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Haematological indices, liver function and lipid profile of broiler chickens fed graded levels of scent leaf (*Ocimum gratissimmum L.*) meal

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Abstract

An experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Faculty of Agriculture, Kaduna State University, Kafanchan, Campus to determine the effect of feeding graded levels of Scent leaf (Ocimum gratissimum) meal on growth performance and carcass characteristics of broiler chickens. Eighty day old Ross chicks were allotted to 4 dietary groups replicated twice with 10 birds per replicate in a complete randomized design (CRD). The study lasted for 8 weeks with feed and water offered ad-libitum. Data were collected on haematological (packed cell volume, red blood cell, haemoglobin, white blood cell, mean corpuscular haemoglobin, mean corpuscular volume, mean corpuscular haemoglobin concentration, lymphocyte, neutrophils) and serum (cholesterol, triglycerides, low density lipoprotein, high density lipoprotein) indices and were subjected to analysis of variance using the general linear model of SAS. All parameters measured on haematological and serum indices were not significantly (P>0.05) different in birds fed scent leaf meal and the control diet. Values obtained on haematological indices and liver function indices were within the normal range for chickens as reported in prior literature. Birds fed 100g scent leaf had lower white blood cell count than those fed 50g and 150g and even the control. The lipid profile of birds fed up to 150g scent leaf (O. gratissimum) showed improved protein function with good lipid profile and having reduced values for high density lipoprotein, low density lipoprotein, triglyceride and cholesterol than the control. It can be concluded that inclusion of scent leaf meal up to 150g did not pose any adverse effect on the haematological indices and normal functioning of the liver of broiler chickens and lipid profile.

Keywords: Poultry, broiler, chicken, scent leaf, haematology and serum

Indices hématologiques, fonction hépatique et profil lipidique des poulets à griller nourris à des niveaux gradués de farine de feuilles odorantes (Ocimum gratissimmum L.)

Résumé

Une expérience a été menée à l'unité de volaille de la ferme d'enseignement et de recherche, faculté d'agriculture, université d'État de Kaduna, Kafanchan, campus pour déterminer l'effet de l'alimentation de niveaux gradués de farine de feuilles parfumées (Ocimum gratissimum) sur les performances de croissance et les caractéristiques de la carcasse du poulet à griller. Des poussins Ross âgés de quatre-vingts jours ont été répartis en 4 groupes alimentaires répétés deux fois avec 10 oiseaux par répétition dans une conception randomisée complète (CRC). L'étude a duré 8 semaines avec des aliments et de l'eau offerts à volonté. Des données ont été recueillies sur les paramètres hématologiques (hématocrite, globules rouges, hémoglobine, globules blancs, hémoglobine corpusculaire moyenne, volume corpusculaire moyen, concentration corpusculaire moyenne en hémoglobine, lymphocytes, neutrophiles) et sériques (cholestérol, triglycérides, lipoprotéines de basse densité, haute densité lipoprotéines) et ont été soumis à une analyse de variance à l'aide du modèle linéaire général de SAS. Tous les paramètres mesurés sur les indices hématologiques

et sériques n'étaient pas significativement (P>0,05) différents chez les oiseaux nourris avec de la farine de feuilles parfumées et le régime témoin. Les valeurs obtenues sur les indices hématologiques et les indices de la fonction hépatique se situaient dans la fourchette normale pour les poulets, comme indiqué dans la littérature antérieure. Les oiseaux nourris avec 100 g de feuilles parfumées avaient un nombre de globules blancs inférieur à ceux nourris avec 50 g et 150 g et même le témoin. Le profil lipidique des oiseaux nourris jusqu'à 150 g de feuilles odorantes (O. gratissimum) a montré une fonction protéique améliorée avec un bon profil lipidique et des valeurs réduites pour les lipoprotéines de haute densité, les lipoprotéines de basse densité, les triglycérides et le cholestérol par rapport au témoin. On peut conclure que l'inclusion de farine de feuilles parfumées jusqu'à 150 g n'a pas eu d'effet indésirable sur les indices hématologiques et le fonctionnement normal du foie des poulets à griller et le profil lipidique.

