

CARCASS AND SERUM BIOCHEMISTRY OF BROILER CHICKENS ON SUPPLEMENTED TURMERIC (*Curcuma longa*) DIETS

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ABSTRACT

Two weeks old Ross 308 brooded broiler chicks were used to assess the effects of broiler diets supplemented with turmeric (*Curcuma longa*) powder on carcass and serum biochemical parameters of the chickens. The chicks were randomly selected on basis of weight equalization and allocated into 4 equal groups that were respectively assigned as follows to four treatment diets; 1, 2, 3 and 4. Diet 1 contained no turmeric powder while in Diets 2, 3 and 4, turmeric was added at 100, 200 and 300g/100kg feed. The birds were raised in a deep litter house for six weeks during which they were offered feeds and water without restriction. On the last day, four birds were randomly picked per replicate for carcass and serum biochemical analysis and the data collected were subjected to the one way analysis of variance (ANOVA). Live-weight and carcass values obtained were significantly affected ($P < 0.05$) by dietary treatments. Live-weight, slaughtered weight, dressed weight and percent dressed weight values of birds offered the turmeric free diet and supplemented turmeric diets 3 and 4 were comparable with significantly lower values recorded in diet 2. Respectively, values in the turmeric free diets were 3.95, 3.80, 3.70 kg/bird and 93.62%/bird. Eviscerated weights were however significantly higher ($P < 0.05$) on the turmeric fed chickens. Values ranged from 3.05 in the non-turmeric diet to 3.23kg/bird in the 200g turmeric diet. Values recorded for total protein, albumin and globulin were not significantly affected ($P > 0.05$). Observed values were statistical comparable, but numerically higher in diet 1; 3.99, 1.91 and 2.08g/dl. Values of triglycerides, total cholesterol and low density lipoprotein (LDH) decreased with increasing levels of turmeric supplement. Respectively, values were 36.12, 118.41 and 52.81mg/dl in the turmeric free diet and 32.33, 91.03 and 20.61 mg/dl in the 300g turmeric diet. High density lipoprotein (HDL) was significantly ($P < 0.05$) increased in the turmeric fed chickens, being lowest (24.41mg/dl) in diet 1 and higher, 72.11, 73.03 and 70.45mg/dl respectively in diets 2, 3, and 4. This study showed that turmeric powder could be used successfully to produce quality broiler chickens containing lower total serum cholesterol but higher HDL. The higher the level of HDL in cholesterol the better the diet. HDL is a valuable food nutrient for health.

Keywords: Turmeric, *Curcuma longa*, Broiler chickens, Carcass, Serum biochemistry.

INTRODUCTION

Phytogenic growth promoters mainly enhance the gut health for optimum functioning of the body. The use of turmeric has become popular during the last decade due to its medicinal properties. Turmeric (*Curcuma longa*) belongs to the ginger (*Zingiberaceae*) family and known to possess phenolic compounds (*curcuminoids*) that act as antioxidant and anti-inflammatory agent. *Curcuminoids* such as *curcumin*, *demethoxycurcumin* and *bisdemethoxycurcumin*, are yellowish turmeric pigments that have antioxidative, anticarcinogenic, and anti-inflammatory properties (Nishiyama *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 (Daramola, 2020). As reported by Kermanshahi and Riasi, (2006) turmeric powder at 0.2% decreased serum triglyceride, total cholesterol and low density lipoprotein (LDL) concentrations in laying hens. Despite the nutritional benefits of turmeric powder, its toxicity when consumed is reportedly dose and specie dependent (Al-Sultan, 2003). In addition, several reports on the effects of turmeric powder on serum biochemistry of broiler chickens have not been consistent. Hence, this study aims at assessing the carcass and serum biochemical indices of broiler chickens on supplemented turmeric (*Curcuma longa*) diets.

