



Comparison Effect of *Moringa oleifera* Leaf Meal and Oxytetracycline on Haematology and Serum Biochemical Profile of Broiler Finishers

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Authors' contributions

This work was carried out in collaboration between all authors. Author ADO and EIA designed the study and carried out the feeding trial. Author IOA did the literature search, performed the statistical analyses and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

Original Research Article

Received 22nd July 2013
Accepted 16th October 2013
Published 31st October 2013

ABSTRACT

Aims: The study was carried out to assess the effects of *Moringa oleifera* leaf meal on the haematological parameters and serum biochemical profile of broiler finishers in comparison with oxytetracycline.

Study Design: The design of the study was a completely randomised design.

Place and Duration of Study: The study was carried out at the Poultry Unit of the Teaching and Research Farm, University of Ibadan, Nigeria. The study lasted for four weeks.

Methodology: One hundred and eight 4 weeks old un-sexed arbor acre broiler chicks were used for the study. Four dietary treatments containing 3064.27-3073.55 Kcal/kg of energy and 19.75% -21.94% crude protein were formulated and each treatment had three replicates with nine birds per replicate. The experimental diets contained 250g of oxytetracycline per 100kg of feed for treatment 1 (T1), 200g, 400g and 600g of *Moringa oleifera* leaf meal per 100kg of feed for treatments 2 (T2), 3 (T3) and 4 (T4) respectively.

Results: The results of the study revealed that there was no significant difference across the treatments for most of the parameters measured. Red blood cell (RBC) counts for birds fed T4 ($4.70 \times 10^6/\text{mm}^3$) were significantly ($P < 0.05$) higher than those fed the control

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diet ($3.61 \times 10^6/\text{mm}^3$). Birds fed T4 recorded highest aspartate amino transferase (AST) mean value (72.18%) which was significantly ($P < 0.05$) higher than the mean value of those fed the control diet T1 (52.26%).

Conclusion: It can be concluded from the result of the study that *Moringa oleifera* leaf meal could be used as alternative antibiotic in place of oxytetracycline. The result of the study suggested that *Moringa oleifera* leaf has antimicrobial properties.

Keywords: Antibiotics; broiler finishers; haematology; *Moringa oleifera*; serum.

1. INTRODUCTION

Haematology has been defined as the study of blood and an important part of clinical pathology as well as diagnostic process. It includes not only the examination of the cellular and fluid portions of blood, but also includes a study of the tissues that form, store and circulate blood cells. The result of haematology analysis is usually used to assess the health status of an animal. Haematological parameters have been observed as good indicators of the physiological status of animal and its changes are important in assessing the response of animal to various physiological situations [1].

Poultry production in Nigeria is limited by high cost of feed ingredients, as well as disease outbreak and predators. Antibiotics are used in animal production as growth promoters, as well as for disease prevention and treatment. However, problems associated with the use of antibiotics in animal production include drug toxicity, residual effect and development of resistance of bacterial diseases [2]. *Moringa oleifera* is available in Nigeria and has earlier been reported to possess nutritional and medicinal properties. *Moringa oleifera* belongs to Moringaceae family which includes 13 species of trees and shrubs [3]. It is widely distributed in the tropics [4, 5]. It is rich in vitamins, amino acids, energy, crude protein, low levels of anti-nutritional factors, antimicrobial properties, as well as having the ability to boost immune system [6, 7, 8, 9]. *Moringa oleifera* has been used in feeding trials with rats [10, 11], rabbits [12,13,14], chicken [15,16] and ruminants [17]. *Moringa oleifera* leaves have been reported to contain $17.01\% \pm 0.10$ crude protein, $7.09\% \pm 0.11$ crude fibre, $2.11\% \pm 0.11$ crude fat, $7.93\% \pm 0.12$ ash content, $63.11\% \pm 0.09$ carbohydrate, 1.69 ± 0.09 fatty acid and 1440.11 ± 0.30 Kcal/100kg of energy value on dry weight basis [18]. The medicinal effect of *Moringa oleifera* has been attributed to its possession of anti-oxidant which is known to have suppressive effects on formation of reactive oxygen species (ROS) and free radicals [19, 20].

