

EFFECTS OF OCCIMUM GRATISSIMUM LEAF MEAL ON BLOOD PROFILE AND INTERNAL ORGANS OF COMMERCIAL BROILER CHICKEN AS NATURAL ANTIBIOTICS

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Abstract

A 35-day feeding trial was conducted to investigate the effects of incorporating Ocimum gratissimum leaf meal at 0, 5, and 10 g, per kg of commercial feed, respectively on the blood profile and internal organs of broilers. Ninety-nine (99) day old broiler chicks were raised on commercial feed for eight days. Birds were randomly allotted into 3 treatments and assigned to the 3 experimental diets in a completely randomized design (CRD). Each group was sub-divided into 3 replicates of 11 birds each. Feed and water were supplied on ad libitum basis during the 4-week trial period. Blood samples of one bird each of the replicates were collected at the end of the experiment for haematological and serum biochemical analysis. Birds fed diet T3 had the highest packed cell volume (PCV) (31.00%), while the lowest value (26.00%) for PCV was recorded on bird fed diet T2. Bird fed diet T2 recorded least haemoglobin (8.30g/dl) while highest Hb (9.90g/dl) was recorded in bird fed diet T3. However, bird fed T3 diet had the highest RBC value of $2.94 \times 10^6/\mu\text{L}$ while those fed T2 diet recorded the lowest value of $2.25 \times 10^6/\mu\text{L}$. Bird fed diet T1 had the highest total protein (6.6%), while the lowest value (5.9%) for total protein was recorded on bird fed diet T3. Bird fed diet T3 recorded least albumin (1.1g/dl) while the highest albumin (1.3g/dl) was recorded in bird fed diet T1. Bird fed diet T3 recorded lowest value (1.98%) of liver and (0.22%) for kidney while the highest value (2.32%) for liver and kidney (0.39%) was noted in bird fed diet T1 respectively. The study revealed that the incorporation of Ocimum gratissimum leaf meal in diet of the broiler did not have any negative effect on the blood profile and internal organs of broiler starters.

Keywords: Blood profile, Internal organs, Scent leaf meal and Broiler starter

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Introduction

The world is a global consumer of chicken meat as one of the most popular sources of animal protein; it is consumed by various tribes, races, and religions because it is relatively cheap, has diverse uses, and is not subjected to many cultural or religious taboos (Olumide *et al.*, 2018). Nonetheless, poultry

industry, which provides this essential protein, has major challenges that jeopardise its growth and sustainability. The main problems are the increasing price of feed materials that constitute up to 70 percent of total production costs and the constant danger of infectious diseases that may lead to high mortality rates, low productivity and farmers incurred losses.

The growing need of natural and safe alternatives in production of livestock has led to the pursuit of viable alternatives that would help decrease the excessive prices incurred in treatment, prevention and control of diseases and pests. There is also a push towards this change due to issues of public health specifically the dangers of drug residues and antimicrobial resistance attributed to the overuse of synthetic chemicals and antibiotics in animal production (Arsene *et al*, 2022). Consequently, both researchers and farmers have resorted to using herbal products and extracts made of plants (Sashikumar, 2017) as a component of livestock feed supplements, growth factors, immune enhancers, and natural solutions to treat diseases and parasites.

Herbal products and spices, which can be in the form of bulbs, rhizomes, knots or leaves are also not only appreciated to enhance the aroma and palatability of food but also aid digestibility and have medicinal properties when ingested in human or animal diet (Odoemelam *et al.*, 2012). Such natural products have been reported to enhance growth and general performance in poultry production especially in rearing broilers.

These examples are garlic bulbs, Black pepper, Scent leaf, pawpaw leaves and others. To enhance the health conditions of the broilers, as well as the desire to meet the expectation of consumers with regard to food quality, poultry farmers incorporate natural herbs into poultry feed (Gardzielewska *et al.*, 2003). Scent leaves have been applied to skin infection, gastroenteritis, stomach ache, cuts, wounds, inflammation as well as hypertensive and also in diuretic activities. It is applied to piles as well as diarrhoea and hemorrhoid (Ugbogu *et al.*, 2021). Therefore, this research was planned to assess the blood profile and internal organs of broiler chicken fed different inclusion rates of *Ocimum gratissimum* leaf meal.

Materials and methods

Experimental site

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Oyo State College of Agriculture and Technology (OYSCATECH), Igbo-ora, Nigeria. The area falls in the savanna-forest zone, latitude of 7° 15'N, longitude of 3° 30'E and an elevation of about 140 m above sea level. The region has an average minimum temperature of 20.5°C, maximum average temperature of 32.5°C, and the average relative humidity ranges at 58% (Sanusi, 2011).

