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GROWTH PERFORMANCE INDEX OF BROILER CHICKENS FED VARYING LEVELS OF TURMERIC (*CURCUMA LONGA*) POWDER

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ABSTRACT

The uses of feed additives are an ideal tool to boost the profits of poultry producers since the use of antibiotics as growth promoters in poultry and animal feed has been banned in many countries. Numerous studies had affirmed the use of bioactive plant as additives in poultry feed. Beneficial effects of bioactive plant substances in animal nutrition may include the stimulation of appetite and feed intake, the improvement in endogenous digestive enzyme secretion, activation of immune response and antibacterial, antiviral and antioxidant actions such plant is turmeric plant. The aim of the study was to assess the effect of turmeric powder on growth performance index of broiler chickens. A total of 140 day old, commercial broiler chicks of Ross strain were randomly divided into four treatments having five replications comprises of seven birds per replicate. The birds of control group (T1) were provided broiler starter and finisher rations while the chickens of other three dietary treatments were also provided the same diet but supplemented with turmeric powder at the rate of 2.0 (T2), 4.0 (T3) and 6.0 (T4) g/kg feed. Data were obtained on average body weight, gain in body weight, feed intake and feed conversion efficiency on weekly basis. The results shows that the values of average body weight, gain in body weight and performance index (PI) were significantly ($P < 0.05$) improved in diet T4 followed by diets T3, T2 and the least in diet T1 while values of feed consumption were lowest in diet T4 followed by diets T3, T2 and the least in T1 group. Supplementation of turmeric powder in diet T4 also showed best result in terms of feed conversion efficiency (FCE). No mortality was observed throughout the experimental period with conclusion that dietary supplementation of turmeric powder up to 6.0g/kg was beneficial without adverse effect on the growth performance index of broiler chickens.

KEYWORDS

Tumeric powder, Broiler chickens and Growth performance index.

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INTRODUCTION

The beneficial effects of phytochemical substances on broiler chickens and anti-oxidative substances in plants have been demonstrated to restrict the formation of toxic oxidation products, maintain nutritional quality and possibly stimulate performance (Adegoke *et al*, 2018)¹. The

performance of broiler chickens reportedly depends on available feed nutrients, utilizable feed ingredients as well as distribution of absorbed nutrients to and through tissues and organs (Salih, 2013)². Turmeric powder (*Curcuma longa*) belongs to the ginger (*Zingiberaceae*) family and known to possess phenolic compounds (curcuminoids) that act as antioxidant and anti-inflammatory agent (Akbarian *et al*, 2012)³. Curcuminoids such as curcumin, demethoxycurcumin and bisdemethoxycurcumin, are yellowish turmeric pigments that have antioxidative, anticarcinogenic, and anti-inflammatory properties (Bagchi, 2012)⁴. Curcumin is the prominently potent curcuminoid, reportedly capable of lowering the activity of reactive oxygen species that elevates the antioxidant enzymes superoxide dismutase, catalase, and glutathione peroxidase levels in the blood.

Turmeric rhizome (*Curcuma longa*) is a widely used spice, food preservative and colouring material that has biological actions and medicinal applications (Akbarian *et al*, 2012)³. Curcumin is the main important bioactive ingredient responsible for biological activity of *curcuma longa* (Nouzarian *et al*, 2011)⁵. Curcumin has been shown to have several biological effects, exhibiting anti-inflammatory (Holt *et al*, 2005)⁶ antioxidant (Hosseini-Vashan *et al*, 2012)⁷, Karami *et al*, 2011)⁸. It is also used in gastrointestinal and respiratory disorders (Anwarul *et al*, 2006)⁹. Many studies have been conducted to evaluate its effect on the performance of broiler chickens (Shohe *et al*, 2019)¹⁰, Choudhury *et al*, 2018)¹¹, Salih, 2013)² and laying hens (Rajesh *et al*, 2018)¹², Hassan, 2016)¹³, Bozkurt *et al*, 2014)¹⁴, Park, 2012)¹⁵ but the results have not been consistent. The uses of antibiotic as growth promoters in poultry have been banned due to concern about their residues in tissue and induction of bacterial resistance. Due to these concerns, recently many feed additives were investigated for alternatives to in-feed antibiotics. Therefore, the aim of this study was to assess the effect of adding different levels of turmeric powder on growth performance and growth index of broiler chickens.

