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STUDIES ON PRODUCTION PERFORMANCE IN BROILER CHICKEN SUPPLEMENTING COPPER AND FLAVOMYCIN IN FEED

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***ABSTRACT* - An experimental study was carried over a period of 42 days using 160 day-old commercial broiler chicks (Ven Cobb) to study the effect of copper and flavomycin as feed additives on growth performance in broiler chicken. The birds were divided into four groups with four replicates of ten chicks in each replicate. The treatment (T_1) was control with standard broiler ration and Cu as $CuSO_4$ at 100 ppm, 200 ppm and flavomycin at 10 ppm were supplemented in the basal diet to form treatment 2 (T_2), treatment 3 (T_3) and treatment 4 (T_4) respectively.**

The chemical composition of T_1, T_2, T_3 and T_4 rations contained 15.43, 106.49, 212.54 and 18.69 ppm of Cu in broiler starter and 12.67, 101.13, 202.72 and 20.20 ppm of Cu in broiler finisher, respectively. The results of the present study revealed that the supplementation of Cu as $CuSO_4$ (100 and 200 ppm) or flavomycin (10 ppm) showed no significant difference among the treatment groups with regard to the feed consumption, body weight gain and feed conversion ratio up to six weeks of age. The carcass weight, slaughter weight, dressing percentage and giblet yield were not influenced by dietary supplementation of either Cu or flavomycin. It was concluded that dietary supplementation of broiler chicken with Cu up to 200 ppm and flavomycin at 10 ppm did not have any adverse effect on production performance of broiler chicken.

***Keywords: Copper, Flavomycin, Production performance and Broiler chicken*.**

I. INTRODUCTION

Broiler chicken production is being recognized as one of the best ways of supplying good quality animal protein at relatively low cost. The Indian poultry industry has been a major contributor to the food processing sector in the country. Currently, Indian broiler meat industry ranks fourth in the world and the domestic broiler meat demand is expected to grow at around 15 to 18 per cent/year (Madhivanan, 2010). However, due to steep rise in cost of feed ingredients compared to the cost of meat from broilers, the profit per bird is getting reduced every year. Thus, reduction in feed cost by improving the bird performance is the need of the day for making profit in poultry production. Growth promoters are used in poultry diets to increase the nutrient availability and to decrease the cost of production. Copper is an essential trace element, which plays a vital role in haemoglobin synthesis, connective tissue maturation, nerve function and bone development. The element is also an essential component of many enzyme systems. In addition, copper helps to lower the plasma and meat cholesterol. The dietary requirement of copper for broiler chicken is 12 ppm (BIS, 2007). But at higher levels copper has growth promoting properties (Bakalli *et al*., 1995; Pesti and Bakalli, 1996).

Antibiotics have been used in livestock and poultry diets ever since its discovery not only as an antibacterial agent, but also as a growth promoter. Flavomycin is a glycolipid antibiotic produced by *Streptomyces* species and is used as a growth promoter in livestock and poultry diets. Public concerns against antibacterial resistance lead to the ban of most of the feed antibiotic growth promoters by USA and European Union, allowing only four antibiotics to use as an antimicrobial growth promoters and flavomycin is one among them.

However, this situation requires seeking of alternatives and Cu has received considerable attention due to its antimicrobial action similar to that of feed antibiotics. The systematic studies comparing the effects of copper and antibiotics are scanty in literature. Hence, this research work was carried out to study the effect of copper as feed additive on production performance in broiler chicken.