Mots-clés : Volaille, poulet à griller, poulet, feuille odorante, hématologie et sérum

Introduction

The poultry industry is one of the fastest growing industries globally. The importance of poultry industry to the socio-economic development of any country cannot be overemphasized as a result of its ability to provide animal protein at a relatively shorter duration (Bonsu *et al.,* 2012). Chicken meat is consumed by most people irrespective of tribe, race or religion. However, high cost of feed has been a major challenge facing the industry. In addition, diseases such as viral, bacterial, protozoan, fungal and parasitic contribute to the challenge of the poultry industry hence the need for antibiotics use. Antibiotics are used as prophylactic and treatment of diseases in poultry. They are also use to improve feed efficiency and utilization (Ogle, 2013). However, their deleterious side effect on both animals and human beings such as bacterial resistance and residual effect in animal products has led to the ban of antibiotics in many countries (Lee *et al.,* 2003 and Mansoub, 2010). Alternatives to the use of antibiotics are plant materials and their derivatives such as *Alium salivium* (Garlic), *Piper nigrum* (Black pepper), *O. gratissimum* (Scent leaves) etc. (Odoemelam *et al.,* 2013). These products are beginning to gain ground in poultry production as more reliable orthodox drugs alternatives due to their low cost of administration, limited side effect and low residues on animal products (Kamel, 2001). *O. gratissimum* is commonly referred to as scent leaf. It is an herbaceous perennial grass (Nnabugwu, 2010; Odoemelam *et al.,* 2012). It contains some chemical compounds and active ingredients (e.g Eugenol, Cinamate, Camphor and Thymol) that makes it exhibit strong antimicrobial, bateriostatic and bactericidal effects on some bacteria (Adebolu and Oladimeji, 2005; Matasyoh *et al.,* 2007). These plants and their materials generally do not have deleterious effect on man, hence the reason for usage in place of commercial antibiotics (Essari T. and Sour M. **2000).** The nutritional effect of any feedstuff on the health status of animals can be reflected through the haematological and serum biochemical indices (Awotwi, 1990). Haematology and serum indices are tools use in assessing the health status of animals (Windisch *et al.,* 2007) as well as the normal functioning of the liver. Therefore, the aim of the experiment was to determine the haematological indices, liver function indices and lipid profile of broiler chickens fed diets containing graded levels of scent leaf (*O. gratissimmum)* meal.

Materials and methods

Experimental site

This study was carried out at the Poultry Unit of the Teaching and Research Farm, Department of Animal Science, Faculty of Agriculture, Kaduna State University, Kafanchan Campus, Kaduna. The site is located within latitude 90 34 ˚ N and longitude 80 17˚E. It is found in the guinea savanna. The area is designated as Koppen's Aw climate with two distinct seasons, a wet season in summer and a dry season in winter. Rainfall occurs between the months of April to October with a peak in August (Bessei, 2006).

Source and processing of scent leaf (O. gratissimum) meal

Scent leaf *(O.gratissimum)* was sourced from Kaduna State University Staff Quarters, Kafanchan Campus, Jema'a Local Government Area of Kaduna State. The leaves were dried at room temperature until it becomes crispy and still retaining the greenish coloration. The dried leaves were then milled using a mortal and pistil to obtain a final meal.

Proximate composition of scent leaf

Sample of scent leaf meal was taken to Biochemical Laboratory, Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria for analysis of dry matter, crude protein, crude fibre, ether extract and crude ash using the method as describe by AOAC (1995) as shown in Table 1.

Experimental diets

Four experimental diets were compounded for both broiler starter and finisher phases of the experiment. Scent leaf (*O. gratissimum*) meal was incorporated at graded levels (0g, 50g, 100g and 150grespectively). Scent leaf (*O. gratissimum)* meal was added as a non-inclusive part of the calculated diet as shown in Tables2 and3 respectively.

