

RESPONSE OF THREE COMMERCIAL BROILER CHICKEN STRAINS TO AFLATOXIN

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SUMMARY: Aflatoxins at level 250 µg/kg was included in the diet of three different strains of commercial broiler chicken designated as A, B and C and growth of twenty chicks/group (control as well as treated), was observed for 3 weeks. Compared to controls, at least in two of the strains, significant weight loss was noted. In strain "A" and "C" respectively 33.3% and 13.2% weight loss was recorded, indicating strain difference in chicks to aflatoxin susceptibility. Use of broiler strains resistant to aflatoxin would help in minimizing this problem.

Key Words: Aflatoxin, weight gain, broiler strain.

INTRODUCTION

Aflatoxins are secondary metabolites of certain strains of *Aspergillus flavus* and *A. parasiticus*. Aflatoxin ingestion by chicken result in many different symptoms such as reduced growth, increased susceptibility to infectious agents etc., (10). A linear relationship was observed in broilers between the level of toxin and reduction in growth (11). The growth of chicks was not affected by concentration of aflatoxin below 200 µg/kg (15). A significant decrease in body weight at level as low as 75 µg/kg was noted though the treated chicken showed no morbidity, mortality or significant pathology on necropsy (6). Growth inhibition due to aflatoxins had also been reported by other researchers (8,14,16,18,20) and varying susceptibility to aflatoxicosis in different breeds of chicken had been demonstrated by research workers in different countries (2,9,13).

Aflatoxicosis in commercial poultry is a serious problem in places with high humidity as it favours growth of aflatoxin producing fungi in the feed. Karachi, the coastal city of Pakistan and a major seat of poultry husbandry in

the country, has high levels of humidity for most part of the year and therefore, fraught with the danger of aflatoxicosis. Since chicken breeds, strains and hybrids are likely to differ considerably in susceptibility to aflatoxicosis, experiments were conducted using three different strains of broilers to establish genetic resistance or strain difference as a factor in susceptibility to aflatoxin.

MATERIALS AND METHODS

Three strains of healthy unvaccinated broiler chicks were obtained from three established commercial hatcheries and designated as strain "A", "B" and "C". Forty chicks of each strain, each weighing 30 to 40 gm, were randomly divided into two groups, control and treated. Each strain was marked with a different colour for identification and housed on litter based floor pens under continuous illumination throughout the experiment.

The dietary treatments consisted of a control diet obtained from a commercial feedmill and the test ration was prepared by addition of moldy rice at 1% and was adjusted in the feed formulation. Moldy rice powder was obtained by inoculating known amount of broken rice with *Aspergillus flavus* (3357 NRRL) supplied by North Regional Research Laboratory, Peoria, Ill., USA, which produces aflatoxin B₁ and B₂. Both the

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finished feeds were analyzed by Romer method (Association of Analytical Chemists Official Methods of Analysis, Chapter 26, Twelfth edition, 1980) and quantified by comparisons of standards on a TLC plate. Confirmation was achieved by making derivatives by TFA and also by spraying 50%H₂SO₄. The control diet was free from aflatoxin, within detectable limits, while the test ration contained AFB₁, ca 250 µg/kg. The chicken were weighed on every 7th, 14th and 21st day and 3 chicks from each group were sacrificed to study serum protein lipids, cholesterol, bilirubin and hemoglobin. The results on these have been reported elsewhere. Using Students "t" test, difference in mean weight was compared between the control and the treated chicks with the strains.

RESULTS AND DISCUSSION

The three strains of the broiler chicken, which received 250 µg/kg of aflatoxin in the feed for three weeks, generally showed no signs of morbidity or feed refusals, however, in some cases feathers were reffled. A few birds were not able to stand on their feet, one treated chick each in strain "A" and "C" suffered from edema or "water belly". There was no mortality due to aflatoxicosis. Growth rate of strains "A", "B" and "C" of treated broiler chicks vis-a-vis controls and between the strains is given in Table 1. The body weight in all treated chicks A, B and C respectively

after one week showed an increase of 15, 4.5 and 6.9% over the controls. At the end of the second week, the treated chicks of strain "A" and "C" suffered a greater weight loss, 21.9 (P<0.001) and 8.8% (P< 0.05) respectively. However, there was no significant difference in strain "B" chicks receiving control feed and aflatoxin containing feed. At the end of the experiment (three weeks) all the birds were weighed and sacrificed. The average weight in controls of strains A, B and C was 318, 277 and 301 g, respectively. Those receiving contaminated feed, respectively it was 212, 283 and 261 gm in strains A, B and C. The weight loss was significant in strain A and C, i.e. 33.33 (P<0.001) and 13.3% (P<0.05) respectively.

Aflatoxin depresses body weight (1,12,27), and the mechanism for this effect includes inhibition of RNA, DNA synthesis (19) as well as RNA polymerase activity (5). Consequence of RNA, DNA synthesis involve reduced protein synthesis which ultimately would reduce growth.

The difference in weight gain in the three strains of chicken implicate genetic difference in response to aflatoxin. These findings are in line with the observations made by Gelboin *et al.* (7), Bryden *et al.* (4), in four major Australian commercial broiler strains. Genetic make up of the strain of birds plays an important role in the susceptibility of birds to aflatoxin.

Table 1: The effect of dietary aflatoxin (250 µg/kg) on body weight gain in three strains of broiler chicks.

Strain	Duration in week	No. of birds in Control/Treated	Weight of chicks (g)		Percent Increase/Decrease	P values
			Control	Treated		
A	1	19/19	88.0 ± 53.41	101.2 ± 3.18	15 ↑	0.01
	2	16/16	212.81 ± 6.87	166.25 ± 5.5	21.9 ↓	0.001
	3	13/13	318.46 ± 12.43	212.5 ± 10.89	33.3 ↓	0.001
B	1	20/19	95.53 ± 4.43	99.63 ± 2.43	4.5 ↑	0.5
	2	17/16	181.8 ± 9.87	176.25 ± 8.06	3 ↓	NS
	3	13/13	277 ± 10.83	283.8 ± 13.96	2.5 ↑	NS
C	1	19/19	78.1 ± 3.15	83.47 ± 2.56	6.9 ↑	0.2
	2	16/16	220 ± 7.5	200.68 ± 3.96	8.8 ↓	0.05
	3	13/13	301 ± 14.3	261.15 ± 10.60	13.2 ↓	0.05

* The decrease in chick number are due to early mortality and also because 3 birds from each group were sacrificed each week to study the different blood parameters.

(↑) increase in weight, (↓) decrease in weight, (%) =Control taken as 100%, (NS) not significant

Quality of poultry feed plays the most important role in the poultry farming as its share is 70% (according to our calculation of all the expenditure). Good quality feed and resistant strain of broiler can lead to greater production and more profit for the poultry farmer. Poultry industry in Pakistan has expanded tremendously during the last few years. However, the acute shortage of chicken meat has pushed its prices steeply upwards. It is suggested that use of broiler strains, resistant to aflatoxicosis, would help in minimizing problem of poor growth rate and poor feed conversion which perhaps are the two most important factors in poultry management.

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