II. MATERIALS AND METHODS

An experiment was carried out for a period of six weeks using one hundred and sixty, day-old commercial broiler chicks (Ven Cobb). The chicks were wing banded, weighed individually and randomly allotted to four dietary treatments viz., T_1, T_2, T_3 and T_4. Each group comprised of four replicates of ten birds each. The group T_1 was fed a control ration as per the BIS (1992) and this diet was supplemented with Cu as $CuSO_4$ at 100 ppm, 200 ppm and flavomycin at 10 ppm level in T_2, T_3 and T_4 respectively. The birds were fed with standard broiler starter ration up to 4 weeks of age and finisher ration up to 6 weeks of age. All the rations were made isocaloric and isonitrogenous. Proximate analysis of the broiler starter and finisher rations were done according to the procedures described by AOAC (1990). Standard managemental practices were followed throughout the experimental period. Feed and water were provided *ad libitum.*

The production performance of broilers was evaluated for a period of six weeks. The weekly body weight was recorded individually. The feed consumption was recorded weekly, replicate wise. From these data, weekly weight gain and feed conversion ratios were calculated. At the end of sixth week, four birds from each treatment were sacrificed to study the mean carcass weight, slaughter weight, dressing percentage and giblet yield. Data collected were statistically analyzed (Snedecor and Cochran, 1994).

III. RESULTS AND DISCUSSION

A. Chemical composition of rations

The chemical composition of T_1, T_2, T_3 and T_4 rations contained (Table. 1) 15.43, 106.49, 212.54 and 18.69 ppm of Cu in broiler starter and 12.67, 101.13, 202.72 and 20.20 ppm of Cu in broiler finisher, respectively.

The percentage of dry matter in starter rations varied between 89.23 and 90.23, ether extract between 1.39 and 1.72 per cent and crude fibre between 2.43 and 2.63 per cent. The total ash, NFE and acid insoluble ash fraction varied from 7.70 to 8.40, 64.40 to 65.37 and 1.40 to 1.80 per cent, respectively. In the finisher rations the percentage of dry matter varied from 90.05 to 90.23, ether extract from 2.32 to 2.56 and crude fibre from 2.46 to 2.55, respectively. The total ash, NFE and acid insoluble ash content varied from 8.05 to 8.40, 66.49 to 66.94 and 2.00 to 2.53 per cent, respectively in the finisher rations. The crude protein and the calculated ME (kcal/kg) of the broiler starter and finisher rations in the present study were in accordance with BIS (1992) recommendations.

B. Body weight and body weight gain

The weekly mean body weight of experimental birds belonging to dietary treatments $T_{1,}$ $T_{2,}$ T_3 and T_4 were 2028.83, 2082.55, 2013.43 and 2135.35 g respectively (Table. 2) and the corresponding cumulative body weight gains were 1980.98, 2034.70, 2015.78 and 2087.40 g, respectively (Table 2). The results on weekly body weight revealed a normal growth pattern in birds of all the treatment groups without any significant difference (P>0.05). From the data, it can be inferred that the dietary supplementation of Cu as $CuSO_4$ at 100 or 200 ppm and flavomycin at 10 ppm did not significantly improve body weight of birds compared to control group, which is in agreement with Ledoux *et al.* (1991) and Konjufca *et al.* (1997) who observed no significant effect on body weight and body weight gain in broiler chicken as a result of Cu supplementation. Similarly, no significant difference in body weight gain between control and flavomycin supplemented groups was observed by Gunal *et al.* (2006) on body weight of broiler chicks. The present findings is in disagreement with Arias and Koutos (2006) and Samanta *et al*. (2011) observed a significant improvement in the body weight of broiler chicken when supplemented with Cu at 150 ppm compared to the control group.

The lack of positive results for Cu and flavomycin as growth promoters in this study might be related to the better sanitary conditions of the facilities during the conduction of the experiment which is in agreement with findings of Hill *et al.* (1953), Visek (1978) and Brainer *et al.* (2003).

C. Feed consumption

Cumulative feed consumption of birds maintained on different dietary treatments at weekly intervals (Table 2) indicates that there was no significant (P>0.05) difference among treatments. The observation on cumulative feed consumption is in agreement with Ledoux *et al.* (1991) in male Cobb chicks who observed no significant effect on average feed intake when Cu was supplemented at 150, 300 or 450 ppm. Similar results were also reported by Konjufca *et al.* (1997) in Ross male broilers. Similarly, the result obtained for flavomycin supplemented group was in close agreement with the findings of Gunal *et al.* (2006).

