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Effect of M*oringa oleifera* Leaf Meal Diets on Growth Response and Hematology of Broiler Chickens at Starter Phase

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Abstract
A feeding trial was conducted to determine the effect of *Moringa oleifera* leaf meal diets on growth response and haematological parameters of broiler chicken. Five diets were formulated containing graded level of *Moringa oieifera* leaf meal (MOLM) at 0, 3, 6, 9 and 12% designated as T1, T2, T3, T4 and T5 respectively. A total of ninety (90) day old (Marshal Strain) were fed diets in completely randomized design and each treatment was replicated three times consisting of 6 birds per replicate. The feed intake by chicks was recorded daily and also birds were weighed on weekly basis to determine the weight gain. At the end of starter phase (4 weeks), blood samples were collected via wing veins and evaluated for haematology. The results of growth performance showed that there were significant differences ($p< 0.05$) in the final body weight (525.66 - 831.01g), daily weight gain (22.35 - 28.62 g) and daily feed intake (51.73 - 51.73g) There were significant differences ($p< 0.05$) in the feed conversion ratios and feed cost per kilogram gain by birds. The feed conversion ratio and feed cost per kilogram gain were better for chicks fed diet containing 6% MOLM (1.90 and ₦171.56 respectively). The results of haematology revealed that there were significant differences ($p<0.05$) in packed cell volume (PCV) and haemoglobin (Hb). The values of PCV and Hb obtained were significantly ($p< 0.05$) highest in chicks fed T3 (28.35% and 9.34 g/dl respectively) compared to others. Based on the study, it was concluded that *Moringa oleifera* leaf meal can be included in the diet of broiler chicks up to 6% without any deleterious effect on performance and haematological parameters.

Key words: *Moringa oleifera* leaves, chicks, growth response and haematology

Introduction

Feed represents the major cost of poultry production which accounts up 70-80% (Smith, 2001). In tropical areas of the world, there is growing scarcity of animal feed resources which indicated the need for testing other alternative ingredients that are available in the localities (Tamburawa, *et al.,* 2017). *Moringa oleifera* plant is available in northern Nigeria. It contains some antibiotics compound beside its nutritional values. The leaves are rich in carotene and ascorbic acid with good amino acid profile (Olugbemi *et al*., 2012).

The objective of this study was to determine the effect of *Moringa oleifera* leaf meal on the performance and haematological parameters of broiler chickens.

Materials and method

This study was conducted at the Teaching and Research Farm of the Department of Animal Science, Kano University of Science and Technology, Wudil. The farm is located on latitude 11^0 37'N and longitude 8^0 58' E at an altitude of 403 m above sea level. The average relative humidity and temperature are 75% and 26^0C, respectively (Olofin 2008).

Experimental diets and design: Five broiler starter diets were formulated using *Moringa oleifera* leaf meal at 0, 3, 6, 9 and 12% levels designated as T1, T2, T3, T4 and T5 respectively. Sample of MOLM was analyzed for proximate composition according to AOAC (1990). The MOLM evaluated contains crude protein and crude fibre (15.66% and 10.44% respectively). Diets were allocated to birds in a completely randomized design (CRD). Each treatment was replicated 3 times consisting of 6 birds per replicate. The experiment lasted 4weeks (Starter phase)

Experimental animals and their management: Ninety (90) day old broiler chicks (Marshal Strain) were used for the experiment. Birds were reared on deep litter system with experimental unit (pens) measuring 1.25m wide,

1.5 m length and 1m height. Fifteen experimental pens were constructed and designed to accommodate experimental birds. The pens were constructed with wood and wire mesh to protect the birds against predators and also served as security. The room was properly heated with charcoal for achieving adequate temperature (37-38^{o}C) of brooding before the arrival of chicks. Birds were given anti-stress (Vitalyte) immediately as arrived to experimental units. Feeds were allotted to birds according to their respective treatments and water was supplied to bird daily *ad libitum.* The chicks were also vaccinated against Gumboro and Newcastle Diseases at 2 and 3 weeks respectively.

Table 1: Composition of Broiler starter diets containing *Moringa oleifera* leaf meal

	Treatments				
Ingredients	T1 (0%)	T2 (3%)	T3 (6%)	T4 (9%)	T5 (12%)
Maize	54.85	53.25	51.65	50.07	48.48
Soya bean meal	32.00	30.60	29.20	27.78	26.37
MOLM	0.00	3.00	6.00	9.00	12.00
Fish meal	3.50	3.50	3.50	3.50	3.50
Wheat offal	5.00	5.00	5.00	5.00	5.00
Bone meal	3.50	3.50	3.50	3.50	3.50
Salt	0.35	0.35	0.35	0.35	0.35
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.30	0.30	0.30	0.30	0.30
Vitamin premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated Analysis					
Crude protein	23.00	23.11	23.14	23.15	23.16
Metabolizable energy	2840	2870	2881	2801	2819

Data collection: Chicks were weighed at the beginning of the study and subsequently weighed on weekly basis to determine the weight gain. Feeds were offered daily and the left-over were weighed on daily basis to determine the feed intake by birds. The weight gain was determined by subtracting the initial body weight from the final weight of birds recorded. Samples of blood were also collected via a wing veins at the age of 4weeks in a bottle containing ethelene diamine tetra acetic acid (EDTA). The blood compositions were evaluated at haematological laboratory of the Faculty of Veterinary Medicine, Ahmadu Bello University Zaria.

