American Journal of Biological, Chemical and Pharmaceutical Sciences
Vol. 2, No. 3, August 2014, pp. 1 - 6, ISSN: 2328 - 6814 (Online)
Available online at http://www.ajbcps.com/

Research article

THE EFFECT OF *MORINGA OLEIFERA* LEAF MEAL (MOLM) ON THE HEMATOLOGICAL PARAMETERS AND THE CHOLESTEROL LEVEL OF RABBITS

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Abstract

An experiment was conducted to investigate the effect of *Moringa Oleifera* leaf meal on the hematological parameters and the cholesterol level of rabbits. Sixteen (16) weaner rabbits of mixed breeds, aged between 6-8 weeks with average weights of 649 $\pm$ 3.0g were randomly allocated into four treatment groups with four rabbits per treatment. Each rabbit serves as a replicate. The rabbits were fed diets containing 0%, 5%, 10% and 15% *Moringa oleifera* leaf meal in the diets designated as T_1, T_2, T_3 and T_4 respectively. The experimental diets and clean drinking water were supplied ad-libitum throughout the experimental periods that lasted for eight weeks. The result of the study showed that there were no significant differences ($P>0.05$) among the treatments for packed cell volume (PCV), red blood cell (RBC), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), white blood cell (WBC), lymphocytes, neutrophils, monocytes, basophils and eosinophils. Significant effect ($P<0.05$) of the diets was only observed in hemoglobin (Hb) concentration whose values were however, within the normal range. Cholesterol level was significantly ($P<0.05$) lower for the diets that had 15% MOLM. It can be concluded that inclusion of *Moringa oleifera* leaf meal up to 15% in the diets of weaner rabbits has no adverse effect on their blood profile and reduces the cholesterol level.

Keywords: *Moringa oleifera*, haematological, Rabbits, cholesterol.

1. Introduction

Rabbits have a great potential as meat producing animals in the tropics especially Nigeria due to their characteristic small size, short generation interval, rapid growth rate and ability to utilize forage and agricultural by-products. (Ajayi *et al* 2005).

Moringa oleifera leaves have been extensively used as animal feeds. For example, Olugbemi et al (2010a) investigated its potential as a hypocholesterolemic agent in layers fed cassava based diets over a 90 day period and showed that *it* possesses hypocholesterolemic properties and its inclusion in layers diets facilitate reductions in egg cholesterol content.. It was also found that addition of 25% *Moringa oleifera* leaf meal to cassava-based broiler diets had no significant ($P>0.05$) effects on weight gain, feed to gain ratio and final body weight when compared to a diet free of cassava and *Moringa oleifera* leaf meal (Olugbemi *et al* 2010b). Melesse A (2012), studied its performance on the layer chicks and reported that there was significant ($P<0.05$) increase in feed and crude protein intake, average weight gain, feed efficiency and protein efficiency when compared to a control diet. He also reported that deseeded pods of Moringa oleifera tree could be used as an alternative, cheap source of home-grown energy supplements for low quality crop residues of tropical livestock while using the seeds for human consumption. Odeyinka *et al* (2008), reported that *Moringa oleifera* leaves are suitable for feeding rabbits does (female). That it can replace *Centrosema pubescen* without adverse effect on the productive performance of rabbits. Okpanachi *et al* (2010), studied the growth and haematological response of growing rabbits to diets containing graded levels of sun dried bovine rumen content (SBRC) and showed that 40% inclusion of it in rabbits diets gave a better weight gain than others. He showed that rabbits can be sustained on forage alone unlike poultry and other non-ruminant animals that competes with man for grains and other concentrates (Vantsawa *et al* 2008). Owen *et al* (2013) studied the economics of raising rabbits using Moringa oleifera Leaf Meal as a replacement for soyabeans in the rabbit's feed. The results obtained shows that significant differences existed in weight gain, feed intake, feed conversion ratio, cost of feed (kg), cost of weight gain and net benefit. It also reveals that MOLM can conveniently replace up to 15% of expensive sources of protein in rabbit diet without compromising performance. Similarly Tarha (2013), reported that it could be used at levels up to 6% of the diets of growing layer chicks, 10% of the diet of laying hens, 5% of the diets of broilers and 20% of the diets of the rabbits without any deleterious effects on the performance. Also Gadzirayi *et al* (2012), included MOLM at 20% as protein supplement in broiler diets and discovered that the birds had similar weight with those fed the conventional commercial feed. However, Aderinola *et al* (2013), showed that feeding 0, 0.5, 1.0, 1.5 and 2.0% *Moringa oleifera* to broiler gave a significantly lower weight than the control and that the hematological parameters were significantly reduced. This study is therefore designed to test the effect of feeding graded levels of *Moringa oleifera* leaf meal on the hematological parameters of rabbits and to ascertain its effect on the cholesterol level.

