EFFECT OF DIETARY TURMERIC *(CURCUMA LONGA L) S*UPPLEMENTATION ON SERUM BIOCHEMISTRY INDICES OF BROILER CHICKENS

[1]*Ajibade, A.J., [2]Makinde, O.J., [1]Ntagbu F.G., [3]Oso, A.O., [1]Adebayo, A. and [1]Adedeji, A.S.
[1]Federal College of Wildlife Management, P.M.B 286, New-Bussa, Nigeria
[2]Department of Animal Science, Federal University, Gashua, P.M.B 1005, Nigeria
[3]Department of Animal Nutrition, Federal University of Agriculture Abeokuta, Nigeria
*Corresponding Author: ajibadj06@gmail.com; +2348032572023

ABSTRACT
This study evaluated the effects of dietary turmeric (Curcuma longa L.) supplementation on the serum biochemistry of broiler chickens. Turmeric, containing curcumin, is renowned for its antioxidant, anti-inflammatory, and hepatoprotective properties, making it a promising feed additive in poultry nutrition. A total of 75 broiler chickens were randomly assigned to five treatments: T1 (control, 0 g turmeric), T2 (75 g turmeric per kg of feed), T3 (150 g), T4 (225 g), and T5 (300 g). Blood samples were collected at 28 days, and serum biochemical parameters, including glucose, total protein, albumin, globulin, urea, calcium, and magnesium, were analysed . Turmeric supplementation had no significant effects (p>0.05) on serum indices of broilers at starter phase. All the serum indices (Glucose, 91.67-95.38 mmol/L; Total protein, 4.94-5.37 g/dl; albumin, 2.65-4.20 g/dl; globulin. 1.29-2.29 g/dl; urea, 3.29-3.94 mg/dl; calcium, 8.02-9.17 mg/dl and magnesium, 1.54-1.99 mg/dl) fall within the normal range established by earlier studies. It was concluded that more studies to investigate turmeric levels beyond 300 g/kg should be conducted.

Keywords: Turmeric, Serum biochemistry, Broiler chicks, Diet supplementation

INTRODUCTION

Turmeric (*Curcuma longa L.*), a herbaceous perennial plant from the Zingiberaceae family, has long been used in traditional medicine and culinary practices, particularly in Asia. Its active compound, curcumin, is recognized for its antioxidant, anti-inflammatory, and hepatoprotective properties (Aggarwal *et al.,* 2007). Recent attention has been directed toward turmeric's potential as a natural feed additive in livestock production, particularly in poultry. This is due to the growing demand for natural and sustainable alternatives to synthetic growth promoters, which have raised concerns over antibiotic resistance and food safety. In poultry production, the serum biochemical profile provides a comprehensive assessment of metabolic and liver functions, offering insights into the health status of birds. Parameters such as serum total protein, albumin, cholesterol, liver enzymes, and glucose are commonly used as indicators of metabolic and hepatic health. Several studies suggest that turmeric supplementation enhances these parameters by improving nutrient metabolism, reducing oxidative stress, and enhancing antioxidant defences (Al-Sultan and Gameel, 2004; Hosseini-Vashan *et al.*, 2012).

Furthermore, turmeric's bioactive compounds, including curcumin, have been shown to modulate lipid metabolism, resulting in reduced cholesterol levels, while also improving liver function by mitigating hepatic stress (Gowda *et al.*, 2013). These properties make turmeric a promising natural alternative to enhance health and productivity in broiler chickens. Despite existing studies, gaps remain in understanding the optimal levels of turmeric supplementation and its specific effects on serum biochemistry. Therefore, this study aims to evaluate the impact of varying dietary levels of turmeric supplementation on the serum biochemical profile of broiler chickens, focusing on its potential to improve metabolic functions and support overall health.

MATERIALS AND METHODS

EXPERIMENTAL SITE

The experiment was conducted at the Poultry Unit of Teaching and Research Farm, of the Department of Animal Production Technology, Federal College of Wildlife Management, New Bussa, Niger State, Nigeria which is located between Latitude: 9°52'03.1"N and Longitude: 4°31'48.4"E.

