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Research Article

Effect of Varying Levels of Cinnamon Powder on Heamatological and Serum Biochemistry Indices of Noiler Chickens

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Abstract

The effect of cinnamon powder on the haematological and serum biochemical indicators of noiler chicken was investigated. A total of 180 noiler chicks were randomly assigned to six dietary treatments in a Completely Randomized Design (CRD), each treatment was divided into three replicates of 10 birds each. Six experimental diets were formed, with 0g of cinnamon powder in the control diet (T1), 0.5g, 1.0g, 1.5g, 2.0g, and 2.5g of cinnamon powder supplementation in 4 litters of water in T2, T3, T4, T5, and T6 respectively.

The experimental diets were fed to the birds for 12 weeks. Data on haematological and serum biochemistry indices were gathered. All replicates had blood samples taken for examination. Blood was drawn from the chicken via venipuncture of the wing vein and placed in two sets of bijou bottles. Ethylene-diamine-tetra-acetic acid (EDTA anti-coagulant) is present in the first set of bottles, but EDTA is absent in the second set.

Red Blood Cells (RBC), White Blood Cells (WBC), Packed Cell Volume (PCV), Lymphocytes, Heamoglobin (Hb), Means Corpuscular Volume (MCV) were data collected on haematological parameters while the Total Protein (TP), Albumin (ALB), Globulin (GLO), Cholesterol (CHO), Aspartate Aminotransferase (AST), Alkaline Phosphate (ALP), Alanine Aminotransferase (ALT) were collected for serum biochemistry evaluation. The results showed that cinnamon supplementation had a significant impact on all blood parameters ($p < 0.05$).

The dietary regimens and blood profile markers examined showed substantial differences. The improved white blood cell (233.53 x 103 µL), red blood cell (2.86 x 106 µL), mean corpuscular haemoglobin (34.08pg), and lymphocytes (222.45%) showed that up to 2.5g of cinnamon powder can be included in Noiler chicken's diet.

Keywords: Noiler; Cinnamon Powder; Haematology; Serum; Chicken; Biochemistry

Introduction

Poultry production is a high-tech, inventive industry that primarily produces chicken meat and eggs [1]. Kuroiler chickens (also known as Noiler chickens) are a hybrid chicken created by combining a male broiler with an exotic pullet. This particular chicken breed is thought to be dual-purpose (egg and meat chicken breed). Despite the fact that they lay eggs, noilers are mostly kept for meat. Noilers are becoming increasingly popular in Africa, as farmers in Uganda, Kenya, and Nigeria have begun to raise them for egg and meat production. As a result, they're known as dual-purpose birds. Their meat is harder than broiler meat but not as tough as local chicken meat. Broilers are generally white, while pullets are mostly brown. Currently, Noilers can only be found (as Amo Noiler) at the Amo farm in Awe, Oyo State (Artibfarm, 2019).

Synthetic and semi-synthetic antibiotics are widely utilized as growth promoters in poultry production, with both beneficial and bad consequences, and this has focused attention to natural anti-

microbial agents and plants such as the cinnamon plant. Farm animals have been fed natural medicine products derived from herbs and spices such as cinnamon (*Cinnamon zeylanicum*) [13].

Cinnamon (*Cinnamomum zeylanicum*), often known as "dalchini," is an ancient medicinal plant that is widely used in India as a condiment. It is a highly prized spice that is used all over the world. Sri Lanka and South India are home to *C. zeylanicum* [18]. Cinnamon is utilized in Ayurvedic and ethnomedicine in many forms. Cinnamon's scent, which may be blended into a variety of meals, fragrances, and medical products, is mostly used in the aroma and flavour industries [15].

Cinnamaldehyde, transcinnamaldehyde (Cin), and eugenol are the main chemical elements of cinnamon. They are present in the essential oil and contribute to the smell as well as a variety of biological activity [6]. Cinnamon powder, cinnamaldehyde alone or in combination with other essential oils has been demonstrated in recent studies to have a wide range of positive effects in poultry. Increased pancreatic and intestinal lipase activity, protection against infections such as *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococus faecalis*, *Staphylococcus aureus*, *Staphylococcus epidermis*, *Salmonella sp., Helicobacter pylori,* and *Parahemolyticus* [3,5,16].

