INFLUENCE OF TURMERIC RHIZOME *(Curcuma longa*) POWDER ON THE HISTOPATHOLOGY OF BROILER CHICKENS AT FINISHING PHASE

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ABSTRACT
An eight weeks' study was conducted to determine the effect of turmeric rhizome (*Curcuma longa)* supplementation on the histopathological changes of broilers chicken at finishing phase. A total of 120 one day-old Arbor acre broiler chicks were randomly allotted into five dietary treatments of three replicates each and eight birds per replicate in completely randomized design. Turmeric powder was added to basal diets at 0.5%, 1.0% and 1.5% to T2, T3 and T4 respectively while T1 and T5 were basal diets with and without oxytetracyclines (100 g/tonne) respectively. Thereafter, one broiler/replicate were humanely slaughtered in accordance with animal welfare guidelines and tissues of the liver were promptly collected into formalin for histopathology examination. Clearing and impregnation were done using xylene and paraffin wax respectively. The tissues were stained with hematoxylin and eosin; and examined using a light microscope. Slight to serious toxic effects were observed in T1 to T4 while T5 revealed improvement in the liver status of the concerned birds as indicated by the presence of no cytoplasmic vacuoles, congestion nor visible lesion. This could probably be linked to the oxytetracycline and turmeric free diet, served to the birds. Also, turmeric supplementation of broilers diet at 0.5% (T2), 1.0% (T3) and 1.5% (T4) in this present experiment caused a significant reduction in damage done to the liver of the experimental birds fed when compared with birds on T1 (basal diet + 100 g/tonne oxytetracycline). Therefore, this study concludes that turmeric rhizome supplementation in broiler chickens reduce the level of damage on the liver due to its hepatoprotective activity.

Keywords: Natural growth promoters, health status, curcumin, antibiotics, medicinal plants

DESCRIPTION OF PROBLEM

Poultry production involves rearing birds like chickens, turkeys, and quails for meat and eggs (1). There is rising demand in the production of high-quality protein broiler meat due to income growth and urbanization (2). Significant advances in broiler production stem from research enhancing feed efficiency and growth (3). Antibiotics were commonly used to improve feed utilization and reduce disease in poultry (4). However, concerns over antibiotic resistance and public health have led to bans in many countries (5).

Natural alternatives such as probiotics, enzymes, and plant extracts are now used in poultry diets to replace antibiotics (6). Plant-based additives stimulate appetite, immunity, digestion, and offer antioxidant benefits (7, 8). Turmeric is a medicinal plant used in poultry feed due to its bioactive curcuminoids (9, 10, 11). Curcumin, the key compound in turmeric, serve as a potent phenolic antioxidant (12). Turmeric has been shown to improve broiler performance, immunity and digestive health (13, 14) while reducing harmful gut microbes (7, 13, 16). Traditionally, turmeric rhizomes have also been used both in medicine and cooking (10, 11). Despite turmeric's benefits, recent studies on its liver and heart effects in poultry show inconsistent results (15). This study aims to assess the impact of turmeric rhizome powder on broiler liver histopathology.

MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Poultry Unit of the Federal College of Agriculture, Moor plantation, Apata, Ibadan, Nigeria with GPS coordinates 7.37575°N, 3.84491° and average annual rainfall and temperature of 1467 mm and 26ºC respectively.

Sourcing and processing of test ingredient

Turmeric rhizomes were gotten from a local market in Ibadan. They were washed properly, sliced into chips form and sun dried under closed observation, Thereafter, they were milled and package in an air tight container.

Experimental birds, management and design.

A total of one hundred and twenty, one day-old Arbor Acres Broiler Chicks were purchased from Zartech hatchery in Ibadan. Two weeks before the arrival of the chicks, the pen was cleaned anddisinfected in preparation for brooding. On arrival, the chicks were weighed individually and randomly allotted into five dietary treatments with three replicates each and nine birds per replicate in a completely randomized design. The experimental diets were served to each of the five treatment groups and water was made available at an *ad libitum* basis. The litters were changed frequently and vaccination schedules were strictly adhered to. The experiment lasted for eight (8) weeks.