Experimental design and management of birds

A total of eighty (80) Ross day old broiler chicks were allotted to four treatment groups in a completely randomized design (CRD) with two replicate per treatment having 10 birds in each replicate. Birds were kept in a deep litter house that was thoroughly cleaned, washed, disinfected and left for one week before the arrival of the birds. Feed and water were supplied *ad-libitum.* Vaccination was administered to the birds as outlined by National Veterinary Research Institute Vom, Plateau State.

Data collection

Haematological indices

Two ml syringe was used to collect blood sample through the jugular vein from one bird per replicate at eight weeks old. The blood samples were transferred into Ethylene di-amine tetra acetic acid (EDTA) bottles to prevent coagulation. Samples were taken to Clinical Laboratory, Faculty of Medicine, Ahmadu Bello University Zaria for determination of Packed Cell Volume, Red Blood Cell, haemoglobin, White Blood Cell (WBC) and WBC components according to the routine for clinical methods as described by Bush (1975).

Table 1: Proximate composition of scent leaf (*O.gratissimum*) meal

Parameters (%)	Scent Leaf (*O. gratissimum*) meal
Dry Matter	91.19
Crude Protein	16.94
Crude Fibre	11.61
Ether Extract	1.64
Crude Ash	7.53
Nitrogen Free Extract	62.28

Table 2: Composition of broiler st arter diets with graded levels of Scent lea f (*O. gratissimum*) meal

	Levels of inclusion (g) of Scent leaf (*Ocimum gratissimum*) meal			
Ingredients	**0**	**50**	**100**	**150**
Maize	56.45	56.45	56.45	56.45
Soy bean meal	29.50	29.50	29.50	29.50
GNC	10.00	10.00	10.00	10.00
Bone meal	2.80	2.80	2.80	2.80
Methionine	0.20	0.20	0.20	0.20
Vitamin-mineral Premix	0.25	0.25	0.25	0.25
Limestone	0.50	0.50	0.50	0.50
Lysine	0.05	0.05	0.05	0.05
Common Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	23.01	23.01	23.01	23.01
ME (Kcal/kg)	2907	2907	2907	2907
Ether extract	3.89	3.89	3.89	3.89
Crude fibre	3.54	3.54	3.54	3.54
Calcium	1.22	1.22	1.22	1.22
Phosphorus	0.90	0.87	1.23	0.87
Lysine	1.23	1.23	1.23	1.23
Methionine + Cysteine	0.90	0.90	0.90	0.90

SLM= Scent leaf meal, GNC= Groundnut Cake

Table 3 : Composition of broiler finisher diets with graded levels of Scent leaf (*Ocimum gratissimum*) meal

	Levels of inclusion (g) of Scent leaf (*Ocimum gratissimum*) meal			
Ingredients	**0**	**50**	**100**	**150**
Maize	58.00	58.00	58.00	58.00
Soy bean meal	23.00	23.00	23.00	23.00
Maize offal	5.00	5.00	5.00	5.00
GNC	10.00	10.00	10.00	10.00
Bone meal	2.70	2.70	2.70	2.70
Methionine	0.20	0.20	0.20	0.20
Vitamin-mineral Premix	0.25	0.25	0.25	0.25
Limestone	0.50	0.50	0.50	0.50
Lysine	0.10	0.10	0.10	0.10
Common Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Crude protein	20.82	20.82	20.82	20.82
ME (Kcal/kg)	2932	2932	2932	2932
Ether extract	3.81	3.81	3.81	3.81
Crude fibre	3.68	3.68	3.68	3.68
Calcium	1.18	1.18	1.18	1.18
Phosphorus	0.82	0.82	0.82	0.82
Lysine	1.09	1.09	1.09	1.09
Methionine + Cysteine	0.82	0.82	0.82	0.82