Materials and Methods

Experimental site

The experiment was carried out at the Poultry Unit of the Teaching and Research Farm of the Ladoke Akintola University of Technology, Ogbomoso, Ogbomoso is located in the derived Savanna Zone that lies on longitude $4^{o}10^{1}$ East of greenish meridian and latitude $8^{o}10^{1}$ North of the equator. The latitude ranges from 300m and 600m above sea level while mean temperature and annual rainfall are 27^{o}C and 1247mm [12].

Experimental animal and management

A total bird of 180-day-old noiler chicks were procured from Amo Farm at Awe, Oyo State, Nigeria. In a Completely Randomized Design experiment, the birds were weighed before being randomly assigned to one of the six dietary treatment groups, each with three (3) replicates and ten (10) birds. The birds were kept in enclosures with natural ventilation on all sides and were extensively managed on a deep litter system, with each cell measuring 12 square feet (125cm x 150cm x 160cm). Before the chicks arrived, the pen was cleaned, disinfected, fumigated, and covered with wood shavings. The brooding house was kept at a comfortable temperature, and clean drinking water and commercial starter mash were provided *ad-libitum*. On the control treatment, prophylaxis and vaccine were given.

Test ingredient and diet formulation

The test ingredient used was cinnamon. It contains 92g per bottle. It was procured in BAYONNE, NJ 07002, U.S.A. It was added to their drinking water.

Certain measured quantity of cinnamon will be dissolved into 4litters of water per treatment and replicates respectively. The layout goes thus

- **T_1:** 0g cinnamon/4litres of water
- **T_2:** 0.5g cinnamon/4litres of water
- **T_3:** 1.0 g cinnamon/4litres of water
- **T_4:** 1.5g cinnamon/4litres of water
- **T_5:** 2.0g cinnamon/4litters of water
- **T_6:** 2.5g cinnamon/4litters of water

Experimental diet

For 8 weeks, birds were fed *ad-libitum* on a broiler starter diet comprising 18% Crude Protein and 3000Kcal/Kg Metabolizable Energy, followed by a grower diet containing 17% Crude Protein and 2300Kcal/Kg Metabolizable Energy.

Data collection

All replicates had blood samples taken for examination. The chickens' blood was taken by venipuncture of the wing vein when they were 12 weeks old. Two sets of bijou bottles were used to collect blood samples. Ethylene-diamine-tetra-acetic acid (EDTA anticoagulant) is present in the first set of bottles, but EDTA is absent in the second set. Blood samples were labeled with the name of the test and the number of replicates.

Hematological examination

The enhanced Neubaucer haemocytometer was used to determine Red Blood Cell (RBC) and White Blood Cell (WBC) using the set with EDTA, as described by Dacie [9]. According to Coles [8], packed cell volume (PCV) was determined using the microhaematocrit method, while heamoglobin (HB) was determined using the cyanomethaemoglobin method. The mean corpuscular volume (MCV) was calculated according to Jain., *et al.* [17].

Serum biochemical test

The set of samples bottle without EDTA were centrifuged in a micro centrifuge to generate centrifuge for serum biochemical analysis. Total protein was determined using the biuret method as described by Doumas., *et al*. [11]. Albumin, using dye-binding technique with bromocresol green as described by Doumas and Biggs [10]. Globulin, by different (total protein minus albumin) total cholesterol by enzymatic method as described by Allain., *et al*. [4]. Serum glucose by enzymatic method of Kaplan and Szabo [19].

Data analysis

Data collected were analyzed using one-way Analysis of Variance of the General Linear Model of SAS [22] and the means was compared using Duncan's Multiple Range Test of the same statistical package.

