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Research Article

Influence of Supplemental Levels of Turmeric Meal (Curcuma Longa) on the Growth Performance and Serum Biochemistry Indices of Finisher Broiler Birds (A Case Study in Ishiagu, Ivo, LGA of Ebonyi state, Nigeria)

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ABSTRACT

A feeding trial was conducted to assess the growth performance and serum biochemistry indices of finisher broiler birds fed diet supplemented with processed turmeric, with inclusion levels of 0%, 0.5%, 1.00% and 1.50% in treatments 1, 2, 3 and 4 respectively. Two hundred and forty (240), four weeks unsexed "Sayed" broiler birds were randomly divided into four treatments which was replicated thrice with twenty birds each in a completely randomized design (CRD). Feed and water were given *ad-libitum*. All dietary treatments had processed turmeric meal except the control (treatment 1). Proximate analysis of the test ingredient (turmeric) and the experimental diets were carried out. Data were obtained for growth performance and serum biochemistry indices. Results obtained for growth performance revealed that final body weight, weight gain, average daily weight gain and average daily feed intake were significantly ($P<0.05$) affected by the dietary treatments. While the value for feed conversion ratio did not differ ($P>0.05$) across the treatment group. Superior value of 2363.10g for final body weight was obtained for birds in treatment 2, while the least value of 2146.60g was obtained in treatment 4. Average daily feed intake value of 137.94g was highest for birds in treatment 3, while the lowest was obtained for birds in treatment 4. Feed conversion ratio was best in treatment 2 with value of 1.97. Serum biochemical indices had values which were significantly ($P<0.05$) influenced across the treatment group. It can be concluded from the results obtained that finisher broiler birds can accommodate processed turmeric meal upto the level of 1.50% without any detrimental effect on the performance or blood profile. Thus, processed turmeric meal at 0.5% inclusion level proved to be superior in the present study.

Key words: Turmeric meal, Growth performance, Haematology, Serum biochemistry and Broiler birds

INTRODUCTION

Positive effect can be expressed through better appetite, improved feed system and increased vitality, regulation of the intestinal microflora etc. A variety of feed additives are being included in poultry diet to derive maximum growth of broiler chicks. Use of in-feed antibiotics and hormones not only increase the cost of production but also leads to increase fat meat and develop antibiotic resistance in microbes (Al-Jaleel, 2012). Thus, beneficial effects of bioactive plants substances in animal nutrition include the stimulation of appetite and feed intake, the improvement of endogenous digestive enzyme secretion, activation of immune responses and antibacterial, antiviral and antioxidant action (Attia *et al*., 2017). In the bid to research for alternative natural feed additives in the poultry industry, various materials have been used ranging from garlic, ginger, neem etc. Thus, there is need to try other medicinal plants such as turmeric to ascertain their potential as growth promoter in broiler production.

Turmeric (*Curcumin longa*) is a spice, widely used in Asia. It is a rhizomatous perennial herb plant in the same family with the ginger plant. However, the root or rhizome of the turmeric plant is harvested in much the same way as the ginger plant (Al-Kassie *et al*., 2011). The turmeric rhizome takes about 10 months to grow before it can be harvested. It is boiled, cleaned and dried in the sun. Turmeric exhibits a wide range of biological activities and is used in traditional medicine.

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MATERIALS AND METHODS

The experimental work was conducted at the Animal Production Technology poultry site. Two hundred and forty "Sayed" strain of broiler birds at four weeks of age were used. The birds were randomly distributed into four treatment groups each consisting of three replicates with sixty birds per treatment and twenty birds per replicate in a completely randomized design (CRD). Four diets were compounded for the experimental work. Diet 1 served as the control with 0% turmeric meal (tm), while diets 2, 3 and 4 had turmeric meal inclusion at the levels of 0.5%, 1.00% and 1.50% respectively.

The turmeric was sourced at the National Research Institute, Umudike, Abia state and also locally at the Ogbete market Enugu, Enugu state. The turmeric was peeled, cleaned by washing, boiled and thereafter dried in the sun, after which it was ground to powder in the college feed mill using the hammermill. Feed and water were given *ad-libitum* and all the necessary vaccination and drug administration were carried out according to standard practice.