Source of Experimental Materials

Turmeric powder was purchased sourced for at the local market within New-Bussa, Niger State, Nigeria.

Experimental Design and Diet Formulation

A total of 75 day-old broiler chicks (Ross 308) were randomly assigned to five dietary treatments in a completely randomized design and housed in pens under the deep litters system. Each treatment group consisted of three replicates, with five birds per replicate (15 birds per treatment). The study lasted 28-days.

Experimental Diets

The dietary treatments were formulated as follows (Table 1):
T1: Control diet (0 g turmeric per kg of feed)
T2: Control diet + 75 g turmeric per kg of feed

T3: Control diet + 150 g turmeric per kg of feed
T4: Control diet + 225 g turmeric per kg of feed
T5: Control diet + 300 g turmeric per kg of feed
Birds were housed in a well-ventilated experimental pen under standard management conditions, including *ad libitum* access to feed and water. The feeding trial lasted for 28 days.

Table 1: Dietary composition of experimental starter diet

Ingredients	Composition
Maize	56.50
Maize offal	6.55
GNC	27.95
Fish meal	2.00
Blood meal	2.00
Bone meal	3.00
Limestone	1.00
Premix	0.25
Salt	0.25
Methionine	0.25
Lysine	0.25
Total	100
CP (%)	23.07
Met. Energy (Kcal/kg)	2878

T1=0, **T2=75g, T3=150g, T4=225g**, **T5=300g**

Table 2: Proximate composition of Starter diets

Components	T1 (Tum0g)	T2 (Tum75g)	T3 (Tum150g)	T4 (Tum255g)	T5 (Tum300g)
Dry matter, %	91.90	91.14	91.00	91.33	92.01
Ether extract, %	4.78	5.70	4.31	5.03	5.40
Crude protein, %	22.71	22.70	22.71	22.71	22.71
Ash, %	6.91	7.17	6.88	7.02	7.35
Crude fibre, %	3.04	3.04	3.05	3.05	3.04
Nitrogen free extract, %	54.46	52.53	54.59	53.52	53.51

Blood Sample Collection and Analysis
At the end of the experiment, blood samples were collected from the wing vein of one bird per replicate (three birds per treatment) using sterile syringes. The collected blood was allowed to clot and centrifuged at 3,000 rpm for 10 minutes to separate the serum. The serum samples were stored at -20°C for subsequent biochemical analysis. The following serum indices were analysed using standard biochemical methods:
Glucose, Total Protein, Albumin, Globulin (calculated as Total Protein – Albumin) Urea, Calcium, Magnesium

Statistical Analysis
Data collected were analysed using a one-way analysis of variance to determine the effect of dietary treatments using Statistical Analysis software (SAS, 2015). Means were compared using Duncan's Multiple Range Test at a significance level of $p<0.05$.

RESULTS
Table 3 shows the results of broiler chickens fed diets supplemented with graded levels of turmeric powder. This showed that turmeric supplementation had no significant effects ($p>0.05$) on serum indices.

Table 3: Effect of Dietary turmeric (*C. longa L.*) supplementation on the serum indices of starter Broilers.

Components	T1 (Tum0g)	T2 (Tum75g)	T3 (Tum150g)	T4 (Tum255g)	T5 (Tum300g)	SEM	P-value
Glucose, mmol/L	91.67	93.00	94.66	93.33	95.38	1.18	0.2074
Total protein, g/dl	4.94	5.01	5.21	5.46	5.37	0.98	0.9660
Albumin, g/dl	2.65	3.16	3.12	4.20	3.65	0.79	0.9658
Globulin, g/dl	2.29	1.95	2.25	1.29	1.72	0.58	0.4703

Urea, mg/dl	3.31	3.94	3.29	3.78	3.71	0.19	0.2510
Calcium, mg/dl	8.02	8.28	8.60	9.08	9.17	0.37	0.9011
Magnesium, mg/dl	1.54	1.81	1.83	1.85	1.99	0.09	0.1501

abc= means with different superscripts on the same row are significantly different (P<0.05), SEM=Standard error of mean

