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Research Article

The Effects of Turmeric (*Curcuma longa)* on Performance and Haematology of Broiler Birds

Ekine OA, Nchege DC and George OS

Department of Animal Science, Faculty of Agriculture, University of Port Harcourt, P.M.B 5323, Port Harcourt, Nigeria.
***Corresponding author:** otokini.george@uniport.edu.ng

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ABSTRACT

This study was conducted to assess the effect of turmeric on performance and haematology of broiler birds. Two hundred day old unsexed broiler chicks were randomly assigned into five treatments and each treatment had four replicates with ten birds each, and the experiment lasted for eight (8) weeks. Five experimental broiler Starter and finisher diets were formulated, incorporating processed turmeric rhizome meals at five dietary levels of 0% as the control treatment (T_1), 0.25% (T_2), 0.5% (T_3), 0.75% (T_4) and 1% (T_5) turmeric meals respectively. Other ingredients were adjusted in such a way that the diets were iso-nitrogenous and iso-caloric and met the nutrient requirements of the birds. Data collected included initial weights, final weights, feed intake, weight gained, feed efficiency, mortality and Haematological parameters. Blood samples were collected from two birds in each replicate. Supplementation of turmeric (*Curcuma longa*) meal statistically affected the performance characteristics (final weight, weight gain and feed efficiency). The varying inclusions of turmeric (*Curcuma longa*) also statistically affected the haematological characteristics (Haemoglobin concentration, Packed Cell Volume, White Blood Cell, Red Blood Cell count, and Platelets. The inclusion of turmeric (*Curcuma longa*) at 1.0% gave the best results. It is therefore, recommended that turmeric (Curcuma longa) be included at 1.0%/100kg in broiler diets for improved performance.

Key words: Turmeric, Heamatological parameters, Growth characteristics and Birds

INTRODUCTION

Agriculture in Nigeria has remained the most sizably voluminous sector for decades and employs proximately 60% of the workforce (Olagunju, 2010). Over 80% of the Country's population living in the rural areas is directly or indirectly dependent on agriculture for their livelihood. (NBS, 2005). The daily increasing human population in the tropics including Nigeria has given rise to increased demand of poultry and livestock products to slake protein need of the people. Poultry meat and eggs play very utilizable roles in bridging the animal protein intake gap in Nigeria. Moreover, poultry products are palatable and acceptable. This acceptability cuts across proximately all cultural and religious boundaries in Nigeria.

Animal and human health are two interwoven fields of research, betokening saturated adipose acid and cholesterol content facilitating prevalent diseases of western societies such as cardiovascular diseases, diabetes (Michaet *et al.*, 2010) and cancer (Ferguson, 2010). Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS) have been implicated in mechanisms of red cells damage, via the alteration of lipid profile and cellular activity. Consumption of variants of phenolic compounds from natural foods has been accentuated as an expedient to possibly decrease the peril of solemn health quandaries due to their antiradical and antioxidant activities (Surh, 2003).

Cellular activity and performance of broiler chicken reportedly depend on available victual nutrients, utilizable aliment ingredients as well as distribution of absorbed nutrients to and through tissues and organs. Researchers have fixated on the benign effects of phytogenic Substances on broiler chickens. Anti-oxidative substances in plants have been demonstrated to restrict the formation of toxic oxidation products, maintain alimental quality and possibly stimulate performance.

Turmeric powder (*Curcuma longa*) belongs to the ginger (Zingiberaceae) family and kenned to possess phenolic compounds (curcuminoids) that act as antioxidant and anti-inflammatory agent. Curcuminoids such ascurcumin, demethoxycurcumin and bisdemethoxy-curcumin, are yellowish turmeric pigments that have antioxidative,

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anticarcinogenic, and anti-inflammatory properties (Nishiyamaet *et al*., 2005). 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. McCarthy *et al.*, (2001), similarly reported curcumin as the active substance in turmeric powder capable of inhibiting the generation of ROS like superoxide anions, H_2O_2 and nitrite radical generation by activated macrophages, which play a consequential role in inflammation. As reported by Kermanshahi and Riasi (2006) turmeric powder at 0.2% decremented serum triglyceride, total cholesterol and LDL-c concentrations in laying hens.

Albeit a number of studies have been conducted to evaluate the effect of feeding turmeric on the performance and hematology of broiler chickens, laying hens and rabbits (George *et al*.,, 2018), the results have been inconsistently erratic. However, there is desideratum for the tenacity of optimum level of turmeric meal in the diet of poultry and livestock. Ameliorations in feed efficiency and poultry productivity through dietary incorporation of this natural victual additive would be of tremendous benefit to the animal production industry and the economic wellbeing of the nation. This study was designed generally to determine the effect of turmeric on performance and haematology of broiler chickens.