There are however little information on the effect of *Moringa oleifera* on blood profile of animals [14]. Hence, the study was carried out to assess the effects of *Moringa oleifera* leaf meal on the haematological parameters and serum biochemical profile of broiler finishers, in comparison with oxytetracycline.

2. MATERIALS AND METHODS

2.1 Location of the Study

The study was carried out at the Poultry Unit of the Teaching and Research Farm, University of Ibadan, Nigeria. The birds used for the study were purchased from a reputable hatchery in Ibadan. The feed ingredients were purchased from a reputable feed mill in Ibadan, Nigeria.

2.2 Management of the Experimental Birds

One hundred and eight arbor acre un-sexed 4 weeks old birds were used for the study, which lasted for four weeks. The birds were checked for deformity or any sign of ailment before brought in for the study. The birds were randomly allotted to four experimental treatments with three replicates per treatment, with each replicate having nine birds. The experimental diets contained 250g of oxytetracycline per 100kg of feed for treatment 1 (T1), 200g, 400g and 600g of *Moringa oleifera* leaf meal per 100kg of feed for treatments 2 (T2), 3 (T3) and 4 (T4) respectively as shown in Table 1. The diets contained 3064.27-3073.55 Kcal/kg of energy and 19.75% -21.94% crude protein Fresh feeds and clean, cool water were served for the birds *ad libitum* throughout the period of the experiment. The birds were raised on a deep litter system.

2.3 Blood Collection and Analysis

On the 28th day of the study, two birds of similar weight were selected from each replicate and blood samples were collected from them. Blood samples were collected from the birds using new, sterilized syringe and needles through their jugular veins. Blood samples were collected before the birds were served feed for the day. Blood samples for haematological analysis were collected into sterilized glass tubes containing ethylene diamine tetra acetic acid (EDTA) as anticoagulant. Samples for serum biochemical analysis were collected into tubes without EDTA. Packed cell volume (PCV) and haemoglobin (Hb) concentrations were determined using micro haemocrit and cyanmethaemoglobin method respectively as described by [21]. Erythrocyte (RBC) and leukocytes (WBC) counts were determined using the improved Neubauer haemocytometer. Blood samples for serum biochemical analysis were centrifuged and subjected to laboratory analyses. Total protein, albumin, cholesterol, urea, creatinine, bilirubin, triglycerides, AST and ALT were determined using spectrophotometer.

2.4 Proximate Study and Statistical Analysis

Proximate compositions of the experimental diets was determined by the method of the Association of Official Analytical Chemists [22]. Data obtained from haematological and serum analyses were subjected to one way of analysis of variance using a Assistat statistical package [23]. Significant differences among the means were separated using Duncan Multiple range test.

3. RESULTS AND DISCUSSION

Table 1 and Table 2 show the gross composition of the experimental diets and proximate composition of the experimental diets respectively. The result of the proximate composition indicated that there was similarity in the composition of the diets. The results of haematology and serum biochemical profile of broiler finishers fed graded levels of *Moringa oleifera* leaf meal were shown in Tables 3 and 4 respectively. The result revealed that there were no significant differences across the treatments for most of the parameters measured. Red blood cell (RBC) counts for birds fed T4 ($4.70 \times 10^6/\text{mm}^3$) were significantly ($P < 0.05$) higher than those fed the control diet ($3.61 \times 10^6/\text{mm}^3$) which recorded the lowest mean value for RBC counts. Birds fed diet containing 200g of *Moringa oleifera* (T2) had the least mean value for monocytes ($1.00 \times 10^6/\text{mm}^3$) which was statistically similar to those fed the control diet (T1) and T4 ($3.00 \times 10^6/\text{mm}^3$) but significantly $P < 0.05$ lower than those fed T3 (3.33

$\times 10^6/\text{mm}^3$). Birds fed T4 recorded highest aspartate amino transferase (AST) mean value (72.18%) which was significantly ($P < 0.05$) higher than the mean value of those fed the control diet (52.26%) but statistically similar to those fed T2 and T3.