Results and Discussion

Table 1 revealed the effect of cinnamon powder on blood haematology characteristics of noiler chickens. There were significant ($p < 0.05$) differences between the dietary treatments and the parameters measured. Chickens on diet 2 (0.5g of cinnamon in water) had the highest (233.53×10^3µL) WBC with the least (209.53×10^3µL) recorded for noilers fed on diet T_6 (2.5g of cinnamon powder in water). Red blood cell (RBC) was highest (2.86×10^6µL) for chickens fed on diet T_2 while the lowest (2.83×10^6µL) was observed for chickens fed with diet T_6. The highest (9.25g/dL) hemoglobin (HGB) was observed for noiler birds fed on diet T_2 while the lowest (8.10g/dL) was recorded for chickens fed with diet T_3 (1.0g of cinnamon in water). The mean corpuscular volume/cell volume (MCV) was highest (124.98fL) for chickens fed diet T_5 (2.0g of cinnamon in water) while noiler fed on diet T_4 (1.5g of cinnamon in water) had the lowest (115.93fL). Chickens on diet T_2 had the highest (34.08pg) mean corpuscular (MCH) with the lowest (32.00pg) obtained from the chickens fed with diet T_4. The Lymphocytes (LYM) was highest (222.45%) for noiler on T_2 while the lowest (205.43%) was recorded for chickens fed with diet T_6.

Parameters			Diets				SEM
	T_1 (0.0g)	T_2 (0.5g)	T_3 (1.0g)	T_4 (1.5g)	T_5 (2.0g)	T_6(2.5g)	
WBC (x 10^3µL)	221.98^{ab}	233.53^{a}	225.38^{ab}	225.13^{ab}	216.13^{bc}	209.53^{c}	3.08
RBC (× 10^6µL)	2.66^{ab}	2.86^{a}	2.51^{bc}	2.72^{ab}	2.50^{bc}	2.83^{c}	0.07
HB (g/dL)	9.00^{a}	9.25^{a}	8.10^{b}	9.05^{a}	8.38^{b}	9.15^{a}	0.14
MCV (fL)	122.52^{ab}	121.48^{ab}	119.70^{bc}	115.93^{c}	124.98^{a}	122.75^{ab}	1.12
MCH (pg)	33.80^{a}	34.08^{a}	32.33^{b}	32.00^{b}	33.80^{a}	33.55^{a}	0.31
MCHC (g/dL)	27.58^{a}	27.80^{a}	27.60^{a}	27.60^{a}	27.00^{a}	27.60^{a}	0.18
LYM (%)	213.08^{ab}	222.45^{a}	219.93^{a}	215.53^{ab}	207.43^{b}	205.43^{b}	2.76

Table 1: Effect of cinnamon powder on blood haematology of noiler chickens.

^{abc}Means along the same row with different superscripts are significantly ($p < 0.05$) different, WBC: White Blood Cell; RBC: Red Blood Cell; HGB: Hemoglobin; MCV: Mean Corpuscular Volume or Cell Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration; LYM: Lymphocytes. T_1 = 0.0g also of cinnamon, also called Control. T_2 = 0.5g of cinnamon, T_3 = 1.0g of cinnamon, T_4 = 1.5g of cinnamon, T_5 = 2.0g, T_6 = 2.5g of cinnamon in water. SEM = Standard error of mean.

The effect of cinnamon powder on blood serum of noiler chickens is as shown in Table 2. There are significant ($p < 0.05$) difference between the dietary treatments and the parameters measured. The highest alanine aminotransferase (ALT) was observed in chickens fed diet T_1 (control) having value (136.25 U/L) while the lowest (40.08 U/L) was recorded for chickens fed with diet T_6 (2.5g of cinnamon in water). Aspartate aminotransferase (AST) was highest (114.05 U/L) for noilers on diet T_6 while the lowest (2.73 U/L) was observed for noilers fed with diet T_3 (1.0g of cinnamon in water) and T_5 (2.0g of cinnamon in water). Chickens on diet T_6 had the highest (34.75 U/L) alkaline phosphatase (ALP) while chickens fed with diet T_5 had the lowest (1.56 U/L). The value (3.18 g/dI) which was recorded for noiler on diet T_6 had the highest total protein (TP) while the noilers on diet T_3 had the lowest (0.43 g/dI) TP. Noiler on T_4 had the highest (74.89 mg/dI) cholesterol (CHO) while noilers fed with T_6 had the lowest (36.05 mg/dI) CHO. The highest (153.73 g/dI) globulin (GLO) was recorded for chickens on T_4 with the least (126.64 g/dI) obtained for chickens fed with diet T_1.

