EFFECTS OF REPLACING SOYABEAN MEAL WITH *MORINGA OLEIFERA* LEAF MEAL ON HAEMATOLOGY AND SERUM CHOLESTEROL CONCENTRATION IN BROILER CHICKENS

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ABSTRACT

The effects of replacing soyabean meal with *Moringa oleifera* leaf meal on haematology and serum cholesterol concentration were examined using 200 started broiler chickens. Treatments were not significant on all haematological variables examined with the exception of Lymphocyte in which there was significant effect ($P<0.05$). Serum cholesterol concentration in the birds shows a decreasing concentration with increasing levels of MOLM in the diets, effects of treatment on serum cholesterol concentration were statistically significant. It is recommended that the use of MOLM in the diets of broiler chicken to reduce its cholesterol content be advocated.

Keywords: *Moringa oleifera* leaf meal, haematology, cholesterol concentration

INTRODUCTION

The hematological profile, both in humans and in animal is an important index of the physiological state of the individual. The ability to interpret the state of blood profile in normal and in diseased conditions is among its primary tasks. It has been seen by many research workers that there is a definite change in the profile of the blood cells throughout the life (Khan *et al.*, 1987). Not only that blood profile changes with advancement in age but it also varies with certain conditions as nutrition, stress, bacterial infection, viral infection and intoxication.

There is also a general assumption that high dietary cholesterol levels found in most meat types result in higher serum cholesterol and consequently a higher risk of arteriosclerosis, hypertension, stroke and coronary heart disease (Grundy, 1990). Close relationships exist among levels of blood cholesterol in the body, those of other fats or lipids and the development of arteriosclerosis.

Therefore, there is need to identify alternative non-conventional feed ingredients which will not only reduce the cost of livestock feeding but could also considerably reduce the cholesterol levels and as well improve meat quality of broiler chickens. Olugbemi *et al.* (2010a) evaluated the hypocholesterolemic potentials of *Moringa oleifera* leaf meal (MOLM) in laying birds and observed a considerable reduction in the level of serum and egg yolk cholesterol when layers were fed diets containing graded levels of MOLM.

This study aims at evaluating the effects of partial equi-protein substitution of soyabean meal with MOLM on haematology and serum cholesterol concentration in broiler chickens.

MATERIALS AND METHODS

The experiment was carried out at the Federal College of Agriculture, Akure and Federal University of Technology, Akure, Ondo State.

Preparation of leaf meal

Fresh *M. oleifera* leaves were harvested from a paddock at the Livestock Farm of Federal College of Agriculture, Akure. The leaves were spread out on a cemented floor and allowed to dry for a period of 3-4 days under shady and aerated conditions. The dried leaves were ground in a hammer mill to produce the leaf meal. The leaf meal were stored in a tightly closed polythene material and used in formulating the MOLM-based diets.

Feed preparation and experimental treatments

A total of two hundred and fifty (250) day-old chicks were procured for the trial. After a 4-week pre-experimental brooding period during which conventional broiler starter diet (23% CP) were fed *ad-libitum*, 200 started broilers were randomly selected, weighed and allotted at 10 birds per replicate and 4 replicates per each of the 5 experimental diets. A completely randomized experimental design was adopted. Five isonitrogenous and isocaloric diets were

formulated and fed *ad-libitum* for 4 weeks. The control diet (Diet 1) contained groundnut cake and soyabean meal as plant protein sources. The protein supplied by soyabean meal in the control diet were replaced at 25, 50, 75 and 100% by that of MOLM in diets 2, 3, 4, and 5 respectively.

Gross composition of the broiler finisher diets is shown in Table 1.

Blood was collected from underneath the wings of birds selected for slaughter using 5 ml syringes, these were put into labeled heparinzed and sterile bottles. The heparinized bottle containing blood were inverted repeatedly for about a minute to prevent clotting of blood samples. The blood collected without anticoagulant was allowed to clot at room temperature and the serum decanted within 6 hours of collection. The blood samples in the bottle containing anticoagulant were used for heamatological studies as described by Lamb (1981) while the sera were kept in sterile bottles until analyzed for serum cholesterol content.

