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COMPARATIVE STUDY OF VARIOUS TREATMENTS TO MINIMIZE THE EFFECT OF AFLATOXINS IN BROILER FEEDS

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An investigation was undertaken to compare various nutritional and preventive treatments to minimize the effect of aflatoxin (B_1) on the performance of broiler chicks. Ration A without aflatoxin served as control while toxin infested maize grains (16 ppm) were used in 5 other rations. Rousselet vitamin-mineral premix (250g/100kg), $CuSO_4$ (40g/100kg) and Altic (100g/100kg) were used in C, D and E rations to combat the effect of aflatoxin. Another ration F had high plan of nutrition i.e. high protein and high energy besides infested grains. Significantly higher weight gain was observed in the group of birds fed control ration, compared with aflatoxin infested rations. There was no difference between ration A and F in respect of feed consumption while they differed significantly from other rations. No significant difference among various rations was observed in respect of feed efficiency values.

Key words: Aflatoxin, Broilers, Nutrition.

Introduction

The mould have a tremendous capability to thrive and metabolize a wide variety of substances, including feed grains, under diverse conditions of temperature, pH and moisture. However, as one of more growth conditions become limiting, sporulation begins. During this phase of the life cycle, secondary metabolic path-ways are activated resulting in toxic end products called mycotoxins. Aflatoxins save toxic secondary metabolites elaborated by *Aspergillus flavus* and *Aspergillus parasiticus*. Aflatoxins have been known for their growth depressing, carcinogenic and immuno-suppressive activities. They reduce feed consumption and feed conversion. Every year the poultry industry encounters a great deal of economic loss due to aflatoxicosis. This has spurred the development of new technologies to combat the effect of these toxins. A number of approaches, including high levels of macro and micro nutrients and addition of chemicals to compound feed have shown promising results under different conditions to minimize the adverse effect of aflatoxins on the performance of birds (Kryukov *et. al.* [1]; Bains, [2]; Dixon *et. al.* [3]; and Dietzel *et. al.* [4].

The underlined project was designed to study the comparative value of addition of Rousselet vitamin-mineral premix, $CuSO_4$, Altic and high plan of nutrition to minimize the effect of aflatoxin in broiler feeds.

Materials and Method

The experiment was conducted in two phases based on completely randomised design, using 180 day-old Hubbard broiler chicks of mixed sexes. The chicks were wing banded and randomly divided into 18 experimental units of 10 chicks each and then assigned to floor pens (1.2m x 0.8m). The birds were raised under standard managemental conditions. Each experimental diet was fed to three pens of ten chicks. Feed and water were supplied *ad libitum*. Continuous lighting was provided throughout the experiment.

The composition of experimental broiler starter and finisher rations is given in Table 1. Ration A (without aflatoxin infestation) served as control while maize grains naturally contaminated with aflatoxin B_1 (16 ppm) were used in ration B. The quantity of aflatoxin in contaminated maize grains was determined by the method of Nabney and Nesbitt [5]. Rousselet vitamin-mineral premix (250g/100kg), $CuSO_4$ (40g/100kg) and Altic* (100g/100kg) were added in ration B to prepare rations C, D and E, respectively. Ration F had high levels of protein and energy besides contaminated grains.

In the first phase of the experiment, day-old chicks were fed on six experimental broiler starter rations namely A, B, C, D, E and F (Table 1). This phase of the experiment terminated when the birds were four weeks old. In the second phase of the experiment, the same birds were shifted to corresponding finisher rations. This phase continued till the birds were seven weeks old. During the experiment all the birds were weighed individualy at the start and at weekly intervals, thereafter. Feed consumption was recorded for each replicate at weekly intervals. The weight gain and feed consumption data were used to compute feed efficiency values. The data thus collected were analysed using analysis of variance techniques and significant difference among treatments were compared by Duncan's Multiple Range Test (Steel and Torrie, [6]).

Results and Discussion

The results of the first phase of the experiment are summarised in Table 2. The maximum weight gain was observed in the group of chicks fed on ration A, whereas lowest weight gain was exhibited by chicks fed on ration D. The birds fed rations A, B and F gained significantly ($P < 0.01$) more weights compared to those fed rations C, D and

*Altic is a product of Sanofi Sante Animale, containing propionic acid (45%), formic acid (15%), propylene glycol (2%) and mineral carrier (38%).

E. The growth of birds was depressed on ration B containing aflatoxin infested maize grains. The production of toxin caused a depression in growth, reduced feed consumption and feed efficiency ratio in the birds. Once the toxin had been ingested by the bird the inclusion of higher levels of vitamin-mineral premix had little effect on the growth rate of the birds. Dietzel *et. al.* [4] earlier reported that aflatoxin adversely affects many of the metabolic processes related to nutrient utilization particularly vitamin D, K, E, A, folic acid and vitamin B_2.