MATERIALS AND METHODS

The experiment was carried out at the University of Port Harcourt Research and demonstration, Choba, Rivers State. Rivers State is located on longitude 4º 45'N, latitude 6º 50'E (4.750º N, 6.833o E), having an annual average temperature of 26º C (78.8º F) and 2708mm average rainfall.

Two hundred day-old unsexed broiler chicks were arbitrarily assigned into five (5) treatments and each treatment had four (4) replicates, with ten birds per replicate. Routine management practices were carried in an open-sided poultry house, and the experiment lasted for eight weeks. Feed and water were provided *ad-libitum* for all the treatment groups, throughout the experimental period, and adequate prophylactic medications and vaccinations were administered to all the treatment groups.

Dried turmeric rhizomes were milled into powdery form and incorporated in the diets at graded levels of inclusion. The turmeric rhizome meal was incorporated into Five experimental broiler Starter and finisher diets at a graded level of 0% as the control treatment (T1), 0.25% (T2), 0.5% (T3), 0.75% (T4) and 1% (T5) turmeric meal respectively, in a complete randomize designed. Other ingredients were adjusted in such a way that the diets were iso-nitrogenous and iso-caloric and met the nutrient requisites of the birds.

The birds were weighed at the commencement of the experiment and weekly thereafter. Daily aliment intake was recorded as the distinction between weight of victual offered and the left over the next morning. At the terminus of the experiment, data obtained included initial weights, final weights, victual intake, weight gained, victual efficiency and mortality Blood samples were additionally amassed from two birds in each replicate (from the cutaneous ulnar vein of the broilers' wings) into bottle treated with ethylene diamine tetra-acetic acid (EDTA) which obviated the formation of blood clots for hematological analysis. The EDTA blood samples were analyzed for its Haemoglobin (Hb), Red Blood Cell (RBC), White Blood Cell (WBC), Lymphocytes, Monocytes and Packed Cell Volume (PCV).

The data collected were statistically analyzed, utilizing the General Linear Model Procedure of the SPSS Software, while consequential differences in the mean were disunited utilizing Duncan Multiple Range Test (DMRT).

RESULTS

The effects of dietary inclusion of turmeric (*Curcuma longa*) on growth performance of broiler chicks is presented in Tables 3. The result showed that there were significant differences ($P<0.05$) observed in final weight, average weight gained and feed conversion ratio. It further shows that, average weight gain and feed conversion ratio was visually examined to be better in T5(1.0%) compared to the other diets, while the feed intake and mortality had no significant differences ($P>0.05$).

The results of haematological indices showed consequential ($P<0.05$) effects in Haemoglobin concentration, Packed Cell Volume, White Blood Cell, Red Blood Cell count, and Platelets, while the differentials (Neutrophils, Monocytes, Lymphocytes and Eosinophils), were not affected significantly ($P>0.05$) by dietary inclusion of turmeric (*Curcuma longa*) meal.

DISCUSSION

The significant differences observed in final weight, average weight gained and feed conversion ratio were not in concurred with Namagirilakshmi (2005) who verbally expressed that broilers fed with turmeric meal (0.25, 0.50, 0.75 and 1%) levels did not significantly differ in body weight gain and the report of Emadi and Kermanshashi (2007), which reported that an inclusion rate of 2.5, 5 and 7.5g/kg of turmeric meal, had no effects on weight gain of broiler chickens. Durrani *et al.* (2006) found that though at 2.5g/kg and 10g/kg levels, turmeric had no effect on body weight but at an inclusion of 5g/kg body weight was significantly higher. It was concluded that the paramount increase in body weight might be due to optimum antioxidant activity of turmeric at the level of 5g/kg that stimulated protein synthesis by enzymatic systems.

The reports of Toghyani *et al.* (2010) betokened that dietary supplementation of turmeric rhizome meal promotes nutrient digestibility due to its phytochemical properties which included the stimulation of appetite and victual intake, the amendment of endogenous digestive enzyme secretion, activation of immune replication and anti-bacterial, anti-viral anti-fungal and anti-oxidant actions. However, in the present study, paramount effects on victual intake due to dietary inclusion of turmeric were not optically canvassed.

Nonetheless, there are reports suggesting that incrementing turmeric inclusion rate in broiler diets results in consequential truncation in feed intake, feed conversion ratio and increment in body weight gain (Nanung, 2013).