Determination of Parameters

At the end of the experimental work, data were collected to determine the growth performance and serum biochemistry indices. Initial body weight, final body weight, body weight gain, feed intake and feed conversion ratio were obtained. Nine birds from each treatment were selected and three ml of blood was collected from each bird from the jugular vein using sterilized syringe. The blood samples collected were transferred into a bottle containing ether diamethyl acetic acid (EDTA) to circumvent coagulation. All data collected were subjected to analysis of variance. Significant different means were separated according to the method of Duncan's multiple range test as outlined by Obi (2002). Proximate composition of the turmeric meal was carried out using the procedure of AOAC (2005).

Table 1: Experimental diet for finisher broilers fed supplemental levels of turmeric meal (tm)

Treatments Ingredients				
	T1	T2	T3	T4
Maize	58.00	58.00	58.00	58.00
Wheat offal	6.90	6.65	6.40	6.40
Soya bean meal	2.00	2.00	2.00	2.00
Full fat soya	7.00	7.00	7.00	7.00
Groundnut cake	10.00	10.00	10.00	9.50
Fish meal (72%)	1.00	1.00	1.00	1.00
Blood meal	3.50	3.50	3.50	3.50
Palm kernel cake	6.50	6.25	6.00	6.00
Turmeric meal	0	0.50	1.00	1.50
Limestone	1.50	1.50	1.50	1.50
Bonemeal	2.50	2.50	2.50	2.50
Methionine	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20
Finisher premix	0.35	0.35	0.35	0.35
Salt	0.25	0.25	0.25	0.25
Total	100	100	100	100
Calculated value				
Crude protein (CP) (%)	19.05	18.90	18.70	18.53
MEnergy (Kcal/kg)	2935.55	2919.20	2905.85	2891.44
Crude fiber (%)	3.89	3.92	3.94	3.96
Ether extract (%)	4.73	4.70	4.67	4.65
Calcium (%)	1.37	1.37	1.37	1.37
Phosphorus (%)	0.56	0.56	0.56	0.56
Methionine (%)	0.62	0.61	0.59	0.57
Lysine (%)	1.09	1.08	1.06	1.03

Table 2: Proximate composition of turmeric meal (On dry matter basis)

Parameters	Percentage (%)
Crude protein	10.32
Crude fiber	4.78
Ether extract	7.40
Ash content	3.98
Nitrogen free extract	63.52

RESULTS

The proximate composition of turmeric meal is presented in Table 2. The result obtained showed that turmeric meal has a crude protein value of 10.32%, crude fiber content of 4.78%, ether extract of 7.40%, ash content of 3.98% and nitrogen free extract of 63.52%. Table 3 revealed the growth performance characteristics value. Superior ($P<0.05$) value of 2363.10g was obtained for final body weight in treatment 2, which was closely followed by those in treatment 1 (2334.50g) and 3 (2300.20g). While the least value of 2146.60g was obtained in treatment 4. The highest ($P<0.05$) body weight gain was seen in treatment 2 (1423.35g), while the lowest was obtained in treatment 4 (1205.60g). Treatment 1and 3 had similar ($P>0.05$) values of 1394.02g and 1360.10g respectively. Feed conversion ratio had values which did not differ ($P>0.05$) across the treatment group with treatment 1 having a value of 2.05 followed by 1.97, 2.13 and 2.27 obtained for feed conversion ratio in treatments 2, 3 and 4 respectively. Serum biochemistry and haematological indices were presented in Table 4. Total protein had a superior ($P<0.05$) value of 3.71g/dl, which was significantly ($P<0.05$) different from those in treatment 4 (3.43g/dl). Treatment 1 (3.50g/dl) had similar ($P>0.05$) value with those in treatment 3 (3.56g/dl). Albumin had value of 2.39g/dl in treatment 2, which was closely followed by those in treatment 3 (2.35g/dl), while the least value of 2.27g/dl (T4) did not differ ($P>0.05$) from those in treatment 1 (2.30g/dl). Globulin was highest ($P<0.05$) in treatment 2 (1.32g/dl), while treatment 4 (1.16g/dl) had the lowest value. Treatments 1 and 3 had similar ($P>0.05$) values of 1.20g/dl and 1.21g/dl respectively. Values obtained for cholesterol showed superiority ($P<0.05$) in treatment 1 (179.11mg/dl), which differ from the values of 167.29mg/dl, 160.60mg/dl and 154.54mg/dl in T2, T3 and T4 respectively.

DISCUSSION

Results obtained for the proximate analysis of turmeric meal revealed similarity with other spices of tropical origin usually used as feed supplements and additives in farm animal nutrition. This includes moderate level of crude protein, ash and crude fiber and high level of ether extract as reported by Olabode *et al*. (2018). This is also in agreement with the report of Emadi and Kermanshahi (2007).