MATERIAL AND METHODS

Site of Experiment

This study was carried out at the Poultry Unit of Teaching and Research Farm, Emmanuel Alayande College of Education, Oyo, Oyo state, Nigeria and Oyo lies on the longitude 3°5' east of the Greenwich meridian and latitudes 7°5' North eastwards from Ibadan, the capital of Oyo State. The altitude is between 300 and 600 meter above level. The mean annual temperature is above 27°C while that of the rainfall is 1,165mm. The vegetation of the area is Guinea Savanna zone (Oyewumi, 2016)¹⁶.

Experimental Animals and their Management

A total of 140 day old, commercial broiler chicks of Ross strain obtained from a reputed hatchery. Each bird was weighed individually and randomly assigned to one of the four dietary treatment groups under intensive management conditions. Each treatment had five replications comprises of seven birds each on a Randomized Block Design. The chicks were reared on a deep litter system and offered feed and water *ad-libitum*. Wood shavings were used as litter materials and were changed weekly to reduce ammonia build up. The feed offered and water as well were weighed and measured on daily basis while the birds were weighed on weekly basis throughout the weeks of experiment. Drugs and vaccinations were done in accordance with the prevailing vaccination and medication schedule for broilers in the experimental area. The experiment lasted for 12 weeks.

Experimental diets

Experimental diets as indicated in the Table No.1 was given to the birds as chick mash (broiler starter) from day old to 4 weeks while the finisher mash was also fed to the birds from 5 to 12 weeks. The broiler chicks of control group (T1) were fed with broiler starter ration (0-21days) and finisher ration (22-56days). The birds of the other three groups were also provided with the same diet as in T1 group but supplemented with turmeric powder at 2.0, 4.0 and 6.0g/kg feed in T2, T3 and T4 groups, respectively.

Data Collection

Data were obtained on weekly basis for body weight (gramme) of the broiler chicks with the aids of a digital weighing balance till 56 days of age. Feed

and water were given *ad libitum* to all the groups of dietary treatments throughout the experimental period. The feed consumed by the birds was recorded precisely. The feed conversion efficiency (FCE) of different experimental groups was calculated by ratio of quantity of feed consumed (g) to total body weight gain (g). Mortality was recorded on daily basis throughout the period of experiment and this was expressed in percentage. Liveability percentage was calculated by subtracting the mortality percentage from 100. Performance Index (PI) was calculated by adopting the following formula as per Bird (1955)¹⁷.

Analysis of Data

All data generated were subjected to one way analysis of variance (ANOVA) using SAS (2009)¹⁸ package. Means were separated using Duncan's multiple Range Test option of the same package.

RESULTS AND DISCUSSION

Table No.2 indicated the average body weight (g/bird/week) of broiler chickens fed varying levels of turmeric powder. The average body weights was significantly ($P<0.05$) affected by the dietary treatments across the weeks. The highest average body weights was recorded for birds on treatment 4 with values of 180.01, 468, 688, 1136, 1499, 1632, 2300 and 2650 g/bird/week for days 7, 14, 21, 28, 35, 42, 49 and 56 days, respectively followed by T3, T2 and T1 in that order. These observations were in line with earlier documentations of Shohe *et al*, (2019)¹⁰, Adegoke *et al*, (2018)¹ and Choudhury *et al*, (2018)¹¹. These authors in their different studies claimed a significant effect of turmeric powder on average body weights of broiler chickens. They further suggested that as the level of the turmeric powder increases, the increase the average body weights of the chickens. The differences in the values of body weight might be attributed to variation in species and climatic conditions.

The average gain body weight (g/bird/week) of broiler chickens fed varying levels of turmeric powder was presented in Table No.3. There are significant ($P<0.05$) variations between the average gain in body weight and the dietary treatments across the weeks. The highest values of 245, 452, 488, 560,

689, 730 and 792 g/bird/week were recorded for birds on diet T4 for average gain in body weight for days 7, 14, 21, 28, 35, 42, 49 and 56 respectively followed by T3, T2 and T1 in that order. The present results on average gain in body weight were in agreement with the findings reported by Salih 2013², Hosseini- Vashan *et al*, (2012)⁷ and Nouzarian *et al*, (2011)⁵ who reported that addition of turmeric powder were significantly affected average weight gain in broiler chickens. These researchers also concluded that the more the addition of the turmeric powders in the diets the more the weight gain of the chickens.