2. Materials and Methods

Sixteen (16) weaner rabbits were used for the experiment. They were between the ages of 6-8 weeks and had average body weights of 649 $\pm$ 3.0g. The rabbits were acclimatized for about 2weeks. They were randomly allocated to four treatment groups with four rabbits per treatments. Each rabbit served as a replicate. They were housed in a wooden hutch measuring 55cm x 40cm x 40cm which was suspended from the ground.

Four experimental diets were formulated to include MOLM at 0%, 5%, 10% and 15% and were designated as T_1, T_2, T_3 and T_4 respectively as shown in table 1.

The feed and water were offered *ad-libitum* to the animals. Feed consumption was determined from the feed

weighed back (that is the feed left over from the quantity offered during the last weighing).

At the end of the feeding trial, blood samples were collected from the ear vein of each rabbit using a sterilized disposable syringe and needle before the meal. An initial 2ml blood was put into a labeled sterile vacuum tube containing Ethyl Diamine-Tetra. Acetic Acid (EDTA) as anti-coagulant which was used for hematological analysis. Another 3mls of blood was collected into a labeled sterile sample bottles without anticoagulant and was used for cholesterol analysis Biuret method of cholesterol total protein determination was employed in the assay. Albumin

was determined using Bromcerol Green (BCG) method. All data obtained were subjected to statistical analysis using Genstat package. Differences in means were separated using Duncan multiple range test (Steele and Torrie, 1980).

Table 1: Composition of Experimental Rabbit Diets

Ingredients Treatments	1	2	3	4
Maize	40.00	40.00	40.00	40.00
Wheat offal	30.00	25.00	20.00	15.00
Maize offal	10.00	10.00	10.00	10.00
Soyabean cake	16.50	16.50	16.50	16.50
MOLM	0.00	5.00	10.00	15.00
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

3. Results

The results of the hematological parameters and the cholesterol test of rabbits fed with graded levels of *Moringa oleifera* leaf meal is as presented in tables 2 and 3.

From table 2, there was no significant difference ($P>0.05$) for packed cell volume (PCV), Red blood cells, (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and Mean Corpuscular haemoglobin concentration (MCHC). Similar pattern was seen for white blood cells (WBC), Lymphocytes, neutrophils, monocytes, basophils and eosinophils where there was no significant differences ($P>0.05$) observed between treatments. However, there were significant differences ($P<0.05$) among treatments for hemoglobin. Treatment four (T_4) has the highest value than all other treatments. This was closely followed by T_2 and the least was the control.

The result from table 3 shows that there was no significant difference ($P>0.05$) for total protein, albumin, Globuline, glucose and creatinine. The urea level was significantly ($P<0.05$) lower for rabbits on 15% MOLM diets. The level decreases as the level of moringa oleifera leaf meal increased in the ration. Cholesterol levels showed significant differences ($P<0.05$). As the level of MOLM increase in the diet of rabbits, the cholesterol level decreases.

4. Discussion

The result for the PCV obtained in this study is within the normal range as reported by church *et al* (1984). The packed cell volume (PCV) is a measure of relative mass of blood. Hematological components of blood are valuables in monitoring the feed constituents that affect blood formation. Nouala *et al* (2006), observed that Moringa oleifera leaves when mixed with conventional concentrate improved its utilization as rabbits feed and that normal PCV value is suggestive of adequate nutritional status of the rabbits.