Table 1: Experimental starter's diet

Ingredient	Control (1)	TRT 2	TRT 3	TRT 4	TRT 5
Maize	41	40.5	40	39.5	39
PKC (Mech.)	7.46	7.46	7.46	7.46	7.46
Soya bean meal	6.5	6.5	6.5	6.5	6.5
Groundnut cake	14	14	14	14	14
Fish meal	7.74	7.74	7.74	7.74	7.74
Wheat bran	7	7	7	7	7
Soyabeanoil	3	3	3	3	3
Bone meal	3	3	3	3	3
D-L Methionine	0.5	0.5	0.5	0.5	0.5
Lysine	0.5	0.5	0.5	0.5	0.5
Vitamin/Mineral PMX	2.5	2.5	2.5	2.5	2.5
Turmeric	0	0.25	0.5	0.75	1.0
Salt	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100
Calculated feed composition					
Crude Protein %	23.06	23.06	23.06	23.07	23.04
ME Kcal/kg	2805.29	2803.88	2808.47	2801.06	2803.27
Crude Fibre %	4.78	4.79	4.81	4.83	4.83
Oil %	6.5	6.5	6.5	6.5	6.5
Analyzed feed composition					
Crude Protein %	23.02	23.02	23.05	23.05	23.03
ME Kcal/kg	2821.00	2816.12	2306.26	2823.14	2806.23
Crude Fibre %	4.23	4.56	4.56	4.69	4.78
Oil %	6.06	6.06	6.06	6.06	6.06

Table 2: Experimental finisher's diet

Ingredient	Control	TRT 2	TRT 3	TRT 4	TRT 5
Maize	51.5	51.25	51	5075	50.5
PKC (Mech.)	5	5	5	5	5
Soya bean meal	10	10	10	10	10
Groundnut cake	10	10	10	10	10
Fish meal	7.7	7.7	7.7	7.7	7.7
Wheat bran	5	5	5	5	5
Soyabeanoil	4	4	4	4	4
Bone meal	3	3	3	3	3
D-L Methionine	0.5	0.5	0.5	0.5	0.5
Lysine	0.5	0.5	0.5	0.5	0.5
Vitamin/Mineral PMX	2.5	2.5	2.5	2.5	2.5
Turmeric	0	0.25	0.5	0.75	1.0
Salt	0.3	0.3	0.3	0.3	0.3
Total	100	100	100	100	100
Crude Protein %	20.06	20.07	20.07	20.07	20.07
ME Kcal/kg	3007.76	3006.35	3004.94	3003.53	3002.12
Crude Fibre %	4.1	4.12	4.14	4.15	4.17
Oil %	7.57	7.57	7.57	7.58	7.58
Analyzed feed composition					
Crude Protein %	19.67	19.53	19.53	19.69	19.69
ME Kcal/kg	3002.98	3003.67	3003.68	3003.78	3002.59
Crude Fibre %	4.06	4.02	4.1	4.7	4.12
Oil %	7.09	7.23	7.23	7.23	7.23

Table 3: Effects of graded levels of turmeric (*Curcuma longa*) on the performance of broilers

Parameters	T_1 (0%)	T_2 (0.25%)	T_3 (0.5%)	T_4 (0.75%)	T_5 (1%)
Ini. wt. (gm)	375.00^{a}± 2.88	365.00^{a}± 8.66	340.00^{b} ± 5.77	370.00^{a} ± 0.00	380.00^{a} ± 5.77
Fin. wt. (gm)	2950.00^{ab} ±28.86	2700.00^{c}± 57.73	2150.00^{d}± 144.34	2750.00^{bc} ± 28.86	3050.00^{a} ± 28.86
Wt. gain. (gm)	429.18^{ab} ± 4.34	389.16^{c} ± 8.17	301.66^{d} ± 25.01	396.66^{bc} ± 4.81	445.00^{a} ± 5.77
Fd Intake (gm)	1155.00 ± 0.00	1155.00 ± 0.00	1155.00 ± 0.00	1155.00 ± 0.00	1155.00 ± 0.00
FCR.	2.69^{b} ± 0.28	2.97^{b} ± 0.63	3.91^{a} ± 0.32	2.91^{b} ± 0.34	2.59^{b} ±0.37
Mortality.	0.75 ± 0.47	0.25 ± 0.25	1.00 ± 0.57	0.00 ± 0.00	0.25 ± 0.25

^{a,b,c,d}: Mean ± SEM in the same row with different superscripts differ significantly (P<0.05)

Emadi and Kermanshahi (2007) reported that at 5g/kg level of inclusion, turmeric significantly decremented aliment consumption of chickens, whereas victual intake of birds supplemented with 2.5 and 10g/kg levels turmeric were kindred to that of control group.

