

HAEMATOLOGICAL AND BIOCHEMICAL INDICES OF WEANER RABBITS FED GRADED LEVELS OF MORINGA (*Moringa oleifera*) MEAL

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Abstract

A feeding trial was conducted with fifty weaner rabbits of 6 – 7 weeks of age to evaluate the influence of graded levels of moringa (*Moringa oleifera*) leaves meal as a replacement for groundnut cake meal on the Haematological and Biochemical indices of weaner rabbits, five experimental diets were formulated with inclusive levels of moringa (*Moringa oleifera*) leaves meal to groundnut cake meal at 0%, 25%, 50%, 75% and 100% for treatments. 1, 2, 3, 4, and 5 respectively and fed for 56 days in a Completely Randomized Design (CRD), the rabbits were allotted into five (5) groups of 10 rabbits each with each sub-group having two rabbits. Blood samples were collected and analysed for haematological and biochemical indices. Data generated were subjected to one way analysis of variance (ANOVA). The biochemical parameters investigated were glucose, urea, creatinine, cholesterol, tryglycerida, total protein, albumin and globulin, while the haematological parameters were packed cell volume (PCV), white blood cell (WBC), Haemoglobin (Hb), mean corpuscular Haemoglobin MCH), mean corpuscular volume (MCV) and mean corpuscular haemoglobin concentration (MCHC). Results showed that PCV, Hb and Rbc values had significant difference ($P>0.05$) amongst the treatments, and increase with increasing dietary levels of moringa leaves meal. The remaining haematological parameters showed no significant differences amongst treatment ($P>0.05$). Biochemical values obtained in the study showed no significant difference amongst treatment groups ($P>0.05$) except for urea nitrogen which showed significant $P<0.05$ amongst treatment groups, never the less some of the biochemical values in this study were out of the normal range for rabbits. Moringa leaves meal can be replaced up to 75% groundnut cake meal without adverse effect on rabbits. Therefore, moringa can be a potential protein source for meeting the crude protein requirement of rabbits.

Keyword: Weaner Rabbits, Haematological and Biochemical indices, *Moringa oleifera*.

Introduction

Increased rabbit production is one way of meeting animal protein requirement of the Nigeria populace (Iyeghe-Erakpotober *et al.*, 2002). The most important nutritional challenge is that inadequate intake of protein especially that of animals (Fielding, 1999). Therefore the average daily protein intake of 60 – 66g per individual per day, out of 27.3g that should have come from animal source (Ewuola and Egbunike, 2008).

Rabbits are beginning to make a useful contribution to meat supply in Nigeria where there is shortage of animal protein (Agunbiade *et al.*, 2000).

Intensive approach to rabbit production would however entail that use of alternative plant protein sources other than the conventional ones to enable “keepers” produce meat at affordable prices. Such alternative plant

protein sources are currently under investigation in Nigeria; where they are being evaluated for nutritiveness, availability, acceptability and affordability. Recently, there has been interest in the utilization of (*Moringa oleifera*) commonly called drumstick tree, as a protein source for livestock (Sarwatt *et al.*, 2002).

Moringa leaves have quality attributes that make it a potential replacement for soyabean meal or fish meal in non-ruminant diets. Furthermore, there is the possibility of obtaining large amount of high quality forage from moringa without expensive inputs due to favourable soil and climate conditions for its growth. Sarwatt *et al* (2004) reported that moringa foliages are a potential inexpensive protein source for livestock feeding. Biochemical components of blood are sensitive to elements of toxicity in feeds. They can also

be used to monitor protein quality of feeds. Haematological components are also valuable in monitoring feed toxicity especially with feed constituents that affect the formation of blood. (Oyawoye and Ogunkunle, 1998). This study examines the effects of different levels of replacement of groundnut cake meal with Moringa (*Moringa oleifera*) leaves meal in the diet of weaner rabbits.

Materials and Methods

Location of the study.

