EFFECT OF *OCIMUM GRATISSIMUM* LEAF MEAL SUPPLEMENTATION ON GROWTH PERFORMANCE AND HAEMO-BIOCHEMICAL RESPONSE OF BROILER-CHICKENS

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ABSTRACT
The growth performance and haemo-biochemical characteristics of broiler-chickens to dietary supplementation of Ocimum gratissimum leaf meal (OGLM) was investigated in a 42 day feeding trial. A basal diet was formulated using the conventional feed ingredients. The diet was divided into six equal portions, and supplemented with OGLM to have diet 1 (0 g OGLM /100kg diet; serving as positive control), diet 2 (0 g OGLM /100kg diet + 250 mg antibiotic, serving as negative control), diet 3 (250 g OGLM /100kg diet), diet 4 (500 g OGLM /100kg diet), diet 5 (750 g OGLM /100kg diet), diet 6 (1000 g OGLM /100kg diet). Feed intake, weight gain, hematological and serum profile of birds fed Ocimum gratissimum leaf meal supplements were significant (P<0.05) while feed conversion ratio and white blood counts were not significantly (P>0.05) different. Supplementation of OGLM at the optimal level of 750 g/100kg diet improved growth rate and up to 1000 g/100kg diet did not compromise blood profile of broiler chickens
Keywords: Broiler chickens, haematology, Ocimum gratissimum, metabolites, haemo-biochemical

INTRODUCTION

The use of hormones, antibiotics, enzymes, prebiotics, and probiotics as growth promoting and health maintaining agents in livestock production cannot be underscored. However, the overuse or indiscriminate use of these agents, particularly synthetic antibiotics has resulted in bacteria becoming resistant to these drugs, creating superbugs which multiply rapidly with its dire consequence on human health upon the consumption of livestock and, or their products (Valezuela-Grijalva *et al*., 2017). Aside from becoming resistant to drugs, antibiotics or synthetic products are poorly metabolized, more toxic, having side effects than natural or organic products (Valezuela-Grijalva *et al*., 2017). Consequent upon these shortcomings, the European Union in 2006 banned the use of antibiotics in livestock production. Other countries had followed suit. In the wake up call to sustain the livestock industry and produce animal products that are consumer friendly, animal scientists, nutritionists, livestock farmers and other allied professionals are challenged to source for natural alternatives that can promote livestock growth without negative consequence on human health and the environment. Thus, the use of herbs and other botanicals are now taking the centre stage as alternatives to antibiotics.

Among the botanicals of importance is *Ocimum gratissimum* leaf popularly known as basil, basil-clove, or alfavaca. In Nigeria, it is generally called scent leaf. In Yoruba, it is called Efinrin while in Hausa, it is called Daidoya and the Igbos called it Nchanwu. *Ocimum gratissimum* serves as condiment in human food, having wide therapeutic properties (Valezuela-Grijalva *et al*., 2017).

The study aimed to assess the additive effect of *Ocimum gratissimum* leaf meal as phytobiotic feed supplement in broiler chicken production.

MATERIALS AND METHODS

The right to conduct the experiment was approved by the Research Committee of the Department of Agricultural Science, Adeyemi Federal University of Education, Ondo, Nigeria.

Leaves from healthy *Ocimum gratissimum* plants were collected from the University environment. The leaves were washed, air-dried, milled and stored before use. The air-dried leaves were analyzed for their proximate composition and mineral contents (AOAC 2002).

Feed preparation A basal diet was formulated using the conventional feed ingredients as shown in Table 1. The basal diet was divided into six equal portions, designated diets 1-6, and supplemented

with *Ocimum gratissimum* leaf meal at graded levels. The diets for the birds were prepared to meet the nutrient requirements of broiler chickens.

Table 1. Feed composition of broiler chickens (g/100g)

Ingredients	Broiler starter	Broiler finisher
Maize	54.1	58.6
Rice bran	5.72	5.43
Wheat offal	6.16	6.41
Groundnut cake	10.1	9.41
Soybean meal	15.7	13.5
Fish meal	5.12	3.55
Lime stone	1.50	1.55
Dicalcium Phosphate	0.50	0.50
Premix	0.30	0.25
Lysine	0.15	0.15
Methionine	0.15	0.15
Common salt	0.50	0.50
Nutrient composition		
Crude protein (%)	23.1	20.3
ME (kcal/kg)	3125	2918

Note: The diets were supplemented to have: diet 1 (0 g OGLM */100kg diet), diet 2 (0 g* OGLM */100kg diet with 250 mg antibiotic), diet 3 (250 g* OGLM */100kg diet), diet 4 (500 g* OGLM */100kg diet), diet 5 (750 g* OGLM */100kg diet), diet 6 (1000 g* OGLM */100kg diet)*

Experimental design and management of birds The experimental design was completely randomized design involving 240 a day old Arbor Acres unsexed broiler chicks distributed to 6 dietary treatments of 40 birds to a treatment. Each dietary treatment was replicated 5 times of 8 birds to a replicate. Fresh feeds and clean cool water were served to the birds ad libitum throughout the 6 weeks experimental period.

Blood collection and haemato-biochemical determination At day 42 of the experiment, blood samples were collected from 3 birds per replicate via the wing vein into two separate bottles. Blood collected into EDTA bottle was used for haematological determination while blood collected without EDTA was used for the serum biochemical determination using commercial kits (Reflection® Plus 8C79 (Roche Diagnostic, GombH Mahnheim, Germany).