The addition of $CuSO_4$ @ 40g/100 kg. feed could not decrease the depression in growth rate of birds. However, Altic – an antifungal preparation had some beneficial effect on the restoration of growth in the birds but addition of high levels of protein and energy seemed to have worked well on the performance of birds. These findings are particularly upheld by those of Veltmann [7]. He reported that protein deficiencies exacerbates the effect of aflatoxin whereas diets fortified with protein have a protective effect in chickens.

The trend in feed consumption was similar to that observed in growth rate of birds, but there was no significant difference among various rations in respect of feed efficiency values. Kryukov *et. al.* [1] also reported that chicks were more susceptible to aflatoxin during first few weeks of their life, when the toxin decreased the renitrogen utilizing ability and high levels of protein during this period improved appetite and increased weight gain compared to aflatoxin infested diets given alone. Rao *et. al* [8] observed stunt growth, poor feed intake, dull general appearance and anemia in birds fed aflatoxin infested feeds.

The results of the second phase of the experiment are summarized in Table 3. The weight gains of birds placed on various finisher rations differed significantly, the highest being on control ration A and the lowest on toxin infested ration D (containing $CuSO_4$). The trend in respect of weight gains of birds on various experimental finisher rations was similar to that observed in case of starter phase. In this phase neither the high levels of vitamin-mineral premix nor Altic had beneficial effect. Copper sulphate had rather adverse effect on the weight gain values. However, high protein-high energy diet had some beneficial effect on the performance of experimental birds. Bains [2] also recommended increased protein and energy levels of diet for recovery from aflatoxin infestation. The earlier conclusion of Kryukov *et. al.* [1] about decreased nitrogen utilizing ability on toxin infested ration also seems very much inline

TABLE 1. COMPOSITION OF THE EXPERIMENTAL STARTER AND FINISHER RATIONS.

Ingredients (%)	Starter		Finisher	
	Uninfested control (A)	Infested high plan of nutrition (F)	Uninfested control (A)	Infested high plan of nutrition (F)
Maize	33	33*	38.5	38.5*
Wheat	10	10	10	10
Rice broken	7	–	8.5	–
Rice polishing	10	10	10	10
Cottonseed meal (decorticated)	8	7	6	6
Sesame (Til oil) cake	5	5	4	4
Corn gluten meal (30%)	4	2	3	3
Corn gluten meal (60%)	4	4	4	2.5
Guar meal	4	4	4	4
Mung broken	–	8	–	7.5
Fish meal	8	10	6	7
Blool meal	3	4	3	3
Molasses	3.25	2.25	3.25	2.5
Limestone	0.5	0.5	0.5	0.5
Premix (Rousselet)	0.25	0.25	0.25	0.25
Vegetable oil	–	–	1.0	1.25
Total	100	100	100	100
Nutrients				
Crude protein	22.517	24.613	19.520	21.545
Metabolizable energy	3071.680	3138.470	3158.285	3242.865
Crude fibre	3.285	3.093	3.149	3.132
Calcium	0.825	1.202	0.840	0.909
Phosphorus	0.974	1.098	0.793	0.863

*Aflatoxin contaminated grains.

TABLE 2. AVERAGE WEIGHT GAIN, FEED CONSUMPTION AND FEED EFFICIENCY OF CHICKS FED VARIOUS STARTER RATION (0-4 WEEKS: PHASE I).

Ration	Average weight gain/bird (g)	Averaged feed consumption/ bird (g)	Feed efficiency ratio
A	423.83[a]	1108.13[a]	2.61
B	365.36[ab]	893.55[bc]	2.44
C	307.50[bc]	883.65[bc]	2.87
D	255.6[c]	801.23[c]	3.13
E	317.65[bc]	814.13[bc]	2.56
F	357.65[ab]	1007.44[ab]	2.81

The same superscript in a column shows non-significant differences.

TABLE 3. AVERAGE WEIGHT GAIN, FEED CONSUMPTION AND FEED EFFICIENCY OF CHICKS FED VARIOUS FINISHER RATIONS (5-7 WEEKS: PHASE II).

Ration	Average weight gain/bird (g)	Averaged feed consumption/ bird (g)	Feed efficiency ratio
A′	864.66[a]	2307.93[a]	2.67
B′	551.57[c]	1705.23[c]	3.09
C′	490.16[cd]	1601.26[c]	3.26
D′	410.03[d]	1458.63[c]	3.55
E′	520.05[cd]	1634.12[c]	3.14
F′	746.48[ab]	2160.73[ab]	2.89

The same superscript in a column shows non-significant differences.

with the findings of present study.

There was no significant difference between the feed consumption on rations A and F but they differed significantly ($P<0.01$) from rations B, C, D and E. However, no significant difference among various rations in respect of feed efficiency values was observed in the study. Similar results have been reported by Dietzel *et. al.* [4] on ration containing 50 microgram aflatoxin per gram feed. Dixon *et. al.* [3], on the other hand, found that the toxin may adversely effect the weight gain in concentrations as low as 1.19 microgram per gram feed.

It may be concluded from the study that the effect of toxin produced in a feed, is very difficult to subside completely. The only remedy which seems to be effective to some extent is to improve nutrient density in aflatoxin infested rations.

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