Table 1. Gross composition of experimental diets (g/100%DM)

Ingredients	T1	T2	T3	T4
Maize (%)	65.50	65.80	65.60	65.40
Soya bean meal (%)	20.00	20.00	20.00	20.00
Groundnut cake (%)	8.25	8.00	8.00	8.00
Fish meal (%)	2.00	2.00	2.00	2.00
Dicalcium phosphate (%)	1.50	1.50	1.50	1.50
Limestone(%)	1.50	1.50	1.50	1.50
Salt (%)	0.25	0.25	0.25	0.25
Premix (%)	0.25	0.25	0.25	0.25
L-Lysine (%)	0.25	0.25	0.25	0.25
DL-Methionine (%)	0.25	0.25	0.25	0.25
Oxytetracycline (%)	0.25	-	-	-
<i>Moringa oleifera</i> (%)	-	0.20	0.40	0.60
Calculated nutrients				
Metabolisable energy (Kcal/kg)	3064.27	3073.55	3072.27	3070.99
Crude protein (%)	19.75	21.06	21.50	21.94
Crude fiber (%)	4.20	3.90	4.00	3.00

Premix: vitamin A (20000000IU), vitamin D (4000000IU), vitamin E (460mg), vitamin K3 (40mg), Vitamin B1 (60mg), vitamin B2 (120mg), Niacin (1000mg), calcium pantothenate (200mg) vitamin B6 (100mg), vitamin B12 (5mg), biotin 1mg, chlorate chloride (8000mg), manganese (2400mg), iron (2000mg), zinc (1600mg), copper (170mg), iodine (30mg), cobalt (6mg), selenium (24mg), antioxidant (2400mg)

T1= 250g/100kg oxytetracycline; T2= 200g/100kg of *Moringa oleifera* leaf meal; T3= 400g/100kg of *Moringa oleifera* leaf meal; T4= 600g/100kg of *Moringa oleifera* leaf meal

Table 2. Proximate composition of experimental diets (g/100%DM)

Parameters (%)	T1	T2	T3	T4
Dry matter	86.90	86.90	87.76	87.40
Crude protein	19.75	21.06	21.50	21.94
Crude fibre	4.20	3.90	4.00	3.00
Ether extract	11.80	11.30	11.00	11.50
Ash	12.00	12.00	16.00	16.00
Nitrogen free extract	52.25	51.74	47.50	47.56

T1= 250g/100kg oxytetracycline; T2= 200g/100kg of *Moringa oleifera* leaf meal; T3= 400g/100kg of *Moringa oleifera* leaf meal; T4= 600g/100kg of *Moringa oleifera* leaf meal

Table 3. Haematological parameters of broiler finishers fed graded levels of *Moringa oleifera* leaf meal

Ingredients	T1	T2	T3	T4	Reference values*	SEM
PCV (%)	31.00	29.67	30.00	30.33	29.00-44.00	1.11
Hb (g/L)	10.33	9.88	9.99	10.11	9.10-13.90	0.37
RBC ($\times 10^6/L$)	3.61 ^b	4.20 ^{ab}	3.98 ^{ab}	4.70 ^a	1.58 -4.10	0.26
WBC ($\times 10^3/L$)	16.42	17.45	16.40	17.87	9.20-31.00	1.88
Monocytes ($\times 10^3/L$)	3.00 ^{ab}	1.00 ^b	3.33 ^a	3.00 ^{ab}	0.06-5.00	0.66
Lymphocytes ($\times 10^3/L$)	70.67	64.00	65.67	71.00	47.20-85.00	3.42