Data collection and analysis Data were collected on daily feed intake, weight gain, haematological indices, serum lipids and data were calculated on feed conversion ratio. All data collected were subjected to one way analysis of variance using General Linear Model (GLM) of SPSS (2006). Means were compared using Duncan option of the statistical software.

RESULTS AND DISCUSSION

Ocimum gratissimum leaf contains appreciable amount of nutrients that can justify its supplementation in broiler chicken diet (Table 2).

Table 2. Chemical composition of *Ocimum gratissimum* leaf

Proximate composition, g/100g		Mineral contents	mg/100g
Dry matter	94.6	**Macro**	
Crude protein	13.2	Ca	2451
Crude fibre	8.23	Na	128
Crude fat	2.21	K	148
Ash	4.33	**Micro**	
		Fe	602
		Zn	31.7
		Cu	1.09

Results (Table 3) show the significant (P< 0.05) difference in the final body weight and average weight gain of broiler chickens fed 500 and 750 g OGLM/100kg diet compared to those fed 0 and 250 g OGLM/100kg diet. It is interesting to note that *Ocimum gratissimum* leaf meal supplementation, particularly at 500 and 750 g/100kg diet performed better in average daily weight gain compared with birds on antibiotic treated diets. The better growth rate of broiler chickens on *Ocimum gratissimum* leaf meal supplementation could be attributed to the biological activity of the bioactive compounds, particularly thymol and eugenol to improve growth rate of broilers due to its anti-microbial, anti-inflammatory, antioxidant and immunomodulatory effects to maintain the health of birds and relax the smooth muscles in the intestine to enhance nutrient absorption (Hoffman-Pennesi and Wu, 2010). The hydrophobic property of phytochemicals to increase membrane permeability and intestinal integrity resulting in proper nutrient digestion and absorption could have increased the growth rate of birds on *Ocimum gratissimum* leaf meal supplementation (Dhama *et al*., 2015; Ogunsipe *et al*., 2020).

Table 3. Performance and haemo-biochemical indices of broiler chickens fed *OGLM* (g/100kg) in the diet

	0 OGLM	0 OGLM + antibiotic	250 OGLM	500 OGLM	750 OGLM	1000 OGLM	SEM	Sig
Performance								
Live weight/bird								
Initial body weight, g	37.99	37.87	37.87	37.91	37.80	37.83	0.14	0.86
Final body weight, g	1654.31^{b}	1663.88^{ab}	1656.16^{ab}	1684.21^{a}	1683.21^{a}	1658.92^{b}	8.69	0.04
Total body weight gain	1616.34^{b}	1626.01^{ab}	1618.29^{b}	1646.30^{a}	1645.41^{a}	1621.09^{ab}	8.74	0.04
Daily weight gain, g	38.49^{b}	38.71^{b}	38.53^{b}	39.20^{a}	39.18^{a}	38.59^{b}	0.208	0.04
Total feed intake, g	3533.18^{ab}	3540.28^{ab}	3522.50^{b}	3560.39^{ab}	3573.80^{a}	3558.07^{ab}	12.38	0.04
Daily feed intake, g/d	84.12^{ab}	84.29^{ab}	83.87^{b}	84.77^{ab}	85.09^{a}	84.71^{ab}	0.295	0.04
Feed conversion ratio	2.17	2.18	2.18	2.16	2.17	2.19	0.01	0.576
Haemo-biochemical indices								
PCV (%)	31.3^{c}	32.31^{a}	31.7^{bc}	32.2^{ab}	32.38^{a}	32.38^{a}	0.141	< 0.001
RBC (10^9/mL)	3.19^{b}	3.27^{b}	3.37^{a}	3.42^{a}	3.41^{a}	3.43^{a}	0.021	< 0.001
Hb (g/dL)	10.2^{c}	10.25^{c}	10.4^{b}	10.7^{a}	10.8^{a}	10.8^{a}	0.043	< 0.001
WBC (10^9/mL)	8.90	9.05	8.65	9.04	8.97	9.02	0.140	0.345
TSP (g/dL)	3.80^{c}	3.82^{c}	3.85^{bc}	3.92^{ab}	3.95^{a}	3.93^{ab}	0.027	< 0.01
Chol (mg/dL)	137^{a}	137.40^{a}	131^{b}	128^{bc}	127^{bc}	126^{c}	1.312	< 0.001

Note: The diets were supplemented to have: diet 1 (0 g OGLM */100kg diet), diet 2 (0 g* OGLM */100kg diet with 250 mg antibiotic), diet 3 (250 g* OGLM */100kg diet), diet 4 (500 g* OGLM */100kg diet), diet 5 (750 g* OGLM */100kg diet), diet 6 (1000 g* OGLM */100kg diet)*

Haematological and serum biochemical parameters increased while cholesterol concentrations decreased in broiler chickens fed *Ocimum gratissimum* leaf meal supplemented diets compared with those on control diets. This shows the haematopoietic potential of the *Ocimum gratissimum* leaf meals to ensure formation of blood cells and allay the fear of hypercholesterolemia or liver disorder.

CONCLUSION AND RECOMMENDATION

Supplementation of *Ocimum gratissimum* leaf meal at 500 and 750 g/100kg diet enhanced broiler growth and up to 1000 g/100kg diet promoted blood cell formation with lower cholesterol concentration in broiler chickens. Hence, broiler farmers are encouraged to utilize this leaf meal as feed supplement at these optimal levels in broiler chicken diet.

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