Harvesting and processing of experimental ingredient (scent leaf)

The fresh leaves of *Ocimum gratissimum* (scent leaf) were picked inside the OYSCATECH premises. The leaves were rinsed carefully, dried at room temperature and then milled by the means of a mechanical grinder. Sieving was done on the ground material and stored and included in the broiler diets at the inclusion weights of 0 g, 5 g, and 10 g/kg of feed.

Experimental birds and their management

One day old broiler chicks (n=99) were sourced from Marveprerola Nigeria Enterprise. The brooding pen was cleaned and disinfected before stocking. On arrival, the chicks were administered one dose of Oxyfura vitamin soluble powder to reduce stress and infection by bacteria. Normal vaccination schedules were adhered to: Gumboro vaccination was administered on day 7 and 21, Lasota Newcastle disease vaccination on day 14 and 32. Each vaccine was dissolved in 2 litres of chlorine-free water containing 100 doses. To avoid coccidiosis, birds were given Proccoc (100 g in 120 litres of water) at days 24-28. During the experimental phase, the birds were fed commercial Ultima starter broiler feed. In the first day of the second week, they were moved to the rearing unit where they were randomly assigned to the

treatment groups (with each dietary treatment having 11 broiler chickens). Each group received one of the three experimental diets throughout the feeding trial.

Experiment diets

Birds in Treatment 1 were fed with 0g *O. gratissimum* diet per 1kg of commercial feed, while birds in Treatment 2 were fed with 5g *O. gratissimum* diet per 1 kg of feed and birds in Treatment 3 were fed with 10g *O. gratissimum* diet per 1 kg of commercial feed.

Blood sample collection and analysis

On the 35th day, 5 mL syringes were used to take the blood samples of one bird in each replicate through the wing vein. A 2.5 mL sample was transferred to a bottle with the anticoagulant ethylenediamine tetraacetic acid (EDTA) and gently mixed to allow it to blend properly for haematological analysis, and the remaining 2.5 mL portion of the sample was transferred to a sterile plain bottle, left to clot at room temperature (approximately two hours) to allow the serum to be separated in a biochemical (serum metabolite) analysis. The blood samples were transferred to the laboratory where they were evaluated.

To determine the state of internal organs, feed was withdrawn from selected birds overnight but given free access to water. The birds were weighed and slaughtered humanely by cutting the jugular vein, and then were defeathered and eviscerated. The carcass weight was calculated following the extraction of feathers and viscera. The head, neck, gizzard, shanks, spleen, heart, digestive tract, liver, and abdominal fat were also removed, weighed separately, and calculated as a percentage of live body weight using the following equation:

$$\text{Organ weight as \% of live weight} = \frac{\text{weight of organ} \times 100}{\text{Live weight}}$$

Statistics analysis

Data generated from the study were arranged using a Completely Randomized Design

(CRD). One-way analysis of variance (ANOVA) was used to analyse the datasets using SAS software (SAS, 2013). Duncan multiple range test was used in comparing treatment means (Duncan, 1955).

Results and Discussion

Table 1: Proximate composition of *Ocimum gratissimum* leaves

Parameter	Composition (%)
Dry Matter	24.68
Ash	10.00
Crude Protein	4.30
Crude Fibre	10.00
Fat	6.00
NDF	55.00
ADF	36.00
ADL	11.00

NDF - Neutral Detergent Fibre, *ADF* - Acid Detergent Fibre, *ADL* - Acid Detergent Lignin

The results of hematological parameters are shown in Table 2. The results indicated that dietary treatments had significant ($p < 0.05$) effects on most blood parameters, except eosinophils and basophils. Birds fed diets supplemented with *Ocimum gratissimum* at 10 g/kg had greater ($p < 0.05$) packed cell volume (PCV) and haemoglobin levels in comparison to the control. Also, the PCV values (26.00-31.00) were in line with what Mitruka and Rawnsley (1977) had reported. The findings indicate that the test birds were not anaemic because PCV contributes significantly to the transport of oxygen and nutrients. High PCV improves the oxygen delivery, and it is effective in preventing anaemia (Coles, 1986). This finding is in agreement with the reports by Chineke *et al.* (2006), who indicated that PCV was indicative of a rise in the number of red blood cells or a fall in the plasma volume. On the same note, Adejumo (2004) observed that PCV and haemoglobin are positively related to the nutritional condition of an animal. This study shows that the broilers were able to withstand the phytochemicals of the

diet because these values were within the normal physiological range. The level of haemoglobin is also a measure of oxygen-carrying capacity of the circulatory system (Iheukwumere and Herbert, 2003).

