GROWTH RESPONSE AND BLOOD PROFILE OF PULLET FED DIETS SUPPLEMENTED WITH TURMERIC

Agbalaya K. K., Onigemo M. A., Oso Y. A. A., Anjola A.O. J., Tijani L. A., Agunbiade M. A.,

Agbaye P. F., Ishola O. J. Asafa A. R., Oladipupo C. P. and Ademoye A. D.

Department of Animal Production Technology, Lagos State Polytechnic, Ikorodu, Lagos, Nigeria.

maonigemo@gmail.com.

Abstract

Sixty-three Isa brown growing pullets of 11-weeks old with average weight of 849.44±2.16g were used in a completely randomized design to evaluate the growth response and blood profile of pullet fed diets supplemented with turmeric. Three experimental diets were formulated and supplemented with turmeric powder at 0g/Kg in diet 1(control), 10g/Kg in diet 2, and 20g/Kg in diet 3. Data were collected on weight gain, feed intake, haematological and serum biochemical indices. There was no significant (P>0.05) differences in the growth parameters except in feed intake. The highest significant feed intake of 88.57g/bird/day was observed in diet 1 followed by 81.61g/bird/day in diet 2 and least in diet 3 80.89g/bird/day. Pullets fed 20g/kg turmeric had the highest weight gain of 5.03g/bird/day. Mean values of haematological parameters measured differed significantly except the Packed Cell Volume (PCV). The haemoglobin (Hb), red blood cell (RBC) and white blood cell (WBC) of birds fed turmeric supplemented diets were significantly (P<0.05) higher than those fed the control diets. The serum biochemical indices were significantly (P<0.05) affected by the diets except for creatinine (CR mg/dl) but diet 1(control) was similar to diet 2 in all the parameters measured except for total protein (PRO) and cholesterol (CHOL). In conclusion, pullets' diet can be supplemented with turmeric up to 10g/Kg without adverse effect on their growth performance and blood profile.

Keywords: Turmeric powder, Pullets, Haematology and Serum biochemistry

Introduction

Medicinal plants, herbs and spices have prospect in livestock sector due to their bioactive compounds that have been in use in treating ailments (Labban, 2010) and also to improve performance when added to animal feed (Hussein, 2013). The focus on alternative to replace antibiotics in animal feed has gained significant interest and recently the use of herbs as feed additives has shown encouraging results. Adomeh and Eguaoje (2019) reported enhanced growth performance of birds fed ginger and garlic mixture at 2% while Olabode *et al.,* (2018) recommended 1.5% safe use of turmeric as a phyto-additive in starter broiler. Herbal feed additives like ginger, garlic and turmeric have received more attention due to their potential to improve nutritive value, boost immune system and enhance performance (Zhang *et al.*, 2009). Similarly, Lee *et al.*, (2004) reported that the antimicrobial activity of the phytochemical components in herbs may provide beneficial effects on poultry performance. Phytochemicals in turmeric are known to be natural, residual free and are thought to be ideal as feed additives in livestock diets (Wang *et al.*, 1998). Curcumin the main active compound furnishes turmeric with its characteristics yellow colour and is recognized as being responsible for most of it therapeutic effects such as antibacterial, antifungal, antiprotozoal, antiviral, antioxidant, anti-inflammatory and hypocholesterolemic activities (Chattopadhyay *et al.*, 2004). Supplementation of dietary turmeric reduced serum cholesterol in laying hens (Kermanshahi and Riasi, 2006), rabbits (Quiles *et al.*, 1998), and rats (Dixis *et al.*, 1998). The objective of this study was to determine the growth response and blood profile of pullet fed diets supplemented turmeric.

Materials and Methods

The study was conducted in the Poultry Unit of the Teaching and Research Farm of Lagos State Polytechnic, Ikorodu, Lagos State. Sixty-three (63) eleven-week old pullet chickens were randomly distributed into three groups with twenty-one chickens per group and each group was replicated thrice in a completely randomized design experiment. Turmeric rhizome were thoroughly washed with clean