SLM= Scent leaf meal, GNC= Groundnut Cake

Liver function indices and lipid profile

At the end of the feeding trial, 2mls of blood was collected from one bird each per replicate with the aid of sterile syringes and needle via wind vein. Blood samples were collected into sterilized bottles void of Ethylene di-amine tetra acetic acid (EDTA). Samples were taken to Clinical Pathology Laboratory, Ahmadu Bello University Zaria for determination of Liver function indices (Aspartate aminotransferase, Alanine aminotransferase, Alkaline Phosphatase) and lipid profile (Cholesterol, Triglyceride, Low density lipoprotein, and High density Lipoprotein). Samples for both liver function test and lipid profile analysis were allowed to clot, centrifuged and serum were then separated and stored at -20ºC as described by Lamb (1991).

Statistical analysis

Data collected were analyzed using General linear model (GLM) of SAS (2006). Significant differences between means were separated using Dunnett test (1995).

Results and discussion

Table 4 shows the haematological indices of broiler chickens fed graded levels of scent leaf (*O. gratissimum*) meal. There were no significant (P>0.05) differences in pack cell volume, red blood cell, haemoglobin, white blood cell, neutrophils, lymphocytes, mean corpuscular volume, mean corpuscular haemoglobin and mean corpuscular haemoglobin concentration on birds fed 50g, 100g and 150g *O. gratissimum* compared with the control group (0g *O. gratissimum*). All the haematological indices obtained in this study were similar to those reported for RBC: 2.5-3.5 x10^6 mm^3, PCV: 22-35 %, Hb: 6-13 g/dl and WBC: 12-30 x 10^3mm^3(Bounous and Stedman, 2000; Ademola and Babatunde, 2009). MCV: 90-140 fL, MCH: 33-47 pg/cell and MCHC: 26-35 g/dl (Bounous and Stedman, 2000). The values obtained for PCV, Hb, MCH, MCV and MCHC were within the ranges as reported Bounous and Stedman (2000) for broiler chickens This therefore implied that *O. gratissimum* have similar mechanism of action for antimicrobial properties with antibiotics. This indicated that inclusion of *O. gratissimum* up to 150g had no adverse effect on the health status of broiler chickens. Table 5 shows the liver function indices of broiler fed graded levels of scent leaf (*O. gratissimum*) meal. There were no significant (P>0.05) differences in Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and Alkaline phosphatase (ALP) on birds fed graded levels of scent leaf (*O. gratissimum*) meal compared with the control. This disagrees with the findings of Mitruka and Rawsley (1977) who reported that AST, ALT, and ALP values were significantly (P<0.05) different. ALP, AST and ALT values obtained in this study were within the normal range (125-200 IU/L, 8.80–20.80 IU/L and 2.33-3.33 IU/L for ALP, AST and ALT respectively) for chickens as reported by Meluzzi *et al.* (1992). ALP, AST and ALT are liver enzymes that help in the normal functioning of the liver cell. ALT and AST are liver enzymes that have linkages between the liver and the blood. This indicated that the test ingredient compared favorably with action of antibiotics. This indicated that *O. gratissimum* had no adverse effect on the normal functioning of the liver.

Table 4: Haematological indices of broiler chickens fed graded levels of scent leaf (*O. gratissimum*) meal

Parameter	T1(0g)	T2(50g)	T3(100g)	T4(150g)	SEM	Reference values
PCV (%)	23.70	21.20	22.70	22.60	5.37	22-35[1]
Hb (g/dl)	7.60	6.80	6.80	6.75	4.96	6-13[1]
RBC(x 10^6/mm3)	1.74	1.50	1.53	1.54	0.38	2.5-3.5 [1]
WBC (x 10^6/mm3)	57.53	46.50	49.10	47.20	14.17	12-30[1]
MCH (pg/cell)	44.15	47.05	44.95	43.50	2.16	33-47[1]
MCHC (g/dL)	32.05	32.95	30.25	29.80	1.29	26.0-35.0[1]
MCV (fl)	137.85	142.70	148.50	145.95	4.22	90-140[1]
Lymphocytes (%)	88.55	91.50	89.70	88.25	1.49	47-94[1]
Neutrophils (%)	3.00	2.15	2.50	3.40	0.53	1.58-3.5