DISCUSSION

The results of this study demonstrated that dietary turmeric (*C. longa L.*) supplementation in starter broilers led to observable, albeit non-significant, improvements in some serum biochemical indices. The non-significant increase in glucose levels across treatments aligns with findings by Hosseini-Vashan *et al*. (2012), who reported that turmeric supplementation does not drastically alter glucose metabolism in broilers. However, the highest glucose levels in the T5 group (300 g/kg) suggest a possible role of turmeric in supporting energy metabolism through its antioxidant properties, which reduce oxidative stress and enhance cellular efficiency. Total protein and albumin concentrations were higher in turmeric-supplemented groups, particularly in T4 (225 g/kg), indicating improved protein metabolism. Gowda *et al.* (2013) highlighted that turmeric and its active compound, curcumin, enhance nutrient absorption and liver function, leading to increased protein synthesis. This suggests that turmeric supplementation may optimize protein utilization in broiler diets. Globulin levels exhibited a non-significant decreasing trend with increasing turmeric inclusion. This pattern may reflect turmeric's anti-inflammatory effects, as curcumin is known to modulate immune responses by suppressing excessive inflammation (Aggarwal *et al.,* 2007). Reduced globulin levels may indicate a balanced immune system, which could support overall bird health. Urea levels were unaffected by turmeric supplementation, suggesting no adverse effects on nitrogen metabolism or excretion. This finding is consistent with the work of Al-Sultan and Gameel (2004), who found that turmeric does not impose additional metabolic burdens on broiler chickens. The increase in calcium and magnesium levels with higher turmeric inclusion, although not significant, aligns with the findings of Durrani *et al*. (2006), who reported improved mineral absorption in broilers fed turmeric. This improvement may be attributed to curcumin's role in enhancing gut health and nutrient bioavailability, which can positively impact mineral metabolism. Overall, while the effects of turmeric supplementation on serum indices were not statistically significant, the observed trends suggest that higher inclusion levels, particularly 225 g/kg and 300 g/kg, may improve metabolic health, nutrient utilization, and overall physiological stability in broiler chickens. It was concluded that more studies to investigate turmeric levels beyond 300 g/kg should be conducted.

CONCLUSION

Dietary turmeric supplementation had no significant effect on serum biochemistry of broiler chickens, though trends suggest potential benefits in protein metabolism and mineral assumption. Futher studies with high turmeric levels are recommended to explore its full impacts on broiler health.

REFERENCES

Aggarwal, B. B., Sundaram, C., Malani, N., and Ichikawa, H. (2007). Curcumin: The Indian solid gold. *Advances in Experimental Medicine and Biology, 595, 1–75. https://doi.org/10.1007/978-0-387-46401-5_1*

Al-Sultan, S. I., and Gameel, A. A. (2004). The effects of curcumin on the liver and kidney functions of broiler chickens. International *Journal of Poultry Science, 3(7), 424–428. https://doi.org/10.3923/ijps.2004.424.428*

Durrani, F. R., Sultan, A., Chand, N., Khattak, F. M., and Durrani, Z. (2006). Effect of different levels of feed added turmeric (Curcuma longa) on the performance of broiler chicks. *Journal of Agricultural and Biological Science, 1(2), 9–11.*

Gowda, N. K. S., Ledoux, D. R., Rottinghaus, G. E., Bermudez, A. J., and Chen, Y. C. (2013). Efficacy of turmeric (Cucuma longa) and curcumin in ameliorating aflatoxin-induced toxicity in broiler chicks. *Poultry Science, 92(1), 198–205. https://doi.org/10.3382/ps.2012-02638*

Hosseini-Vashan, S. J., Golian, A., Yaghobfar, A., Zarban, A., Afzali, N., and Esmaeilinasab, P. (2012). Antioxidant status, immune system, blood metabolites, and carcass characteristics of broiler chickens fed turmeric rhizome powder under heat stress. *African Journal of Biotechnology, 11(94), 16118–16125. https://doi.org/10.5897/AJB12.2463*

SAS. 2015. Statistical Analysis System Institute. User's guide. Version 9.3, SAS Institute Inc. Cary, N.C.