MATERIALS AND METHODS

Experimental Design and Management

A total of 140 Ross 308 broiler chicks were brooded for two (2) weeks and during this period they were fed a commercial starter feed only without any herbal supplement added to the feed. Thereafter, a total of 128 of the chicks were then used for feeding trial. They were allotted randomly to 4 experimental treatments. Thirty-two (32) chicks were randomly selected and allocated to each of the four (4) treatment groups (T₁, T₂, T₃ and T₄) in a completely randomized design (CRD). Each treatment group contained four (4) replicates with eight (8) birds per replicate. Four (4) experimental diets were prepared. Diet one (1) was a commercial broiler diet (starter - 22% CP, 3000kcl/kg ME; finisher - 19%CP, 3100kcl/kg ME) with no turmeric powder added while diets 2, 3 and 4 were commercial diets with turmeric powder added at 0, 100, 200 and 300g/100 kg of feed respectively. The birds were

respectively allowed free access to the treatment (T₁, T₂, T₃ and T₄) diets throughout the duration of the study, that is at the remaining starter phase (2 weeks) and finisher phase (4 weeks).

On day 56 of the experiment, blood samples (2.5mls. each) were collected from 4 birds in each replicate per treatment with needles and syringes through the wing veins into well labelled plain sterile bottles. They were immediately analysed for serum biochemical parameters namely; total protein (albumin and globulin), triglycerides and total cholesterol - low density lipoprotein (LDH) and High density lipoprotein (HDL).

Statistical Analysis

Data generated were subjected to a one-way analysis of variance (ANOVA) and treatment means that significantly differed were compared using the Duncan's Multiple Range Test (DMRT) as outlined by Steel and Torrie (1990) using the SPSS (2014) package, IBM version 20.

RESULTS AND DISCUSSION

The carcass assessment of broiler chickens fed feeds supplemented with turmeric powder (T₁ 0g, T₂ 100g, T₃ 200g and T₄ 300 g/100kg feed) are shown in Table 1. All carcass values obtained were significantly affected (P<0.5) by dietary treatments. Live-weight, slaughtered weight, dressed weight and dressed percent weight of birds offered the turmeric free diet and supplemented turmeric diets 3 and 4 were comparable with significantly low values recorded in diet 2. Respectively values in the turmeric free diets were 3.95, 3.80, 3.70 kg/bird and 93.62%/bird. Eviscerated weights were however, higher in the turmeric fed chickens. Values ranged from 3.05 in the non-turmeric diet to 3.23kg/bird in the 200g turmeric chickens.

Again as observed above in Table 1, the live-weight, slaughtered, dress, and eviscerated weights including dressing percent were comparable among broiler chickens fed non-turmeric diet and turmeric supplemented diets. This implies that the additive has no adverse effect on these parameters. Turmeric is a medicinal plant which offers a lot of health benefits. The results of this study therefore suggest that the turmeric powder can be safely used for health benefit in broiler chickens without compromising the carcass characteristics. Turmeric is a medicinal plant with high concentration of curcumin that is an effective antioxidant, antiviral (Liu *et al.*, 2013a) and antibacterial activities (Liu *et al.*, 2013b). These health benefits of turmeric powder might have contributed to the comparable carcass performance of the turmeric fed chickens with the antibiotic administered counterparts in this study.

Table 1. Effects of Turmeric Supplemented Diets on Carcass Parameters of Broiler Chickens

Parameters	T ₁ (0g/100kg TM)	T ₂ (100g/100Kg TM)	T ₃ (200g/100kg TM)	T ₄ (300g/100kg TM)
Final live-weight (kg)	3.95 ^a	3.60 ^{ab}	3.55 ^b	3.85 ^a
Slaughtered-wt.(kg)	3.80 ^a	3.45 ^b	3.75 ^a	3.60 ^{ab}
Dressed-weight (kg)	3.70 ^a	3.10 ^b	3.55 ^a	3.50 ^a
Eviscerated-wt.(kg)	3.05 ^b	3.20 ^a	3.23 ^a	3.10 ^{ab}
Dressed PercentWt. (%)	93.62 ^a	86.31 ^b	92.22 ^a	90.95 ^{ab}