On contrary, the result of the present study disagrees with the findings of Anjum *et al.* (1992) who observed an improvement in feed intake when broiler chicken were supplemented with Cu at 250 ppm levels.

D. Feed conversion ratio

The cumulative mean feed conversion ratio (FCR) of birds maintained on different dietary treatments were 1.67, 1.64, 1.64 and 1.64 for treatments $T_{1,}$ $T_{2,}$ T_3 and T_4 and the values (Table 2) were statistically similar (P>0.05). This is in agreement with the findings of Ledoux *et al*. (1991) who observed that supplemental dietary Cu at 150, 300 or 400 ppm did not improve FCR in broilers. Likewise, the results of present study do confirm with Wang *et al*. (2007) in broiler chicken. The flavomycin supplementation also did not improve the FCR in broilers which is in agreement with findings of Attia *et al.* (2011) in broiler chicken.

On contrary to the present findings, Pesti and Bakalli (1996) and Samanta *et al*. (2011) observed an improved FCR in broilers supplemented with Cu as $CuSO_4$.

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Table 1.The chemical composition of T_1, T_2, T_3 and T_4 of broiler starter and finisher rations.

Components (% DM basis)	Broiler starter				Broiler finisher			
	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Dry matter	90.23	90.62	90.47	89.23	90.05	90.18	90.06	90.23
Crude protein	23.01	23.06	22.95	22.99	20.09	20.00	19.95	20.16
Ether extract	1.63	1.62	1.72	1.39	2.56	2.32	2.52	2.43
Crude fibre	2.63	2.52	2.62	2.43	2.53	2.46	2.55	2.52
Nitrogen free extract	65.03	64.40	64.64	65.37	66.78	66.94	66.72	66.49
Total ash	7.70	8.40	8.07	7.81	8.05	8.28	8.31	8.40
Acid insoluble ash	1.80	1.69	1.49	1.40	2.09	2.53	2.30	2.00
Calcium	1.28	1.31	1.33	1.25	1.28	1.35	1.29	1.17
Total Phosphorus	0.57	0.54	0.50	0.54	0.51	0.56	0.54	0.56
Copper, ppm	15.43	106.49	212.54	18.69	12.67	101.13	202.72	20.20
ME, kcal/kg*	2800	2800	2800	2800	2900	2900	2900	2900

* Calculated value

Table 2. Performance of broilers supplemented with Cu and flavomycin in diets (0-6 weeks of age)

Parameter	Treatments			
	T_1 (Control)	T_2 (Cu - 100 ppm)	T_3 (Cu - 200 ppm)	T_4 (Flavomycin -10 ppm)
Live weight (g)	2028.83 ± 43.22	2082.55 ± 41.96	2013.43 ± 81.12	2135.35 ± 63.50
Body weight gain (g)	1980.98 ± 43.14	2034.70 ± 42.04	2015.78 ± 48.52	2087.40 ± 63.55
Feed consumption	3813.68 ± 33.50	3842.33 ± 44.65	3834.45 ± 47.33	3950.00 ± 66.76
Feed efficiency	1.67 ± 0.02	1.64 ± 0.01	1.64 ± 0.02	1.64 ± 0.04
Carcass wt, kg	1.55 ± 0.08	1.31 ± 0.09	1.32 ± 0.08	1.53 ± 0.08
Slaughter wt, kg	1.84 ± 0.09	1.58 ± 0.11	1.58 ± 0.09	1.82 ± 0.09
Dressing, %	72.05 ± 0.43	70.82 ± 0.95	72.11 ± 0.69	71.08 ± 0.86
Giblet yield, %	5.85 ± 0.28	6.79 ± 0.41	6.89 ± 0.36	5.91 ± 0.29

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