The result obtained for growth performance characteristics which was revealed in Table 3 showed that birds in treatment 2 (0.5%tm) had the highest ($P<0.05$) final body weight. This could be due to the optimum antioxidant

Table 3: Growth performance characteristics of finisher broiler birds fed supplemental levels of turmeric meal

	Treatment				
Parameters	T1 (0% tm)	T2 (0.50%tm)	T3 (1.00%tm)	T4 (1.50%tm)	SEM
Initial body weight (g)	940.48	939.75	940.10	941.00	-
Final body weight (g)	2334.50 [a]	2363.10 [a]	2300.20 [a]	2146.60[b]	32.15
Body weight gain (g)	1394.02[b]	1423.35[a]	1360.10[b]	1205.60[c]	20.39
Average daily body weight gain (g)	66.38[a]	67.80[a]	64.77[a]	57.41[b]	9.21
Feed intake (g)	2857.68[b]	2805.39 [c]	2896.74[a]	2741.97[d]	29.67
Average daily feed intake (g)	136.08[a]	133.59[b]	137.94[a]	130.57[c]	11.19
Feed conversion ratio	2.05[c]	1.97[c]	2.13[b]	2.27[a]	0.31

Note: tm = turmeric meal

Table 4: Serum biochemical and haematological characteristics of finisher broiler birds fed supplemental levels of turmeric meal

	Treatments				
Parameters	T1 (0% tm)	T2 (0.50%tm)	T3 (1.00%tm)	T4 (1.50%tm)	SEM
Total protein (g/dl)	3.50[b]	3.71[a]	3.56[b]	3.43[c]	0.46
Albumin (g/dl)	2.30[b]	2.39[a]	2.35[a]	2.27[b]	0.02
Globulin (g/dl)	1.20[b]	1.32[a]	1.21[b]	1.16[c]	0.01
Cholesterol (mg/dl)	179.11[a]	167.29[b]	160.60[b]	154.46[b]	11.57

Note: tm = turmeric meal

activity of turmeric at that particular level which could stimulate protein synthesis by the bird's enzymatic system. This was in agreement with the findings of Al-Jaleel (2012) who observed significant increase in final body weight when turmeric meal was added into the diet at the rate of 0.5%. This could also be explained by the exhibition of antimicrobial properties of turmeric which have high potentials and ability to inhibit some pathogenic bacteria in chicken (Al-Sultan, 2003). Results obtained for feed intake showed that there was significant ($P<0.05$) difference among the treatment group. This result agrees with the work carried out by Al-Jaleel (2012) who found significant ($P<0.05$) difference in feed consumption while working with broiler birds. However, the result disagrees with the work of Nouzarian *et al*. (2011) who observed no significant ($P>0.05$) difference in feed intake of broiler finisher birds. Feed conversion ratio had its best in treatment 2 (0.5%tm). This is in agreement with the work carried out by Durrani *et al*. (2006) who reported that the best feed efficiency was due to optimum antioxidant activity of turmeric meal at the level of 0.5%. This they attributed to the fact that this herbal plant may provide some compound that could exhibit antimicrobial properties.

Table 4, showed the serum biochemical indices of finisher birds. Values obtained for total protein in the study were within the normal range of 3.3 to 5.5g/dl as given by The Merck Veterinary Manual (2015). Thus, the high value obtained in treatment 2 (0.5%tm) could suggest that the quantity and quality of protein made available to the birds was sufficient for their normal performance and function (Al-Kassie *et al*., 2011). Values obtained for albumin were higher than the control, except in treatment 4 (1.50%tm). This could suggest that there was an increase in the release of plasma protein in the blood of the birds as serum albumin is the most abundant in plasma protein (Al-Sultan, 2003). Results obtained for cholesterol showed that as the level of turmeric meal increased in the diet, the value of cholesterol decreased simultaneously across the treatment group studied. The decrease in serum cholesterol suggests that there could be a general decrease in lipid mobilization. This suggest that the turmeric meal could have an indirect inhibitory effect exerted at the level of HMG-CoA reductase, which is a key enzyme in cholesterol biosynthesis in farm animals.

Conclusion

From the study, inference can be drawn to say that turmeric meal up to the level of 1.50% in the diet of finisher broilers can be accommodated without any negative effect both on the growth performance and the blood profile. Thus, at the rate of 0.5% level of inclusion, higher growth performance can be obtained which eventually will lead to a better profit.

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