SEM=Standard Error of Mean, PCV=Packed Cell Volume, Hb=Haemoglobin, RBC=Red Blood Cells, WBC=White Blood Cells, MCH=Mean corpuscular haemoglobin, MCHC= Mean corpuscular haemoglobin concentration, MCV= Mean corpuscular volume, [1]=Bounous and Stedman, 2000

Table 5: Liver function indices of broiler chickens fed graded levels of scent leave (Ocimum gratissimum) meal

Parameters	T1 (0g)	T2 (50g)	T3(100g)	T4(150g)	SEM	Reference value
ALT (IU/L)	68.88	74.76	69.51	80.83	5.02	125-200[2]
AST (IU/L)	28.24	32.88	25.79	29.75	3.94	8.80–20.8[2]
ALP (IU/L)	136.39	135.83	112.22	149.75	6.81	-

SEM=Standard Error of Mean, AST=Aspartate aminotransferase; ALT=Alanine aminotransferase; ALP; Alkaline phosphatase, IU/L = international units per litre [2]= Meluzzi *et al.* (1992)

Table 6 shows the lipid profile of broiler fed graded levels of scent leaf (*O. gratissimum*) meal. There were no significant (P>0.05) differences observed in total cholesterol, high density lipoprotein (HDL), triglyceride and low density lipoprotein (LDL) on birds fed graded levels of scent leaf (*O. gratissimum*) meal compared with the control. This agrees with the findings of Fagbohun *et al.* (2012) who reported that HDL, LDL and triglycerides were not significantly (P>0.05) affected by dietary inclusion of *O. gratissimum*. Cholesterol levels obtained in this study were within the range52.0-148mg/dl of normal healthy chicken (Mitruka and Rawsley, 1977). Birds fed up to 150g scent leaf (*O. gratissimum*) had reduced levels of triglycerides, cholesterol, low density lipoprotein and high density lipoprotein. This disagrees with the report of Alizadeh *et al.* (2008) who reported that supplementation of broiler diets with OGM significantly increased the levels of triglycerides, cholesterol, low density lipoprotein. Higher levels of high density lipoprotein and high triglyceride usually result in metabolic syndrome (Ademola and Babatunde, 2009) which indicate bad cholesterol. This implies that there was an improved protein function with good lipid profile as the level of scent leaf (*O. gratissimum*) increased in the diet which agrees with the earlier reported of Ademola and Babatunde (2009) who observed that inclusion of *O. gratissimum* in the diet of broiler chickens reduced low density lipoproteins, triglycerides, cholesterol and high density lipoprotein thereby improving the health status of the birds.

Table 6: Lipid function indices of broiler chickens fed graded levels of scent leaf (*Ocimum gratissimum*) meal

Parameters	T1 (0g)	T2 (50g)	T3 (100g)	T4 (150g)	SEM
Cholesterol (mg/dl)	113.41	116.03	116.38	106.62	4.70
Triglycerides	197.77	195.86	185.93	183.75	9.89
HDL (mmol/L)	42.86	52.02	50.92	42.66	5.53
LDL (mmol/L)	37.33	23.89	17.79	22.47	2.82

SEM=Standard Error of Mean, HDL=high density lipoproteins; LDL=low density lipoproteins

Conclusion and recommendation

The study, showed that Inclusion of *O. gratissimum* up to 150g did not pose any adverse effect on the haematological indices of broiler chickens. Also, up to 150g *O. gratissimum* inclusion in the diets of broiler chickens had no negative effect on the normal functioning of the liver and lipid profile.

Ocimum gratissimum at 100g per 100kg can be supplemented in broiler diet to replace antibiotics, because birds fed with this level had the lowest range of WBC value which shows bird immunity power. Further research can be carried out using the extract (juice) or essential oils from *O. gratissimum* to determine its effect on the performance of broiler chickens.

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