Experimental diets

Diets were formulated for broiler chickens according to the provisions of (17) to meet the nutrient requirements of broiler chickens. The five (5) dietary treatments were designated as T1, T2, T3, T4 and T5.

T1: Basal diet + oxytetracycline (100 g /tonnes)

T2: Basal diet + 0.5% of turmeric rhizomes powder

T3: Basal diet + 1.0% of turmeric rhizomes powder

T4: Basal diet + 1.5% of turmeric rhizomes powder

T5: Basal diet without oxytetracycline

Table 2: Gross Composition of Experimental Diets fed to Broiler Chickens at Finishing phase

Ingredients (kg)	T1	T2	T3	T4	T5
Maize	63 .00	62.50	62.00	61.50	63.00
Soybean meal	31.50	31.50	31.50	31.50	31.50
Wheat offal	1.50	1.50	1.50	1.50	1.50
DCP	1.00	1.00	1.00	1.00	1.00
Limestone	2.00	2.00	2.00	2.00	2.00
Lysine	0.30	0.30	0.30	0.30	0.30
Methionine	0.20	0.20	0.20	0.20	0.20
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Turmeric powder	0.00	0.50	1.00	1.50	0.00
Oxy-tetracycline	0.01	0.00	0.00	0.00	0.00
Total	100	100	100	100	100
ME (Kcal/ kg)	3001.35	2998.84	2996.33	2993.82	3001.35
Crude protein (%)	19.79	19.79	19.79	19.80	19.79
Crude Fat (%)	3.68	3.69	3.70	3.72	3.68
Crude Fiber (%)	3.44	3.45	3.46	3.48	3.44
Available phosphorus (%)	0.43	0.43	0.43	0.43	0.43
Calcium (%)	1.04	1.04	1.04	1.04	1.04
Lysine (%)	1.34	1.34	1.34	1.34	1.34
Methionine (%)	0.50	0.50	0.50	0.50	0.50

DCP-Dicalcium Phosphate; ME- Metabolizable Energy; T1 - Basal diet + oxytetracycline (100 g /tons); T2 - Basal diet + 0.5% of turmeric rhizomes powder; T3 - Basal diet + 1.0% of turmeric rhizomes powder; T4 - Basal diet + 1.5% of turmeric rhizomes powder; T5 - Basal diet minus oxytetracycline

DATA COLLECTION

Histopathology study

At the end of the eighth week, one broiler per replicate was humanely slaughtered via cervical dislocation and whole liver tissues were swiftly collected and dehydrated in formalin solution (10%) for histopathology examination. Clearing and impregnation were done using xylene and

paraffin wax respectively. The tissues were sectioned using a microtome (Rotary kepee model KD 202A), stained with hematoxylin and eosin; and examined using a light microscope as described by (18) and (19) for histological studies. The slides were observed for histological indicator to observe for possible degenerative changes on the tissues structure using a microscope connected to a computer system. Thereafter, the slides were projected on the computer for clear assessment and subsequently captured and printed for interpretation at the physiology laboratory.

STATISTICAL ANALYSIS

Data collected were analyzed using Statistical Package for the social Sciences (SPSS) and subjected to One-way analysis of Variance (ANOVA). Means where significant were separated using Duncan's Multiple Range Test. Experimental design used were Completely Randomized Design (CRD).

RESULTS AND DISCUSSION

Histopathology of the liver

Histopathological liver changes were evaluated in broiler chickens under different dietary treatments (Plate 1–5). Oxytetracycline induced hepatocellular degeneration with large cytoplasmic vacuoles (20). Groups T2–T4, given 0.5%, 1.0%, and 1.5% turmeric respectively, showed varying hepatic toxicity. T2 exhibited mild vacuolar degeneration with small vacuoles. T3 and T4 however, revealed pronounced vacuolation, suggesting dose-dependent hepatotoxicity. Contrary to its known hepatoprotective role (21), turmeric caused liver stress at higher doses, suggesteing that curcumin may induce oxidative stress at elevated levels (22, 23). Increased vacuolation in T3 and T4 implies metabolic disruption in poultry (24). T5 group (devoid of both oxytetracycline and turmeric supplementation) showed normal liver histology with compact hepatic plates. No vacuoles, congestion, or lesions were observed in T5, indicating hepatic recovery (24). Oxytetracycline's known effects include disruption of lipid metabolism and mitochondrial function (20). The study challenges the universal safety of natural supplements like turmeric (21). Higher turmeric doses may be harmful to non-mammalian species like poultry (24). Findings stress careful use of both antibiotics and phytogenic additives in poultry diets (23).