T1= 250g/100kg oxytetracycline; T2= 200g/100kg of *Moringa oleifera* leaf meal; T3= 400g/100kg of *Moringa oleifera* leaf meal; T4= 600g/100kg of *Moringa oleifera* leaf meal

SEM = standard error of the mean; P<0.05

* Mitrika and Rawnsley (1977)

Table 4. Serum biochemical profile of broiler finishers fed graded levels of *Moringa oleifera* leaf meal

Ingredients	T1	T2	T3	T4	SEM
Total protein (g/dL)	1.89	2.69	3.60	4.29	0.95
Albumin (g/dL)	0.53	1.12	1.13	1.23	0.24
Urea (mg/dL)	3.77	4.55	4.08	3.56	0.58
Creatinine (mmol/l)	0.66	0.66	0.69	0.64	0.08
AST (μ/L)	52.26 ^b	65.33 ^{ab}	61.19 ^{ab}	72.18 ^a	5.12
ALT (μ/L)	6.98	6.16	5.81	7.71	0.78
Cholesterol(mmol/l)	148.10	160.47	176.36	172.90	15.13
Bilirubin (mmol)	0.12	0.15	0.16	0.14	0.04
HDL (mg/dL)	12.89	26.74	32.31	18.92	10.66
VLDL (mg/dL)	34.34	27.95	31.93	33.33	2.29

T1= 250g/100kg oxytetracycline; T2= 200g/100kg of *Moringa oleifera* leaf meal; T3= 400g/100kg of *Moringa oleifera* leaf meal; T4= 600g/100kg of *Moringa oleifera* leaf meal

P=0.05; HDL=high density lipoprotein; VLDL= very low density lipoprotein

Haematological characteristics of livestock have been observed as factors determining the response of livestock to the diet they are fed [1,24]. The result of this study showed no significant differences for most of the parameters measured. This finding is similar to the result of other researchers [14] who reported that there was no significant difference across the treatments for growing rabbits fed graded levels of *Moringa oleifera* leaf meal. Also, the result indicated that most of the parameters measured fell within the normal (reference range) for healthy chickens [21] as shown in Table 3. Diets containing *Moringa oleifera* leaf meal recorded higher mean values for RBC which may be due to the presence of saponin in *Moringa oleifera*. Saponin has been reported to have haemolytic activity against RBC [25]. The result of the serum biochemical profile was similar to the findings of previous studies where no significant difference was noticed for most of the parameters studied for laboratory animals fed experimental diets containing *Moringa oleifera* leaf meal or crude extract from *Moringa oleifera* leaves [10, 13, 14]. The increase in AST noticed in diets containing *Moringa oleifera* leaf meal is similar to the result of other researchers [11] who reported significant increase in the levels of ALT and AST for rats fed diets containing 400mg/kg and 1600mg/kg doses of extracts of *Moringa oleifera* leaves. However, ALT in this study did not follow a similar trend with the result of [11]. The highest mean values of AST and ALT were noticed

in T4 and that may suggest damage to the liver, as ALT is known to increase in liver disease [11, 26]. However, the increase was not significantly different from the control diet. The result of this study therefore indicated that inclusion of *Moringa oleifera* at the included levels did not pose any adverse effects on the experimental animals as there was no indication of organ toxicity from the serum enzyme assessed. However, further studies are recommended on the effect of *Moringa oleifera* leaf meal on serum enzymes at higher doses.

4. CONCLUSION

It can be concluded from the result of the study that *Moringa oleifera* leaf meal could be used as alternative antibiotic in place of oxytetracycline. The result of the study suggested that *Moringa oleifera* leaf has antimicrobial properties. Hence, it is recommended as a good feeding stuff in broiler finishers as earlier reported in previous studies. However, inclusion level of 600g or more of *Moringa oleifera* leaf meal per 100kg of feed of broiler finishers should be further investigated.

CONSENT

Not applicable.

ETHICAL APPROVAL

Authors declare that "Principles of laboratory animal care" were followed.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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