water, sun dried for three days then oven dried for 30 minutes thereafter milled into powdery form and added as supplement into basal experimental diet comprising 42% maize, 22% PKC, 10% GNC, 20% wheat offal, 2%SBM, 2% bone meal, 1.5% limestone, 0.25% premix and 0.25% salt at the rate of 0g/Kg (control, T1), 10g/Kg T2 and 20g/Kg T3 turmeric supplementation. The determined crude proteins (g/Kg) are 185.5, 183.0 and 181.0 while gross energy (Kcal/Kg) are 3351.7, 3530.8 and 3477.9 for T1, T2 and T3 respectively. The pullets were raised in battery cage system during which feed and water were provided *ad libitum* for thirteen weeks. At the end of the trial about 2 mls of blood was collected from each bird using needle and syringe through the jugular vein from two birds per replicate into labeled heparin bottle and Ethylene-diaminetetraacetic acid (EDTA) bottle for analyses. Data were collected on weight gain, feed intake, haematological and serum biochemical indices. All data were subjected to analysis of variance using the Assistat-statistical Assistance 7.6 beta software developed by Silva and Azevedo, (2016) and differences between treatment means were separated using Duncan Multiple Range Test of the same software.

Results and Discussion

Growth performance of pullets fed diet supplemented with turmeric

The growth performances of growing pullets fed diet supplemented with turmeric are presented in Table 1. Statistical analysis showed that turmeric had no significant (P>0.05) influence on the growth parameters except for the feed intake (FI). The highest FI (88.57g/bird/day) was observed in T1 (control treatment) followed by T2 (81.61g/bird/day) and the lowest in T3 (80.89g/bird/day). The lowest feed intake might be attributed to the aroma in turmeric which probably affects the birds' appetite and also the level of inclusion of turmeric in the diet. Turmeric has been reported to reduced feed intake in bird (Durrani *et al.*, 2006; Olabode *et al.*, 2018). The weight gain, specific growth rate and feed conversion ratio of the experimental birds were similar (P> 0.05).

Table 1: Growth Performance of Pullets fed diet supplemented with turmeric

Variables	Levels of supplementation (g/kg feed)			SEM±
	T1 (0%)	T2 (1%)	T3 (2%)	
Average initial weight (g)	846.98	851.05	849.44	2.16
Weight gain (g/bird/day)	4.39	4.29	5.03	0.231
Feed intake (g/bird/day)	88.57[a]	81.61[b]	80.89[b]	2.448
Specific growth rate	1.13	1.24	1.25	0.038
Feed conversion ratio	20.18	19.02	16.08	1.22

[ab] mean with the same superscript on the same row are not significantly different (P>0.05),
SEM –Standard error of means

Haematological parameters of pullets fed diet supplemented with turmeric

Table 2 shows the haematological parameters of pullet fed different levels of turmeric based diets. The haematological parameters of growing pullets fed turmeric supplementation were significantly (P<0.05) higher than those on control diet except PCV. The haemoglobin observed ranged from 7.7 in T1 to 9 in T2. The Hb values were within the normal range of 7-14 reported by earlier workers (Mitruka and Rawnsley 1977; Esmail 2004; Sugiharto *et al.*, 2011; Iheukwumere and Herbert 2012; Campbell 2013). PCV values ranged from 27 in T3 to 29 in T2. The birds fed diets 10g/Kg of turmeric had the highest PCV of 29% though the values in all the treatments appeared to be within the normal range of 22.0-35.0% reported in literature (Jain 1986; Campbell 2013) The highest red blood cell (RBC) count ($3.77X10^{12}$/L) was recorded in T2 while the lowest value was observed in birds fed control diet (T1 $3.00X10^{12}$/L). The higher RBC counts of birds fed turmeric supplemented diets compared with the birds fed control diet might be attributed to the fact that turmeric in iron which probably resulted in increased production of haemoglobin and consequently increased RBC

concentration. Hence, turmeric positively influences blood formation and reduces anaemic condition (Sharma, 2003; Olabode *et al.,* 2018). Birds fed turmeric supplemented diets had significantly higher WBC values when compared to the control diet probably due to fact that the turmeric in the diets activates immune response and disease resistant (Zhang *et al.,* 2009). The improvement in haematological constituents in this study is in accordance with previous researchers' reports (Sugiharto *et al.,* 2011; Sodamola *et al.,* 2016; Olabode *et al.,* 2018).

Table 2: Haematological parameters of pullets fed diet supplemented with turmeric

Variables	Experimental diets			SEM±
	T1 (0%)	T2 (1%)	T3 (2%)	
Haemoglobin (g/d1)	7.7[b]	8.5[a]	9.0[a]	0.38
Packed cell volume (%)	28	29	27	0.58
Red Blood Cell ($X10^{12}$/L)	3.00[b]	3.77[a]	3.55[a]	0.23
White Blood Cell ($X10^{9}$/L)	4960[b]	7200[a]	7040[a]	721.48

[ab]mean with the same superscript on the same row are not

Serum biochemistry parameters of pullets fed diet supplemented with turmeric

Serum biochemistry parameter of pullet chickens fed turmeric-supplemented diet is shown in the Table 3. Statistical analysis revealed that serum biochemical parameters of pullets fed turmeric-supplemented diet differs significantly (P<0.05) except creatinine (CR mg/dl).