Parameters			Diets				SEM
	T_1 (0.0g)	T_2 (0.5g)	T_3 (1.0g)	T_4 (1.5g)	T_5 (2.0g)	T_6(2.5g)	
ALT (U/L)	136.25^{a}	100.73^{b}	75.38^{c}	57.71^{cd}	117.00^{ab}	40.08^{d}	6.60
AST (U/L)	3.31^{b}	3.39^{b}	2.73^{b}	3.30^{b}	2.75^{b}	114.05^{a}	3.38
ALP (U/L)	2.66^{b}	1.62^{b}	2.12^{b}	2.16^{b}	1.56^{b}	34.75^{a}	0.48
TP (g/dl)	0.70^{cd}	1.78^{b}	0.43^{d}	1.50^{b}	1.20^{bc}	3.18^{a}	0.20
ALB (g/dl)	125.40^{a}	117.48^{a}	148.19^{a}	119.32^{a}	140.11^{a}	121.61^{a}	7.74
CHO (mg/dl)	44.42^{b}	39.67^{b}	74.89^{a}	48.64^{b}	38.97^{b}	36.05^{b}	2.94
GLO (g/dl)	126.64^{b}	144.68^{a}	147.26^{a}	153.73^{a}	147.57^{a}	142.43^{a}	2.37

Table 2: Effect of cinnamon powder on blood serum of noiler chickens.

^{abcd}Means along the same row with different superscripts are significantly ($p < 0.05$) different.

ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; ALP: Alkaline Phosphate; TP: Total protein; ALB: Albumin; CHO: Cholesterol; GLO: Globulin, T_1 = 0.0g also of cinnamon, also called Control. T_2 = 0.5g of cinnamon, T_3 = 1.0g of cinnamon, T_4 = 1.5g of cinnamon, T_5 = 2.0g, T_6 = 2.5g of cinnamon in water. SEM: Standard Error of Mean.

The blood haematology features of noiler chickens showed a substantial difference between the food regimens. The haematology features showed that chickens given diet T2 (0.5g cinnamon in water) had better haematology characteristics than cinnamon groups. This observation was in line with the findings of Homseng., *et al*. [14], who found that adding cinnamon to broiler chicken diets at varied levels had a substantial impact on blood profile. Sura [23] found that feeding ceylon cinnamon (*Cinnamomun zeylanicum*) powder to broiler chicks increased red blood cell, white blood cell, mean corpuscular volume, and hemoglobin levels significantly.

The blood serum biochemical parameters of noiler fowl exhibited a substantial difference between dietary regimens. The blood serum characteristics of chickens fed diet T6 (2.5g cinnamon in water) showed that they had better blood serum characteristics than the cinnamon group. This discovery supported the findings of Homseng., *et al*. [14], who found that adding cinnamon to broiler chicken diets at varied levels has a substantial impact on blood profile. Ali., *et al*. [2] also found that adding cinnamon powder to broiler chicken diets improved aspartate aminotransferase, total protein, albumin, and cholesterol levels significantly. This was also in line with the findings of Ciftci., *et al*. [7], who found that supplementing broiler chicks with cinnamon oil reduced blood cholesterol levels significantly. Talib., *et al*. [24] found a substantial difference in blood cholesterol levels in broiler chicks fed cinnamon powder. Mehdi., *et al*. [21] found a substantial difference in blood alanine aminotransferase levels when cinnamon and garlic were added to the broiler's feed (ALT).

However, the current study's enhanced blood serum biochemical features opposed those of Mehdi., *et al*. [21], Ali., *et al*. [2], and Koochaksaraie., *et al*. [20]. These researchers reported that cinnamon powder had no effect on blood serum biochemical parameters. On the effect of cinnamon powder on blood metabolites in broilers. Koochaksaraie., *et al*. [20] found that blood serum properties were unaffected. Ali., *et al*. [2] found that alanine aminotransferase (ALT) had no effect on physiological responses or reproductive success in broiler chicks fed diets supplemented with various doses of cinnamon powder. Mehdi., *et al*. [21] found a non-significant rise in aspartate aminotransferase, alkaline phosphatase, total protein, albumin, and cholesterol in broiler chickens when cinnamon and garlic were used as growth promoters.

Conclusion

The data of the present study showed that the haematology and serum biochemical indices of noiler chickens were affected by the inclusion of cinnamon powder in their water especially at 0.5g/ 4 liters of water and 2.5g/4 liters of water inclusion level for haematology and serum biochemical indices repectively.

Conflict of Interest

We certify that there is no conflict of interest with any financial, personal, or other relationships with other people or organization related to the material discussed in the manuscript.

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