The average feed intake (g/bird/week) of broiler chickens fed varying levels of turmeric powder is as shown in Table No.4. Significant ($P<0.05$) effect was observed among the dietary treatments and the feed intake across the weeks. The feed consumption improved due to turmeric addition in the diets. Diet T4 was more consumed at the later part of the experiment (1322g, 1350g, 1400g) for 42, 49 and 56 days respectively. The current result of feed intakes of supplementation of turmeric powder in the diet of broiler chickens that indicated reduced feed intake in comparison to control diet agreed with the findings of Mondal *et al*, (2015)¹⁹ and Rajput *et al*, (2013)²⁰ who reported that feed consumption of broiler chickens improved due to addition of turmeric powder.

Table No.5 shows the feed conversion efficiency (FCE) of broiler birds in different groups at the end of 56 days. The values for feed conversion efficiency was significantly ($P<0.05$) the lowest in T4 followed by T3, T2 and the highest in T1 group. It was evident from the result that supplementation of turmeric powder at the rate 6g/kg feed was better as compared to either 2g or 4g per kg of feed. This might linked to better performance of in terms of body weight, body weight gain and feed intake in T4 group as compared to other group. These pattern of result that favoured T4 diet (8 g/kg feed) was in agreement with findings of Adegoke *et al*, (2018)¹, Akbarian *et al*, (2012)³ who claimed significant effects of turmeric powder supplementation on feed conversion efficiency in broiler chicken birds.

The average mortality and performance index of broiler chickens fed varying levels of turmeric powder is presented in Table No.6. The mortality percentage revealed that no mortality was recorded during the experiment period while the liveability gives 100% which indicated all the birds survived during the study period. The values for performance index for diets T1, T2, T3 and T4 dietary treatments calculated were 293.90, 321.76, 345.34 and 359.67, respectively. The performance index of broiler chickens was significantly ($P < 0.05$) highest in diet T4 (359.67) followed by diets T3, T2 and the lowest value of 293.90 was recorded for diet T1.

Higher performance index observed in diet T4 might be due to the combined effect of better body weight and feed conversion efficiency as compared to the other dietary treatment groups. These observations on mortality, liveability and performance index was similar to the findings of Shohe *et al*, (2019)¹⁰ and Mondal *et al*, (2015)¹⁹ who also concluded that addition of turmeric powder in the feed enhanced the overall performance of the broiler chickens.

Table No.1: Gross composition of experimental diets (Starter and Finisher phases)

S.No	Ingredients	Starter				Finisher			
		T ₁	T ₂	T ₃	T ₄	T ₁	T ₂	T ₃	T ₄
1	Maize	43.0	43.0	43.0	43.0	49.0	49.0	49.0	49.0
2	Soybean meal	22.0	22.0	22.0	22.0	8.50	8.50	8.50	8.50
3	Groundnut cake	13.50	13.50	13.50	13.50	8.50	8.50	8.50	8.50
4	Palm kernel Cake	6.50	6.50	6.50	6.50	19.50	19.50	19.50	19.50
5	Fish Meal	2.50	2.50	2.50	2.50	2.00	2.00	2.00	2.00
6	Wheat offal	7.50	7.50	7.50	7.50	6.50	6.50	6.50	6.50
7	Bone Meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
8	Premix	0.25	0.25	0.25	0.25	2.50	2.50	2.50	2.50
9	Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
10	Methionine	0.20	0.25	0.20	0.20	0.25	0.25	0.25	0.25
11	Oyster Shell	1.50	1.50	1.50	1.50	0.25	0.25	0.25	0.25
12	Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
13	Total	100	100	100	100	100	100	100	100
Calculated									
14	Crude protein (%)	23.00	23.00	23.00	23.00	21.39	21.39	21.39	21.39
15	Metabolizable energy (kcal/kg)	1712.8	1712.8	1712.8	1712.8	2759.43	2759.43	2759.43	2759.43

T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

Table No.2: Average body weight (g/bird/wk) of broiler chicken fed varying levels of turmeric powder