Table 3: Serum biochemistry parameters of pullets fed diet supplemented with turmeric

Variables	Experimental diets			SEM±
	T1 (0%)	T2 (1%)	T3 (2%)	
Protein (g/d1)	59.28[a]	48.59[b]	45.55[b]	12.49
Glucose (mg/dl)	141.90[a]	143.00[a]	126.50[b]	15.98
Cholesterol (mg/dl)	128.13[b]	171.23[a]	163.08[a]	39.67
Triglycerides (mg/dl)	74.64[a]	84.90[a]	70.91[b]	12.55
Albumin (g/dl)	1.26[a]	1.13[a]	1.08[b]	0.16
Alkaline phosphatase (u/l)	99.36[a]	118.68[a]	82.80[b]	31.1
Creatine (mg/dl)	0.82	1.1	0.64	0.4
Urea (mg/dl)	23.40[a]	34.22[a]	20.51[b]	12.52

[ab]mean with the same superscript on the same row are not significantly different (P>0.05)

The highest value of glucose was recorded in T2 (143.00mg/dl) while the lowest value was obtained in T3 (126.50mg/dl), the values of glucose recorded in this study is below the normal reference value (192-299mg/dl) reported by church *et al.,* (1984). Cheesebrought (1999) reported that high serum glucose indicates pancreatic or liver disease. The highest serum protein was recorded in T1 (59.28g/dl) while the lowest value was recorded in T3 (45.55g/dl). The protein value obtained from this study is above the normal reference value (3.0-4.9g/dl) reported by Church *et al.,* (1984) and also within the range of 39.45-55.53g/dl reported by Ochefu (2006). The highest value for Cholesterol was recorded in T2 (171.23mg/dl) and the lowest value was obtained from T1 (128.13mg/dl) the Cholesterol value of this study is within the normal reference value (129-297mg/dl) reported by Church *et al.,* (1984). The highest value of Triglycerides was obtained in T2 (84.90mg/dl) while the lowest value was recorded in T3 (70.91mg/dl). Numerically T2 had the highest value of Creatine while the lowest value was recorded in T3. Alkaline phosphatase and urea had their highest values in T2 and their lowest value was obtained in T3. T1 had the highest value for ALB while the lowest value was reported in T3.

Conclusions and Recommendation

The dietary inclusion of turmeric powder at 10g/kg and 20g/kg did not show significant difference except in the feed intake. However, chickens fed diet 2 (10g/kg) had the highest values for weight gain, feed intake, feed conversion ratio and specific growth rate except for protein efficiency ratio. The turmeric had no adverse effect on the haematological and serum biochemistry indices of the experimental birds. In conclusion, the results of the study indicated that up to 20g/kg dietary inclusion of turmeric could be recommended for beneficial effects on pullet chickens performance.

References

Adomeh, E.E. and Eguaoje A.S. (2019). Performance and organoleptic qualities of broiler chickens fed and raised with varying levels of ginger and garlic mixture. *Nigerian J. Anim Sci.* 21(2): 310 – 318.

Campbell, T. W. (2013). Processing the avian haematological sample. *Avian haematology*. P 8-9.

Chattopadhyay, I., Biswas, K., Bandyopadhyay, U., and Banerjee, R. K, 2004. Turmeric and curcumin: Biological actions and medicinal applications. *Curr Sci.* 87:44-53.

Cheesebrought, M., (1999). District Laboratory Practice in Tropical Countries. 1999 edition. Cambridge University Press, Cambright, UK.

Church, J. P., Judd, J. T., Young, C.W., Kebay, J. L. and Kim, W.W. (1984). Relationships among diet constituents and specific serum clinical components of subjects eating self-selected diets. *Aric. J. Clin. Nutr*. 40: 1338-1344.

Dixit, V.P., Jain, P. and Joshi, S. C. (1988). Hypolipidaemic effects of *Curcuma longa* L and Nardostachysjatamansi DC in triton-induced hyperlipidaemic rats. *Indian Journal of Physiology Pharmacology*, 32, 299–304.

Durrani, F.R., Mohammad, I.., Asad, S., Suhail, S. M, Naila, C. and Durrani, Z. (2006). Effect of different levels of feed added turmeric on the on the performance of broiler chicks. *Journal of Agricultural Biology Science.* 1; 9-11.

