistically non-significant difference among the weight gain of the chicks belonging to different groups.

The feed consumption of the chicks belonging to group A, B, C and D was 0.707, 0.715, 0.690 and 0.696 kg respectively (Table 2). The maximum feed was consumed by the chicks belonging to group B and the minimum feed was consumed by the chicks of group C. There was non significant difference in feed consumption of chicks belonging to different groups.

Almost the same trend was observed in feed conversion ratio, of the chicks, which was observed to be 3.59, 3.581, 3.626 and 3.511 respectively (Table 2). The poor FCR was showed by group C kept on ration containing low toxin plus Sorbatox as compared with control and other groups. The best FCR was found in group D, where low toxin feed was supplemented with Mycofix-plus.

The data regarding mortality of the chicks also showed non-significant differences. The mortality of the chicks belonging to group A, B, C and D was observed as 1.90, 0.593, 1.91 and 1.90 % (Table-2). It is evident from the results that no significant difference was observed in weight gain, feed consumption, FCR and mortality percentage of the chicks belonging to the different groups and maintained on different experimental rations containing low toxin and different toxin adsorbents.

Second Phase: During second phase of the experiment the affect of the toxin adsorbents was observed on cross chicken in terms of their average weight gain, feed consumption FCR and mortality during three weeks.

The average weight gain of the chicks belonging to group A, B, C, D and E at the end of three weeks of age was found to be 0.215, 0.246, 0.245, 0.251 and 0.247 kg respectively (Table 3). The statistical analysis of the data revealed that there was a significant suppression in the weight gain of the chicks belonging to group A, where high toxin feed was offered. This depression in the weight gain was alleviated when high toxin feed was additionally supplemented with toxin adsorbents i.e. Myco-Ad, Sorbatox and Myco fix-plus in group B, C and D. The weight gains of the groups B, C and D was almost equal to the chicks belonging to group E where low toxin feed was offered to the birds. The maximum weight gain of 0.251 kg was observed in group D, where high toxin feed was additionally supplemented with Mycofix-plus while minimum weight gain of 0.215 kg was noted in group A where the ration offered to the birds contained high level of Aflatoxin.

The feed consumption of the chicks belonging to group A, B, C, D and E was observed as 0.842, 0.872, 0.842, 0.868 and 0.868 kg respectively (Table 3). Apparently there was no gross difference in the feed consumption of the chicks belonging to different groups. There was statistically non-significant difference in the feed consumption. It showed that high toxin ration did not depressed or increase the feed consumption. Moreover, there was no nutrient adsorption on account of toxin adsorbents otherwise feed consumption of these groups would have increased to fulfil the deficiency of specific nutrients. Almost similar trend as in weight gain was observed in the feed conversion ratio of 3.923, 3.555, 3.437, 3.467, and 3.529 respectively (Table 3). The poor FCR was showed by group A 3.923. This affect was removed when toxin adsorbents were supplemented in group B, C and D. It was observed that the FCR of group B, C and D was almost equal to group E. There was also a high mortality of 2.47 in group A however, the statistical analysis revealed non-significant difference in the mortality of the chicks belonging to

Table 2: Activity of aflatoxin adsorbents in polutry Feed from day old-5th wks of age

Groups	Paramenters	Average Wt Gain (Kg)	Feed Consumption (Kg)	Feed Conversion Ratio	Mortality % Age
A	Low toxin Day old-5wks	0.197	0.707	3.59	1.90
B	Low toxin + Myco-Ad Day old 5wks	0.200	0.715	3.581	0.593
C	Low toxin + Sor batox Day old 5wks	0.190	0.690	3.626	1.91
D	Low toxin + Mycifix-plus Day old -5wks	0.198	0.696	3.511	1.90

Table 3:Activity of aflatoxin adsorbents in poultry feed from 6 wks to 8 wks of age

Groups	Paramenters	Average Wt Gain (Kg)	Feed Consumtiobn (Kg)	Feed Conversion Ratio	Mortality % Age
A	High toxin 6wks-8wks	0.215*	0.842	3.923*	2.47
B	High toxin Myco-Ad 6wks-8wks	0.246	0.872	3.555	1.23
C	High toxin + Sorbatox 6wks-8wks	0.245	0.842	3.437	0.00
D	High toxin + Mycofix-plus 6wks-8wks	0.251	0.868	3.461	0.00
E	Low toxin 6wks-8wks	0.247	0.868	3.529	0.00

*- Significant ($P<0.05$)

different groups.