The count of red blood cell (RBC) and white blood cell (WBC) rose considerably with a higher inclusion level of scent leaf. The WBC variations indicate disparity in immune response (Ganong, 1991) with birds on the 10

g/kg diet experiencing the highest immunity, and birds in the control diet (0 g/kg) registered the lowest. The trend was justified by the high lymphocyte counts in the supplemented groups. Mean corpuscular haemoglobin concentration, mean corpuscular volume and mean corpuscular haemoglobin are markers of the severity of anaemia. The findings of MCH and MCHC in present study indicate that the birds could withstand stress quite effectively.

Table 2: Haematological parameters of Broilers fed varying levels of *O. gratissimum* leaf meal diet

Parameters (%)	T ₁ 0g(OG)	T ₂ 5g(OG)	T ₃ 10g(OG)	SEM (±)	P value
PCV (%)	30.00 ^{ab}	26.00 ^b	31.00 ^a	1.25	
Hb (g/dl)	9.75 ^b	8.30 ^c	9.90 ^a	6.36	
RBC (x10 ⁶ ul)	2.78 ^b	2.25 ^c	2.94 ^a	0.17	
WBC (x10 ³ ul)	12825 ^b	13125 ^{ab}	13275 ^a	108.01	
Platelets	109500 ^c	122500 ^b	124500 ^a	3839.37	
Lymphocyte (%)	60.00 ^b	58.50 ^b	65.50 ^a	1.74	
Basophils (%)	0.00	0.00	0.05	0.14	
Monocyte (%)	3.50	3.00	3.00	0.14	
Eosinophil (%)	4.50	4.50	4.50	0.00	
MCV (fl)	108.24 ^b	118.65 ^a	105.59 ^c	3.25	
MCHC (%)	32.49	31.91	31.93	0.16	
MCH (pg)	35.17 ^b	37.85 ^a	33.72 ^b	0.99	

^{a b c} Means on the same row with different superscript are significantly different ($P < 0.05$). PCV= Packed cell volume, MCH= Mean Corpuscular Haemoglobin, RBC= Red blood cell, WBC= White blood cell, MCHC= Mean Corpuscular Hameoglobin Concentration, MCV = Mean Corpuscular Volume, OG = *O. gratissimum*

The findings from the serum parameters are presented in Table 3. Most of the serum indices were affected significantly ($p < 0.05$) by dietary treatments, except blood urea nitrogen and creatinine. The highest values were observed in the total protein and albumin in birds treated T1 and the lowest in T3 (10 g/kg *O. gratissimum*). These values were within the normal range of healthy broilers as indicated by Ajuonuma *et al.* (2013), which shows good health and ability of the diets to sustain the production of blood proteins. Globulin levels were much greater in T1 than in T2 and T3, indicating a slight

immunosuppressive effect at higher levels of inclusion.

The liver enzyme activities (AST, ALT, ALP) of the broilers were within normal physiological limits, which means there was no hepatic damage and proves the safety of *O. gratissimum* inclusion. These enzyme activities are biomarkers of hepatotoxicity and liver functioning (Yildirim *et al.*, 2011). Alkaline phosphatase (ALP) is a protein secreted primarily by intestinal mucosa, liver, bone, kidney, and placenta, and is involved in skeletal development. Lower levels of activity of ALP can indicate a slowing in bone development whereas higher levels indicate a

higher level of functioning of osteoblastic and bone mineralization. In the present work, T3 increased ALP activity in birds, indicating that

the 10 g/kg *O. gratissimum* diet stimulated bone formation and mineral deposition.

Table 3: Serum indices of Broilers fed varying levels of *O. gratissimum* leaf meal diet

Parameters (%)	T1 0g (OG)	T2 5g (OG)	T3 10g (OG)	SEM (±)
Total Protein (g/dl)	6.60 ^a	6.30 ^b	5.90 ^c	0.17
Albumin (g/dl)	1.30 ^a	1.15 ^b	1.10 ^c	0.05
AST (I.U/L)	187.50 ^{ab}	190.50 ^a	179.00 ^c	2.81
ALT (I.U/L)	27.50 ^b	28.00 ^a	22.00 ^c	1.57
ALP (I.U/L)	206.50 ^b	203.00 ^c	210.00 ^a	1.65
BUN (mg/dl)	6.80 ^a	6.40 ^a	6.50 ^a	0.09
Creatinine (mg/dl)	0.55 ^a	0.50 ^a	0.50 ^a	0.01
Globulin (g/dl)	5.30 ^a	5.15 ^b	4.80 ^b	0.12
A.G. Ratio	0.34 ^b	1.12 ^a	0.23 ^c	0.23