The study was conducted at the College of Agriculture, Livestock Teaching and Research Farm Jalingo, Taraba State, Nigeria. Jalingo the Taraba state capital is located between latitude 8°3' north and longitude 11°5' east in the guinea savannah zones of northern Nigeria.

Experimental rabbits and diets.

Fifty (50) mixed breeds of weaner rabbits aged 6 – 7 weeks were randomly allotted

into five groups of 10 rabbits per group. Animals were housed in a standard hutch of 120cm by 15 cm and raised 120 cm from the ground. Each animal was properly dewormed and given acaricide bath prior to the experiment and also given anti stress.

The moringa leaves were collected from free moringa stands within the study area. The harvested moringa leaves were air dried in shade under a shed until they were crispy to touch, while retaining their greenish colouration. The leaves were then milled with a hammer mill of sieve size 3mm to obtain a product herein referred to as moringa leave meal (MOLM) which was stored in a container until needed.

The moringa leave meal and the formulated diets were analysed for chemical composition using the method described by AOAC (2005) and presented on Table 1.

Table 1: Proximate Composition of Experimental Diets

Nutrient	T1	T2	T3	T4	T5
Moringa	26.80	2.20	18.90	2.40	45.20
Crude protein	9.440	9.60	10.20	10.40	10.50
Fat	3.60	3.20	3.00	2.80	2.60
Crude fibre	7.20	7.20	7.40	7.45	7.50
Ash	6.00	6.00	5.80	5.80	5.70
Nitrogen free extract	71.60	72.00	71.50	71.55	71.70
ME (kcal/kg)	3163.04	2966.79	2770.56	25744.64	23378.73

Five diets, T1, T2, T3, T4 and T5 were formulated from maize, maize offal, fish meal, groundnut cake, salt, bone meal, premix and the grinded moringa leave meal was incorporated into the diet at the levels of 0%, 25%, 50%, 75% and 100% respectively. The proximate composition of the experimental diet is given in Table: 2.

Five treatment groups were allotted to the five diets in a Completely Randomized Design (CRD). Each treatment was replicated five times with two rabbits per replicate. Each replicate receives an assigned diet for the period of 56 days.

Table 2: The Composition and Proximate Constituents of the Experimental Diets

Treatments	0%	25%	50%	75%	100%
Maize offal	75.00	70.72	66.4	62.17	57.90
Groundnut cake	10.00	7.50	5.00	2.50	0.00
Moringa	0.00	6.78	13.56	20.33	27.10
Fish meal	2.00	2.00	2.00	2.00	2.00
Maize	10.00	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Premix	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100
<i>Calculated Analysis</i>					
Crude protein	15.58	16.1	15.98	16.19	16.47
Crude fibre	8.56	99.32	10.07	10.83	11.58
Calcium	1.01	1.12	1.20	1.20	1.50
Phosphorus	0.52	0.67	0.78	0.91	1.04
ME.Kcal/kg	3163.04	2966.79	2770.56	2574.64	2378.73

Haematological and Biochemical Analysis

Blood samples for haematological and biochemical analysis was collected on the last day of the experiment. One rabbit was randomly selected from each replicates, ie three rabbits per treatment and bled from punctured jugular vein to aspirate 7ml of blood from each rabbit; from which 2 mls of each was collected into a specimen bottle treated with ethylene diaminetetrat acetic acid (EDTA) for haematological assay as described by Sirios (1995). The remaining of each blood sample was allowed to coagulate to produce serum for blood chemical measurement.

Blood samples were analysed for total erythrocytes (Rbc), Leucocytes (WBC), packed cell volume (PCV) haemoglobin (Hb). The coagulated blood was subjected to standard serum separation for total serum protein, albumin, globulin, urea, creatinine, tryglyceride and cholesterol.

The erythrocytes indices that include the mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC) were calculated using the formular of Sirios (1995). All data were subjected to analysis of variance (ANOVA) applicable to a completely randomized design (CRD) (Stee and Torrie, 1980). Significant means were

separated using Duncan Multiple Range Test as outlined by (Obi, 2002).