Bitto and Gemade (2001), reported that increased RBC values is associated with high dietary protein, disease-free animals and function as oxygen carrier. The value of RBC obtained in this study is within the normal range of 5.46 – 7.94 x 10^6/mm^3 as reported by Mitruka *et al* (1977). This however, is in contrast with the work of Okeke *et al* (2009) who found significant influence of *Moringa oleifera* leaf meal on the RBC of rabbits. They reported lower values (3.2 – 3.35 x 10^6/mm^3) which were below the normal range.

The non-significant (P>0.05) effect of diets on the neutrophils, eosinophils, monocytes, basophils and lymphocytes indicates a normal physiology of the animals fed the *Moringa oleifera* leaf meal. It also implies that the immune system of the rabbits were adequate. The presence of monocytes in the blood of rabbits in this experiment is also contrary to the work of Bitto and Gemade (2001) who recorded its absence in the rabbits fed pawpaw peal meal.

The non-significant (P>0.05) influence of diets on the hematological indices and the positive influence of the diets on hemoglobin suggest the nutritional adequacy and safety of the *Moringa oleifera* leaf meal.

The significantly (P<0.05) lower value of cholesterol levels among rabbits fed high percentage of *Moringa oleifera* leaf meal is in agreement with the work of Aderinola *et al* (2013). They observed that cholesterol levels reduce as the level of *Moringa oleifera* leave meal inclusion increases in the diets of broiler birds. It can be concluded that *Moringa oleifera* leaf meal can conveniently be used as feed supplements in feeding rabbits without any detrimental effects.

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Table 2: Haematological Parameters of Rabbits fed with graded levels of Moringa Oleifera leaf meal

PARAMETERS	T_1 (0%MOLM)	T_2 (5%MOLM)	T_3 (10%MOLM)	$T_4$15%MOLM)
RBC x10^6/mm^3	5.99±0.34	6.51±0.21	6.12±0.13	6.83±0.17
Hb (g/dl)	11.82±0.53^b	12.99±0.40^{ab}	12.23±0.29^b	13.6±0.33^a
MCV (fl)	60.09±0.08	60.03±0.02	60.04±0.01	60.00±0.00
MCH (fmol)	19.77±0.24	20.00±0.01	20.00±0.02	20.00±0.00
MCHC (g/dl)	32.89±0.45	29.96±3.36	33.3±0.03	33.30±0.00
WBC x 10^9/	9.60±1.44	36.60±0.88	36.00±2.08	39.00±1.15
Lymphocytes %	61.00±0.58	63.00±2.52	66.67±3.33	65.33±0.33
Neutrophils %	30.00±0.33	30.00±2.00	25.00±3.00	28.33±2.96
Monocytes %	3.33±0.33	2.33±0.33	3.67±0.88	2.33±0.33
Basophils %	2.67±0.35	2.67±0.33	2.67±0.67	2.33±0.33
Eosinophils %	3.00+1.00	2.00+0.53	2.00+0.58	3.00+0.58

Table 3: Cholesterol levels of Rabbis fed with graded levels of *Moringa oleifera* leaf meal

PARAMETERS	T_1 (0%MOLM)	T_2 (5%MOLM)	T_3 (10%MOLM)	T_4 (15%MOLM)	SIGNIFICANCE
Total protein (g/dl)	7.49±0.22	7.79±0.30	8.23±0.223	7.72±0.53	NS
Albumin (g/dl)	3.53±0.09	3.80±0.05	3.96±0.05	3.80±0.27	NS
Globuline (g/dl)	3.90±0.19	3.99±0.25	4.28±0.22	3.92±0.26	NS
Glucose (g/dl)	113.17±4.45	112.00±6.76	124.93±0.64	111.13±4.82	NS
Urea (mg/dl)	6.00±0.49^c	7.33±0.27^b	9.17±1.39^a	9.03±0.42^a	*
Creatinine (mg/dl)	1.00±0.03	1.10±0.14	1.40±0.11	1.25±1.15	NS
Cholesterol (mg/dl)	98.60+4.51^a	96.00+5.86^b	92.67+4.37^b	89.33+8.67^c	*