Serum cholesterol

The serum samples which were collected and stored at -18°C were analysed for cholesterol concentration using the Randox® cholesterol kit (Randox Lab Ltd, UK). On the day of analysis, the samples were allowed to thaw for one hour at room temperature. The reagent (1 ml) was added to each serum sample (10 µl) in a test tube, mixed thoroughly and incubated for 10 minutes. Measurement of the absorbance of the sample was done against the reagent blank within 60 minutes using a Spectrumlab 23A spectrophotometer at 546nm. The serum cholesterol concentration (mg/dl) was calculated as:

$$\text{Concentration of sample (mg/dl)} = \frac{\text{Absorbance of sample} \times \text{conc std}}{\text{Absorbance of Standard}}$$

Where concentration of standard is 196.86 mg/dl

Statistical analysis

All data generated were subjected to one-way analysis of variance (ANOVA) using general linear model (GLM) procedure of SAS (1995). Significant differences were separated using the Duncan Multiple Range Test.

RESULTS AND DISCUSSION

Results of effects of dietary treatments on haematological variables and serum cholesterol concentration in broiler chickens fed diets containing MOLM as replacement for SBM are presented in Table 2

Effect of treatments were not significant on all haematological variables examined with the exception of Lymphocyte in which treatment effects shows statistical significance.

Serum cholesterol concentration in the birds shows a decreasing trend with increasing levels of MOLM in the diets, effects of treatment on serum cholesterol concentration shows statistical significance.

Adeyemo and Longe (2007) reported that haematological parameters most commonly used in nutritional studies include haemoglobin concentration (Hb), mean cell volume (MCV) and packed cell volume (PCV). The values obtained for Hb, RBC and PCV in this study fell within the normal ranges presented by Mitruka and Rownsley (1977), Ross *et al.* (1978) and Morton *et al.* (1993), while the values obtained for MCHC in all the experimental diets were almost of the same average which suggests that the bird were able to tolerate the diets without any symptoms of detrimental effects. Effect of treatment on monocytes in the present study is significant. Monocyte is a part of the WBC whose function is to protect animals against infection. Red blood cells (RBC) are responsible for the transportation of oxygen and carbon dioxide in the blood as well as manufacture if haemoglobin, hence higher values indicates a greater potential for this function and a better state of health. The non-significant result obtained for RBC across the treatments implies that the diets did not alter these parameters. The result obtained for PCV and Hb which falls within normal ranges indicates that the diets were nutritionally adequate to meet the protein needs of the birds. Low Hb concentration apart from denoting anaemia also indicates low protein intake, parasite infection and liver damage (Adeyemo and Longe, 2007).

A decreasing trend was noticed in serum cholesterol concentration with increasing levels of MOLM in the diets. This is in agreement with the findings of Olugbemi *et al.*, (2010a) who reported that MOLM inclusion in layer diets was instrumental in cholesterol reduction in serum and yolk. Olugbemi *et al.*, (2010b) also observed that abdominal fat was lower in broiler chickens fed MOLM based diets, and according to Tewe and Bokanga (2001), higher cholesterol

contents are an indication of higher fat deposition. The fact that inclusion of MOLM resulted in a decrease in cholesterol levels affirms its potential as a hypocholesterolemic agent. This agrees with the report of Ghasi *et al.*, (2000). The mechanism of cholesterol reduction is thought to be through the lowering of plasma concentrations of LDL by β-sitosterol, the bioactive phyto-constituent isolated from *Moringa oleifera* leaves (Saluja *et al.*, 1978; Kane and Malloy 1982 and Ghasi *et al.*, 2000).