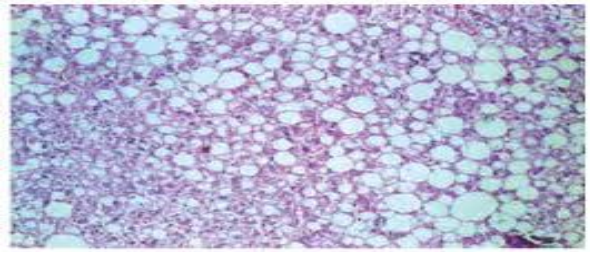

Plate 1: Histopathological view of liver tissues of broiler chickens fed diets supplemented with oxytetracycline (100 g

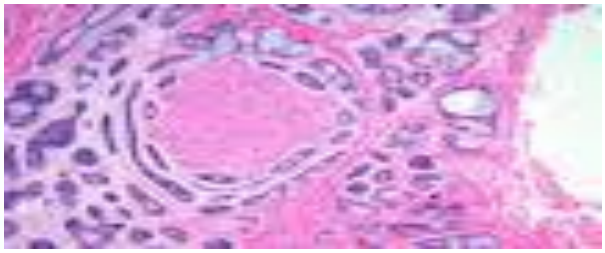

Plate 2: Histopathological view of liver tissues of broiler chickens fed diets supplemented with 0.5% turmeric rhizomes powder

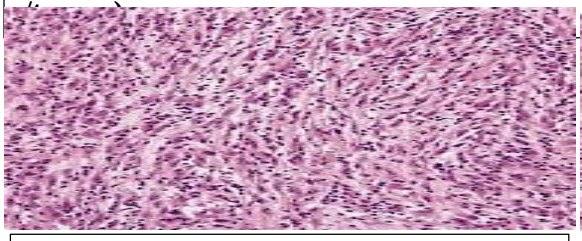

Plate 3: Histopathological view of liver tissues of broiler chickens fed diets supplemented with 1.0% turmeric rhizomes powder

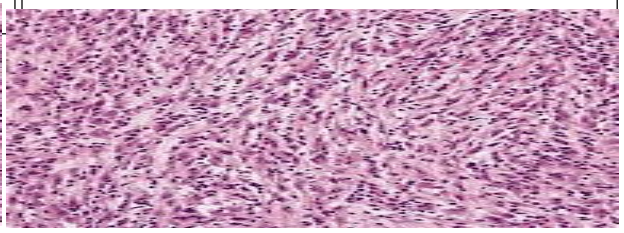

Plate 4: Histopathological view of liver tissues of broiler chickens fed diets supplemented with 1.5% turmeric rhizomes powder

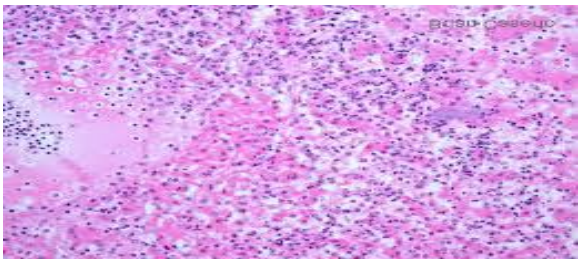

Plate 5: Histopathological view of liver tissues of broiler chickens fed diets without oxytetracycline (control)

CONCLUSION AND APPLICATION

The level of liver damage in the turmeric treated groups was reduced when compared with the antibiotics treated group indicating reduction in cell damage in liver. The study concludes that while turmeric has potential as a natural alternative to synthetic growth promoters, its use must be approached with caution. Appropriate dosing is critical to avoid unintended toxic effects in the liver. Future research should focus on determining optimal inclusion levels and investigating species-specific responses in order to ensure both its efficacy and safety in poultry production systems

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