^{a, b and c}Means along the same row having any identical superscript are not significant ($p>0.05$); Aspartate Amino Transferase (AST), Alanine Amino Transferase (ALT) and Alkaline Phosphatase (ALP), Blood Urea Nitrogen (BUN), OG= *Ocimum gratissimum*

The result of internal organs is shown in Table 4 and it revealed that *O. gratissimum* inclusion influenced several physiological parameters in broilers. Liver weight declined progressively with increasing inclusion levels, from 2.32% in the control group (T1) to 1.98% in T3, suggesting reduced hepatic fat deposition or a lower metabolic burden at higher scent leaf levels. Similar trends have been linked to the hepatoprotective and lipid-lowering effects of phytochemicals such as eugenol and flavonoids found in *O. gratissimum* (Bano *et al.*, 2017). This result negated the findings of Amaduruonye *et al.*, (2018) who reported no significant ($p>0.05$) difference for the values obtained for liver across the treatments. Kidney weights were highest in the control group (0.39%) and lowest in T3 (0.22%), indicating that moderate *O. gratissimum* inclusion may support renal efficiency without imposing excess metabolic load (Alabi *et al.*, 2021). Heart and lung weights increased significantly in T2 compared to T1 and T3, potentially reflecting improved cardiopulmonary development (Lahlou *et al.*,

2004). Spleen weight, a key immune organ index, was highest in T2, suggesting that moderate inclusion could stimulate immune tissue development. This aligns with the known immunomodulatory properties of *O. gratissimum* (Priyanka *et al.*, 2018). Heart and lung weights were significantly higher in T2 than in T1 and T3, suggesting a possible improvement in cardiopulmonary development at moderate *O. gratissimum* inclusion. Gizzard weights were higher in T1 and T2 (2.95% respectively) but reduced in T3 (2.71%), possibly due to changes in dietary fibre dynamics and mechanical grinding activity at higher inclusion levels. The gastrointestinal tract length was significantly longest in T3, which could suggest adaptation to higher dietary fibre content, as observed in herbal feed inclusion studies (Olumide *et al.*, 2020). The overall results suggest that moderate *O. gratissimum* inclusion (5 g/kg) may improve organ development, while higher levels could reduce certain organ weights without evidence of pathological effects.

Table 4: Internal organs of broiler fed varying levels of *O. gratissimum* leaf meal diet

Parameters (%)	T1 0g (OG)	T2 5g (OG)	T3 10g (OG)	SEM (±)
Liver	2.32 ^a	2.29 ^{ab}	1.98 ^c	0.09
Kidney	0.39 ^a	0.29 ^b	0.22 ^c	0.04
Spleen	0.00 ^b	0.05 ^a	0.00 ^b	0.01
Bile	0.00 ^b	0.14 ^a	0.14 ^a	0.04
Heart	0.39 ^c	0.46 ^a	0.43 ^b	0.02
Lung	0.58 ^b	0.86 ^a	0.50 ^c	0.09
Proventriculus	0.39 ^b	0.50 ^a	0.50 ^a	0.03
W Gizzard	2.95 ^a	2.95 ^a	2.71 ^b	0.07
E Gizzard	1.50 ^b	1.49 ^{bc}	1.62 ^a	0.03
GIT weight (g)	6.24 ^a	5.17 ^b	5.14 ^{bc}	0.30
GIT length (cm)	11.47 ^b	11.36 ^{bc}	12.94 ^a	0.42

^{a, b, c}, Mean along the same row with the same superscript and significantly different ($p < 0.05$)

W Gizzard- Whole Gizzard, E Gizzard- Empty Gizzard, GIT- Gastrointestinal Tract

Conclusion

The results of this study indicated that inclusion of *Ocimum gratissimum* leaf meal in the diet of broilers can serve as safe natural growth promoters, enhance blood profiles, and maintain organ health.

Recommendation

From the results of this study, it is advised that *Ocimum gratissimum* leaf meal be incorporated in broiler diets at a moderate level of 5 g/kg feed to enhance growth performance, improve haematological indices, and support optimal internal organ development without adverse effects on liver or kidney function. Higher inclusion levels (10 g/kg) should be used with caution, as they may reduce certain organ weights and protein parameters without providing additional performance benefits.

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