CONCLUSION AND RECOMMENDATION

From the result of this experiment, it could be observed that substitution of SBM with MOLM did not impose negative effect on haematology of the birds but offers opportunities of obtaining some of the health benefits of *Moringa oleifera* in chicken meat through reduction in cholesterol concentration. It is therefore recommended that the use of MOLM in broiler production be advocated as a means of reducing cholesterol concentration in meat of broiler chickens.

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TABLE 1: Gross composition* (as fed basis) of experimental diets (%)

INGREDIENTS (kg/100kg)	1 (0% MOLM)	2 (25% MOLM)	3 (50% MOLM)	4 (75% MOLM)	5 (100% MOLM)
Maize	53.50	52.75	52.20	51.50	51.00
Groundnut cake (44%CP)	12.00	12.00	12.00	12.00	12.00
Soyabean meal (42%CP)	14.00	10.50	7.00	3.50	-
MOLM (29.7%CP)	-	4.95	9.90	14.85	19.80
Wheat Offal	9.50	9.00	8.77	8.35	7.70
Brewer dry grain	5.73	5.75	5.30	5.20	5.10
Bone Meal	2.30	2.40	2.50	2.50	2.50
Oyster Shell	1.70	1.20	0.75	0.35	-
Salt	0.50	0.50	0.50	0.50	0.50
Lysine	0.20	0.35	0.48	0.60	0.75
Methionine	0.32	0.35	0.35	0.40	0.40
Vitamin/Mineral Premix	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Metabolizable energy (kcal/kg)	2823	2787	2753	2718	2685
Crude protein (%)	19.65	19.42	19.17	18.94	18.68
Calcium	1.52	1.52	1.53	1.52	1.52
Phosphorus	0.54	0.54	0.55	0.54	0.53
Ether Extract	4.03	4.07	4.11	4.16	4.20
Crude Fibre	4.53	5.37	6.13	6.95	7.75
Methionine	0.60	0.61	0.59	0.61	0.59
Lysine	1.01	1.02	1.02	1.01	1.02
ME:CP	143.7	143.5	143.6	143.5	143.7

* ME = Metabolizable energy; CP = Crude protein; MOLM = *Moringa oleifera* leaf meal; SBM = Soyabean meal.

Blood collection and hematological studies

Table 2: Haematological variables and serum cholesterol of Broiler Finishers' Chicken Fed *Moringa oleifera* Leaf Meal (MOLM) Based Diet

DIETS Parameters	1	2	3	4	5	±SEM
ESR	2.67	3.00	2.50	2.67	2.80	0.16
PCV	31.67	30.67	32.00	31.50	31.17	0.31
RBC	3.06	2.85	3.11	2.95	2.75	9.25
HBC	10.55	10.22	10.65	10.52	10.40	0.10
MCHC	33.28	33.28	33.25	33.35	33.33	0.02
MCH	3.47	3.68	3.57	3.63	3.85	0.09
MCV	10.47	11.07	10.83	10.88	11.60	0.27
Lymphocyte	58.83^{ab}	56.33^{a}	57.17^{ab}	60.50^{b}	60.67^{b}	0.58
Neutrophyl	25.00	25.83	25.00	24.33	23.67	0.34
Monocyte	13.17	13.33	14.83	12.17	12.33	0.56
Basophyl	2.17	2.00	2.00	2.00	2.33	0.06
Eosinophyl	0.83	0.83	1.00	1.00	0.83	0.06
SCC (mg/g)	158.70^{a}	157.80^{a}	156.40^{a}	151.24^{a}	138.40^{b}	6.24

abc = Means along the same row with different superscripts are significantly different ($p<0.05$).

ESR - Erythrocyte sedimentation rate, PCV – Packed Cell Volume, RBC – Red blood cell, HBC – Haemoglobin concentration, MCHC – Mean Cell Haemoglobin Concentration, MCH – Mean cell haemoglobin, MCV – Mean cell volume, SC – Serum cholesterol concentration