Results and Discussion

The results of the haematology parameters are shown in table 3. The results indicate that PCV, HB and RBC were highly ($P<0.01$) significant across the various treatments. However, no significant ($P>0.05$) difference were observed in the indices for WBC, MCH, MCV and MCHC. The treatments means for the PCV shows that higher inclusion of moringa increased PCV as recorded in T5 with 39.67 compared to the T1 which recorded 30.00. For the Hb, the indices show that T3 recorded the highest mean with 18.64 and the lowest was in T1 with 13.28. Similarly, the RBC value ranges from 3.08 – 44.42. The treatment mean for WBC, MCH, MCV and MCHC indices although not significantly ($P>0.05$) different indicated that higher inclusion of moringa above 50% in the treatments diets did not increase the values as observed in T3 which recorded 10.20 as against .23 in T5. More so, MCV value also decreased with increasing inclusion of moringa in treatment diet as revealed by T3 (31.80) compared to 66.80 recorded in T5.

The PCV values has significant difference ($P>0.001$) among the various treatments and increased with increasing dietary levels of moringa meal. The ranges is

((30.00 to 36.70%) and the RBC values range (3.08 to $4.2 \times 10^6 \text{ mm}^3$). The PCV values obtained in this study are within the ranges reported by Alade *et al.*, (2001) (29 – 50%) for growing rabbits fed dry poultry waste and the RBC was inferior. The Hb values ranges from 13.28 to 18.64 were significantly different ($P < 0.001$) among treatments and were superior to that reported by Etchu and Egbunike (2003) which has the values of 10.76 to 12.04 respectively. This suggests that moringa is nutritionally sufficient to meet the protein needs of growing rabbits. Hence, Hb increases in animals on low protein intake. The values of WBC obtained in this study fell within the normal range of $3.0 - 12.5 \times 10^{12/l}$ but except for 0% inclusion level which recorded the highest value of $13 \times 10^{12/l}$ (Schalm *et al.*, 1975).

The result for MCH, MCV, MCHC obtained in this study show no significant difference ($P > 0.05$) amongst treatments. The values obtained in this study were higher than that reported by Anon (1980) for MCV, MCH and MCHC which is an inclination of higher level of protein utilization. Deviation indices erythrocytes indices values from the normal may be an indication of anaemia (Onifade and Tewe, 1993; Abu *et al.*, 1999). The results of serological parameters analysed are presented in Table 3. There was no significant difference ($P > 0.05$) in the values obtained for glucose, urea, creatinine, cholesterol, tryglyceride, total protein, albumin and globulin level in the blood.

The results of moringa based diet on glucose level indicates no significant ($P > 0.05$) difference. However, looking at the treatments means revealed that 25% moringa inclusion had the lowest glucose level (6.80) followed by 50% moringa inclusion with a mean of 7.00 while the highest level of 7.30 was recorded in 100% inclusion. The results in this study is in agreement with Abu *et al.*, (1999).

The level of blood urea also indicated no significant ($P > 0.05$) difference. However, treatment means reveals that T3 had the lowest level of 5.50. The creatinine blood level of the weaner rabbits show that 85.4 was recorded in T5 followed by T4 with 82.5 while the lowest value of 75.2 was recorded in T1. The cholesterol level in the blood of the weaner rabbits reveal the highest mean of 211.1 recorded in T2 followed by T3 with a mean of 182.7 while the lowest value (170.4) was

recorded in T1 with T4 and T5 recording 175.3 each. Tryglyceride level result shows that the lowest mean of 216.4 was recorded in T3 while the highest mean of 320.2. The blood total protein level depicts that T5 had the lowest mean of 55.8, followed by T4 with 59.3 while the highest value of 64.1 was in T2. Similarly, other serology parameters such as albumin level in the blood indicates that T4 had mean of 40.0 followed by T1 with 40.7 while a value of 40.9 was recorded in T5.

The values obtained from this study do not show significant difference ($P > 0.05$) among treatments except urea. Blood urea concentration (mg/dl), even though similar ($P > 0.001$) for all groups, were lower than the normal range (30.0 – 37.3). These values are in order because high blood urea levels are associated with poor protein quality (Eggun, 1970).