Fascinatingly, some authors did not find salutary effects on supplementing diets with turmeric meal at the rate of 0.5g/kg (Akbarian *et al*., 2012) or 2.0g/kg (Mehala and Moorthy, 2008). These reports suggested that a lot is yet to be understood on the exact effect and mechanism of turmeric on poultry performance.

Table 4: Effects of Turmeric (*Curcuma longa*)meal on the haematological indices of broilers birds

Parameter	T_1 (0%)	T_2 (0.25%)	T_3 (0.50%)	T_4 (0.75%)	T_5 (1.0%)
Packed Cell Volume (%)	28.00±1.68^{b}	33.00±2.08^{a}	25.75±1.75^{b}	24.25±1.79^{b}	24.25±0.47^{b}
Hemoglobin (g/dl)	9.1±0.57^{b}	11.00±0.7^{a}	8.5±0.57^{b}	8.2±0.58^{b}	8.0±0.14^{b}
Red Blood Cell (x10^{6}/ul)	4.02±0.27^{b}	4.95±0.32^{a}	3.95±0.2^{b}	3.65±0.3^{b}	3.7±0.1^{b}
White Blood Cell (x10^{6}/ul)	12.62±0.45^{bc}	10.07±0.28^{c}	14.05±1.6^{ab}	17.07±1.5^{a}	15.82±1.15^{ab}
Platelet (x10^{3}/ul)	246.5±6.9^{b}	261±6.73^{b}	259.7±18.8^{b}	288.2±18.8^{b}	342.5±15.2^{a}
Neutrophils	38.5±3.01	39.25±3.5	38.75±2.9	38.75±2.6	43.25±2.13
Lymphocytes	49.75±3.6	49.50±3.2	50.50±2.3	49.50±2.1	46.00±1.6
Eosinophils	3.5±0.5	3.5±0.2	3.5±0.8	4.0±0.7	3.2±0.4
Monocytes	8.25±0.6	7.75±0.85	7.25±0.75	7.75±1.03	7.70±0.3

^{abc}: Means having different superscripts on the same row are significantly (P<0.05) different. SEM= Standard error of mean

The results obtained on Haemoglobin concentration, Packed Cell Volume, White Blood Cell, Red Blood Cell count, and Platelet showed paramount differences but were not in acquiescent with the report of Noori *et al*., (2011), who verbally expressed that no consequential difference subsisted in Packed Cell Volume, White Blood Cell, Red Blood Cell Count, and Platelet between treatments. T2(0.25%) exhibited a paramount increase in Packed Cell Volume which acceded with Noori*et al*. (2011) who reported paramount increase in Packed Cell Volume at 0.5% inclusion level. Dietary inclusion of turmeric had paramount effect on White Blood Cell count which is in acquiescent with Noori *et al.*, (2011) who reported a significant effect in inclusion of 1.0% turmeric powder.

The present study, showed no consequential differences in Lymphocyte, Eosinophil, Monocyte, and Basophil levels, which are not in acquiescent with the report of Emadi and kermanshahi (2007), that supplementation of turmeric at 0.5% level in broiler diets showed a consequential increase in Lymphocyte, Eosinophil, Monocyte, and Basophil. Raghdad (2012) reported consequential abbreviation in Eosinophil in the blood of broilers victualed diet containing turmeric powder compared to control, which was contrary to results obtained in the present study. It was suggested that birds of treated group were better equipped for the non-concrete cellular replication when invaded by peregrine agents (Raghdad, 2012).

It can be concluded, that supplementation of turmeric (*Curcuma longa*) meal of varying inclusions (0.25%, 0.50% and 0.75% and 1.0%) statistically affected the performance characteristics (final weight, weight gain and feed conversion ratio). The varying inclusions of turmeric (*Curcuma longa*) additionally statistically affected the haematological characteristics of Haemoglobin concentration, Packed Cell Volume, White Blood Cell, Red Blood Cell Count, and Platelets. The inclusion of turmeric (Curcuma longa) at 1.0% proved best across the treatments, and it is ergo recommended that the inclusion of turmeric (*Curcuma longa*) at 1.0% can be incorporated in broiler diets for ameliorated performance, but further research should be carried out utilizing higher calibers of turmeric (Curcuma longa) meal as an additive.

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