Esmail, S. H. M. (2004). Flavouring poultry feeds can be beneficial. In: world poultry J. 20(5): 14-15.

Hussein, S. N. (2013). Effect of Turmeric (*Curcuma longa*) powder on growth performance, carcass traits, meat quality, and serum biochemical parameters in broilers. *Journal of Advanced Biomedical and Pathobiology Research,* 3 (2): 25-32.

Iheukwumere, F.C. and Herbert, U. (2012). Physiological responses of broiler chickens to quantitative water restrictions: haematology and biochemistry. *J. Poult. Sci.* 2:117- 119.

Jain, N. S. (1986). Schalms veterinary haematology (4thedn). Lea and Febiger, Philadelphia, USA.

Kermanshahi, H., and Riasi, A. (2006). Effect of Turmeric Rhizome Powder (*Curcuma longa*) and Soluble NSP Degrading Enzyme of Some Blood Parameters of Laying Hens. *International Journal of Poultry Science* 5 (5): 494-498.

Labban, L (2010). Medicinal and pharmacological properties of turmeric (*Curcuma longa*); A review. *Int. J. Pharma. Biomed Sci*. 5(1): 17 – 23.

Lee, K. W., Everts, H., and Beynen, A.C. (2004). Essential oils in broiler nutrition. *International Journal of Poultry Science*; 3:738-752.

Mitruka, B.M. and Rawnsley, H.M. (1977). Clinical, Biochemical and Haematological reference value in Normal Experimental Animal. Mason publishing company, New York, pp 35 – 50.

Ochefu, J., 2006. The effects of Kapok (Ceiba pentandra) seed meal-based diet on growth, carcass yield and blood chemistry of weaner rabbit. M.SC. thesis. Department of Aninmal breeding and physiology, University of Agriculture, Markudi.

Olabode, A. D., Adetutu, I. S., Agu, C. I., Ugwuowo, I. C., Ojuoloruntaye, T. J. and Okelola, O. E. (2018). Growth performance and haematological characteristics of starter broilers fed diets supplemented with turmeric (*Curcuma longa*) meal. *Nig. J. Anim Prod.* 45(5):79 – 83.

Quiles, J. L., Aguilera, C. and Mesa, M. D. (1998). An ethanolic-aqueous extract of *Curcuma longa* decreases the susceptibility of liver microsomes and mitochondria to lipids peroxidation in atherosclerotic rabbits. *Biofactors*;8 (1-2):51-57.

Ross, J.G., G. Christie, W.G. Halliday and R.M. Jones, (1978). Haematological and chemistry comparison values for chemical pathology in poultry. *Vet. Res.*, 102: 29-31.

Sharma, K.K. (2003). Improving bioavailability of Iron in Indian diets through food-based approaches for the control of iron deficiency anemia. *Food Nutrition and Agriculture*, 32, 51–61.

Silva, F. and Azevedo, C. A. V. de. (2016). The Assistat Software Version 7.7 and its use in the Analysis of Experimental Data. *African Journal of Agric. Research.* 11 (39):3733 - 3740.

Sodamola, M. O, Jimoh, W. A, Adejola, Y. A, Akinbola, D. D, Olanrewaju, A. and Apiakason E. 2016. Effect of Turmeric (*Curcuma longa*) Root Powder (TRP) on the Growth Performance, Hematology and Serum Biochemistry of African Catfish (*Clarias gariepinus*) *Academia Journal of Agricultural Research* 4(9): 593-596.

Sugiharto, I., E. Widiastuti and N. S. Prabowo (2011). Effect of Turmeric Extract on Blood Parameters, Feed Efficiency and Abdominal Fat Content in Broilers. *J. Indonesian Trop. Anim. Agric*. 36(1): 23 – 26.

Wang, R., Li, D., and Bourne S. (1998). Can 2000 years of herbal medicine history help us solve problems in the year 2000. In Lyons, T. P., Jacques, K.A. eds. Biotechnology in the Feed Industry. Proceedings of Alltech's 14th Annual Symposium, Nottingham (UK): Nottingham University Press. Pp. 273-291.

Zhang, G.F., Yang, Z.B., Wang, Y., Yang, W.R., Jiang, S.Z. and Gai, G.S. (2009). Effects of ginger root (*Zingiber officinale*) processed to different particle sizes on growth performance, antioxidant status and serum metabolites of broiler chickens. *J. Poult. Sci.* 88, 2159-2166.