The cholesterol levels obtained in this study are within the normal reference range of 20 to 83 mg/dl (Anon, 1980). But the values in this study are relatively low compared to the normal range; this is due to the low presence of cholesterol in the test diet. Since cholesterol levels are within normal range, the problem of severe liver dysfunction or mal absorption of fat observed in abnormal levels are ruled out (Bush, 1975).

The albumin and globulin values obtained in this study were not significant ($P > 0.05$) amongst treatment but numerically were different and higher than those reported by Onifade and Tewe (1993) with values of 5.81 to 6.75g/dl and 3.07 to 4.50g/dl. Since total protein, globulin and albumin are averagely responsive to total protein intake (Onifade and Tewe, 1993), the values obtained in this study indicates nutritional adequacy of the dietary protein.

The numerical values of globulin indicate the difference in strength or the ability of rabbits on different dietary treatments to fight against disease (Robert *et al.*, 2000). The range of serum creatinine (73.7 to 85. Mg/dl) obtained in this study agreed with that reported by Oloyede *et al.* (2007) (4.00 to 89.5 mg/dl) for soyabean meal, raw Bambara nut meal, roasted Bambara nut meal and fermented Bambara nut meal fed to broiler chickens. The value obtained by Oloyede *et al.* (2007) was a result of improper protein utilization. The creatinine values obtained in this study were

higher than the normal ranges of (12.0 – 18.0) for rabbits.

Table 3: Effect of Moringa based Diets on Haematological and Biochemical Parameters of Weaner Rabbits

Parameters	Dietary Treatment					LSD	SEM
	T1	T2	T3	T4	T5		
PCV%	30.00	34.67	36.00	34.33	39.67	4.88	2.68**
Hb%	13.28	13.77	18.64	16.37	17.63	2.79	1.53**
RBC 10 ⁶ mm ³	3.08	3.29	4.42	3.97	4.00	0.72	0.91**
WBC (%)	13.33	8.30	10.20	9.37	9.23	7.46	4.10NS
MCH (pg)	43.03	41.90	42.13	442.97	44.57	2.95	1.62NS
MCV (fl)	66.23	38.80	81.80	55.07	66.80	73.79	40.56NS
MCHHC (g/dl)	0.44	2.91	1.70	0.50	0.44	2.43	1.33NS
Glucose (mg/dl)	6.80	7.15	7.00	7.13	7.30	0.46	0.7NS
Urea (mg/dl)	7.77	6.85	5.50	6.80	6.53	1.34	1.34*
Creatinine (mg/dl)	75.2	79.6	73.7	82.5	85.4	16.50	9.07NS
Cholesterol (mg/dl)	24.0	28.0	20.0	26.0	26.0	30.17	34.14NS
Tryglyceride (mg/dl)	2441.3	320.2	216.4	254.4	231.0	125.86	69.18NS
Total protein (mg/dl)	60.0	64.1	61.4	59.3	55.8	6.67	3.67NS
Albumin (mg/dl)	40.7	41.6	43.1	40.0	40.9	3.72	2.04NS
Globulin (mg/dl)	19.3	21.5	18.3	19.5	14.9	6.57	3.61NS

NS = not significant $P > 0.05$; * = Significant $P < 0.05$; ** = highly significant $P < 0.01$

SEM = Standard Error of Mean; LSD = Least Significant Difference

Conclusion

Even though rabbits fed experimental diets appeared generally healthy, some haematological and biochemical parameters were out of normal range for rabbits. This situation could be attributed to the fact that the processing methods could not possibly eliminate all traces of antinutritional properties in moringa such as

tannins, saponins and phytates. From the results obtained moringa leaves meal can be replaced up to 75% groundnut cake meal without adverse effect on rabbits. Therefore, moringa can be a potential protein source for meeting the crude protein requirement of rabbits. Further research should investigate the utilization of higher levels of moringa in the diets of growing rabbits.

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