TM – Turmeric. Means in the same row with different superscripts a, b and c are significantly different (P < 0.05)

Table 2. Effects of Turmeric Supplemented Diets on Serum Biochemical Parameters of Broiler Chickens

ameters	T ₁ (0g/100kg TM)	T ₂ (100g/100Kg TM)	T ₃ (200g/100kg TM)	T ₄ (300g/100kg TM)
Total Protein (g/d/)	3.99	3.84	3.87	3.76
Albumin (g/dl)	1.91	1.82	1.81	1.74
Globulin (g/dl)	2.08	2.08	2.06	2.02
Triglycerides (mg/dl)	36.12 ^a	35.08 ^a	32.71 ^b	32.33 ^b
Total Cholesterol (mg/dl)	118.41 ^a	109.62 ^a	95.12 ^b	91.03 ^b
High density lipoprotein (HDL) (mg/dl)	24.41 ^b	72.11 ^a	73.03 ^a	70.45 ^a
Low density lipoprotein (LDL) (mg/dl)	52.81 ^a	25.51 ^b	23.34 ^b	20.61 ^b

Means in the same rows with different superscripts (a, b) are significantly different (p<0.05)

The current study has demonstrated that inclusion of turmeric powder in broiler chicken diets had significant influence on some of the serum biochemistry parameters. The non-significant values of sera protein, albumin and globulin among the broiler chickens fed the control and turmeric powder supplemented diets implies that the

additive had no detrimental effects on these parameters when fed to broiler chickens especially at various dosages used in this study. This result collaborates the report of Daramola *et al.* (2020) who observed no significant effect of turmeric powder on the level of sera protein. This further suggests that turmeric powder can be safely used in broiler nutrition without adverse effect on sera protein. However, the levels of triglycerides and total cholesterol were reduced in broiler chickens fed T₃(200 of turmeric powder/100 kg feed) and T₄ (300g turmeric powder/100 kg feed). Triglycerides are the main constituents of the body's fat stores and the serum or plasma total triglycerides concentrations may be determined to assess metabolic disorders. The reduction in sera triglycerides of turmeric fed broiler chickens implies that turmeric powder may be used to counter hypertriglyceridemia conditions which involve negative energy balance in the body.

This is in agreement with the report by Riasi *et al.* (2012), that turmeric powder inclusion in diets of Hy-Line W-38 laying hens decreased the level of triglyceride and total cholesterol. In addition, turmeric supplemented diets significantly influenced the levels of high density lipoprotein in broiler chickens while the levels of low density lipoprotein were reduced. This results agreed with the earlier report of Zhongze *et al.*(2008), that turmeric inclusion at 0.35 g/Kg stimulated the production of serum high-density lipoproteins (HDL), reduced total cholesterol, LDL (Low- density lipoproteins) and VLDL (very low density lipoprotein) concentrations. Sugiharto *et al.* (2011) also reported a significant increase in erythrocyte with 600mg/kg live body weight turmeric meal inclusion in the drinking water of broiler chickens. Riasiet *al.*, (2012), reported that turmeric powder inclusion in diets of Hy-Line W-38 laying hens decreased the level of triglyceride, total cholesterol and LDL-cholesterol and increased the serum HDL. Low-density lipoproteins (LDL) and high-density lipoproteins (HDL) are mainly involved in transport of cholesterol. However, HDL are more efficient in transporting cholesterol than LDL. Thus the increase in the level of HDL and the reduction of LDL is beneficial to the birds and enhance the quality of the meat products.

CONCLUSION AND RECOMMENDATION

Turmeric is a medicinal plant which offers a lot of health benefits. The results of this study showed that the broiler chickens produced had low levels of total cholesterol with good amounts of high density lipoprotein while the live weight, carcass and serum protein values were not compromised. It is therefore suggested that turmeric powder be used not just for growth and health of the broiler chickens, but also for quality meat.

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