Discussion

First Phase: The average weight gain observed in the chicks during first 5 weeks of age revealed no significant difference among different groups. It showed that the toxin adsorbents studied during the experiment i.e. Myco-Ad, Sorbatox and Mycofix-plus had no effect on the nutrients of poultry feed. These results were contrary to the finding of Scheideler (1993), who reported certain specific nutrient deficien upon the supplementation of poultry feed with various adsorbents. This difference could be attributed to comparatively less or no nutrient adsorption in cross chicken as compared with commercial poultry. The observation of Scheideler (1993) was reflected in group C where Sorbatox was used as toxin adsorbent, although the value of 0.190 was not significantly low as compared with control. A significant difference was observed in feed consumption of birds belonging to different groups. It revealed that none of the Aflatoxin adsorbent used during study created specific nutrient deficiency, otherwise the feed consumption of that group would have been increased. The data regarding feed conversion of the chicks as well as mortality of the chicks was found to be non-significant among different groups. The best FCR was 3.51 showed by group D although statistically non-significant, could be attributed to the adsorption or inactivation of certain toxin factors other than Aflatoxins by Mycofix-plus. The over all performance of chicks revealed that toxin binders did not adsorb the nutrients of poultry feed.

Second Phase: The average weight gain of the chicks belonging to group A showed a significant ($P< 0.05$) difference. The comparative poor weight gain of 0.215 kg can be attributed to the affect of high toxin in poultry feed. Group B, C and D had almost same weight gain as was observed in group E, where low feed toxin was offered to the birds. Their weights were significantly high as compared with group A. All the three toxin adsorbents had comparatively equal effect over Aflatoxin adsorption, however the maximum weight gain of 0.251 kg in group D revealed that mycofix-plus was more efficient in adsorption of Aflatoxin. A non-significant difference in the feed consumption of the chicks revealed no effect of different toxin binders on the feed in take. The high toxin content in poultry feed in group A also resulted in poor FCR. The affect was mainly due to high toxin because the subsequent groups B, C, D and E had comparatively better FCR. The over all results are indicative of the fact that the poor performance, affect of high toxin can be safely alleviated through the toxin binders. Similar findings were reported by Rizvi (1980), who reported high contamination of Aflatoxin in poultry feed. Goush and Chauhan (1991) observed similar trend in body weight gain and feed efficiency in brioler chicken Kubena *et al.* (1998) claimed that HSCAS reduced the toxicity of Aflatoxins similar to the reports of Ledoux *el al.* (1999). However, the feed consumption was not significantly reduced due to Aflatoxins in the present study contrary to the findings of Goush and Chauhan (1991).

References

Anonymous, 1998. In: Mycotoxins: Economic and health risks. K.A. Nisi, ed. Council for agricultural science and technology, Ames, IA., pp: 1-91.

Diener, U. L. and N. D. Davis, 1996, Pathology, 56:1390.

Ghosh, R. C. and H.V.S Chauhan, 1991. Effect of purified Aflatoxin B1 on the performance of broiler chicks. Ind. J. Animal Health, 30:59-62.

Hamilton, P. B., 1984. Determining safe levels of Mycotoxins. J. Food Prot., 47: 570-575.

Jones, F. T., W. M. Hagler and P. B Hamilton, 1982. Association of low levels of Aflatoxin in feed with productivity losses in commercial broiler operation. Poultry Sci., 61:861-868

Kubena, L. F., R. B. Harvey, R. H. Bailey, S. A. Buckley and G. E Rottinghaus, 1998. Effects of a Hydrated sodium calcium aluminosilicate (T-Bind™) on Mycotoxicosis in young broiler chickens. Poultry Sci., 77:1502-1509.

Ledoux, D. R., G. E. Rottinghaus, A. J. Bermudez and M. Alonso-Debolt, 1999. Efficacy of a hydrated sodium calcium aluminosilicate to ameliorate the toxic effects of Aflatoxin in broiler chicks. Poultry Sci., 78:204-210.

Nichols, T. E., 1983. Economic effects of Aflatoxin in corn. In: Aflatoxin and *Aspergillus flavus* in corn. Diener, U; R. Asquith, and J. Dicken, s ed. Southern coop. Ser Bulletin 279. Auburn University, Auburn, Al 67-71.

Pasteiner, S., 1998. Mycotoxin in Animal Husbandry Biomin Gesunde Tierernahrung International Gesmb H. A-3130 Herzogenburg Austria, :166.

Rizvi, A.V. R., A. R. Shakoori, and S. M. Rizvi, 1990 Aflatoxin contamination of commercial poultry feeds in Punjab, Pakistan. Pak J. Zool., 22: 387-398.

Scheideler, S. E., 1993. Effects of various types of aluminosilicates and Aflatoxin B1 on Aflatoxin toxicity, chick performance, and mineral status. Poul Sci., 72:282-288.

Snedecor, G. W. and W. G. Cochran, 1967. Statistical methods 6th Edition. Iowa State Univ., press, Ames, Iowa USA.

Steel, R. G. D. and J. H. Torrie, 1981. Principles and procedures of statistics. 2nd Edition Mc. Graw Hill Book co. Inc. NY.