S.No	Week (days)	Treatment				
		T1	T2	T3	T4	± SEM
1	0	56.0	56.0	57.0	56.0	0.001
2	7	170.02 ^c	173.01 ^c	175.01 ^b	180.01 ^a	3.90
3	14	385 ^d	425 ^c	450 ^b	468 ^a	18.34
4	21	634 ^d	649 ^c	665 ^b	688 ^a	21.67
5	28	950 ^c	1100 ^b	1129 ^a	1136 ^a	33.90
6	35	1219 ^c	1256 ^c	1389 ^b	1499 ^a	23.78
7	42	1455 ^d	1558 ^c	1589 ^b	1632 ^a	29.33
8	49	1960 ^d	2110 ^c	2256 ^b	2300 ^a	31.89
9	56	2100 ^d	2450 ^c	2550 ^b	2650 ^a	

^{abcd}Means along the same row at each week with different superscripts are significantly different (P<0.05)
 T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

Table No.3: Average gain in body weight (g/bird/wk) of broiler chickens fed varying levels of turmeric powder

S.No	Week (days)	Treatment				
		T1	T2	T3	T4	± SEM
1	7	107	108	110	109	0.04
2	14	200 ^d	210 ^c	232 ^b	245 ^a	7.10
3	21	401 ^d	422 ^c	440 ^b	452 ^a	18.34
4	28	460 ^d	479 ^c	485 ^b	488 ^a	24.56
5	35	501 ^c	520 ^b	531 ^b	560 ^a	45.11
6	42	634 ^d	656 ^c	675 ^b	689 ^a	56.78
7	49	680 ^d	700 ^c	720 ^b	730 ^a	89.33
8	56	740 ^d	765 ^c	780 ^b	792 ^a	92.21

^{abcd}Means along the same row at each week with different superscripts are significantly different (P<0.05)
 T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

Table No.4: Average feed intake (g/bird/wk) of broiler chickens fed varying levels of turmeric powder

S.No	Week (days)	Treatment				
		T1	T2	T3	T4	± SEM
1	7	150	149	148	142	3.09
2	14	370 ^a	360 ^b	353 ^c	345 ^d	17.56
3	21	689 ^a	656 ^b	645 ^c	603 ^a	23.21
4	28	868	867	866	865	67.45
5	35	1009 ^b	1012 ^a	1002 ^c	1001 ^c	23.18
6	42	1200 ^c	1250 ^b	1320 ^a	1322 ^a	56.78
7	49	1300 ^d	1323 ^c	1345 ^b	1350 ^a	34.56
8	56	1320 ^d	1342 ^c	1356 ^b	1400 ^a	56.21

^{abcd}Means along the same row at each week with different superscripts are significantly different (P<0.05)
 T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

Table No.5: Average feed conversion efficiency of broiler chickens fed varying levels of turmeric powder

S.No	Week (days)	Treatment				
		T1	T2	T3	T4	± SEM
1	7	1.50 ^a	1.47 ^b	1.41 ^c	1.30 ^d	0.09
2	14	370 ^a	360 ^b	353 ^c	345 ^d	15.22
3	21	689 ^a	656 ^b	645 ^c	603 ^a	12.21
4	28	868	867	866	865	77.34
5	35	1009 ^b	1012 ^a	1002 ^c	1001 ^c	22.89
6	42	1200 ^c	1250 ^b	1320 ^a	1322 ^a	50.21
7	49	1300 ^d	1323 ^c	1345 ^b	1350 ^a	45.99
8	56	1320 ^d	1342 ^c	1356 ^b	1400 ^a	66.34

^{abcd}Means along the same row at each week with different superscripts are significantly different (P<0.05)
 T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

Table No.6: Average mortality (%) and performance index of broiler chickens fed varying levels of turmeric powder

S.No	Variable	T1	T2	T3	T4
1	Mortality (%)	0.00	0.00	0.00	0.00
2	Liveability (%)	100	100	100	100
3	Performance Index	293.90 ^d	321.76 ^c	345.34 ^b	359.67 ^a

^{abcd}Means along the same row at each week with different superscripts are significantly different (P<0.05)
 T1 = Diet without turmeric powder, T2 = diet supplemented with turmeric powder at 2.0g/kg feed, T3 = diet supplemented with turmeric powder at 4.0g/kg feed, T4 = diet supplemented with turmeric powder at 6.0g/kg feed

CONCLUSION

The present findings that indicated that addition of turmeric powder enhanced the growth performance index of broiler chickens concluded that dietary supplementation of turmeric powder at 6.0g/kg was found to be beneficial than the other dietary treatments for broiler chickens.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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