Data collected was subjected to analysis of variance using SAS (2002) software package and Duncan's Multiple Range Test was used to separate the means.

Results and Discussions

The results of performance of chicks fed diets containing *Moringa oleifera* leaf meal are presented on Table 2. The results showed there were significant differences ($p<0.05$) in the final body weight, daily weight gain and daily feed intake. Broiler chicks fed T3 (6% MOLM diet) had the highest final body weight (831.01g) and those fed T5 (12% MOLM diet) had the lowest value of final body weight (522.66g). Similarly, the daily weight gain was observed to be highest for broiler chicks fed 6% MOLM diet (28.62g) compared to others. However, the feed intake was highest for broiler chicks fed diet containing 12% MOLM diet (63.19g) compared to others.

Table 2: Performance of Broiler chicks fed diets containing *Moringa oleifera* leaf meal

	Treatments					
Parameters	T1 (0%)	T2 (3%)	T3 (6%)	T4 (9%)	T5 (12%)	SEM
Initial body weight (g)	29.33	29.10	29.60	29.57	29.56	1.26
Final body weight (g)	699.67^{c}	749.67^{b}	831.01^{a}	749.68^{b}	525.66^{c}	70.05
Daily weight gain (g)	23.94^{c}	25.73^{b}	28.62^{a}	25.79^{b}	22.35^{c}	2.51
Daily feed intake (g)	55.68^{b}	54.15^{b}	54.56^{b}	51.73^{b}	51.73^{a}	2.57
Feed conversion ratio	2.41^{c}	2.17^{b}	1.90^{a}	2.02^{b}	2.72^{c}	0.25

Feed cost ₦/Kg gain	216.90[b]	195.30[c]	171.56[c]	181.80[c]	244.2[a]	10.28
Mortality rate %	0.00	0.00	0.00	0.00	0.33	0.15

[abc]=means with different superscript on the same raw are significantly different (p<0.05);
SEM= Standard error of means

There were significant differences (p< 0.05) in feed conversion ratios (FCR) and feed cost per kilogram gain (FC₦/ Kg gain) by birds. The FCR and FC₦/ Kg gain were recorded better for chicks fed diet containing 6% MOLM (1.90 and ₦171.56 respectively). This may be due to efficiency of feed utilization by the chicks compared to others. This agrees with report of Doma (1998) who reported that the lower the feed conversion ratio the better the diet in monogastric animals

The results of hematology are presented in Table 3. The results of haematology revealed that there were significant differences (P<0.05) in packed cell volume (PCV) and haemoglobin (Hb). The highest PCV value was obtained in chicks fed T3 (28.35%) and the lowest value was recorded in T2 (25.34%). These values obtained were within the normal range of chicks as reported by (Banerjee, 2007). The reduction in PCV and red blood cell values are indications of low protein intake and this may result to mild anemia (Lindsay, 1997). Similarly, the Hb value was recorded highest in T3 (9.34 g/dl) and lowest in control diet (7.67 g/dl). This agrees with the work of Robert, *et al.* (2000) who reported that low level of haemoglobin may depress transportation of oxygen from the respiratory organs to the peripheral tissues.

Red blood cells (RBC) and white blood cells (WBC) counts were significantly (p<0.05) affected by the dietary inclusion MOLM. The RBC count was recorded higher in T1 and T3 (4.33 and 4.46 $X10^6$µl respectively) and lower in T4 and T5 (3.90 and 3.41 $X10^6$µl). This also agrees with work of (Lindsay, 1997) However, the WBC count was observed to be highest in birds fed 6% MOLM diet (3.67 $X10^6$/mm) compared to others. Roberts *et al.* (2000) reported that white blood cells help in protecting microbial infection and wound healing in the body.

Table 3: Hematological parameters of Broiler chickens fed diets containing MOLM

	Treatments					
Parameters	T1 (0%)	T2 (3%)	T3 (6%)	T4 (9%)	T5 (12%)	SEM
Packed cell volume (%)	28.33[a]	25.34[c]	28.35[a]	26.67[b]	27.01[a]	0.83
Hemoglobin (g/dl)	7.67[c]	8.41[b]	9.34[a]	8.67[b]	8.68[b]	0.86
Red blood cell ($X10^6$µl)	4.33[a]	3.56[c]	4.46[a]	3.90[b]	3.41[c]	0.23
White blood cell $X10^6$/mm	3.34[c]	2.91[b]	3.67[a]	3.10[c]	3.11[c]	0.77
Neutrophils (%)	16.60[b]	21.67[a]	18.40[b]	17.33[b]	13.67[c]	1.55
Lymphocytes (%)	62.33[b]	61.33[b]	66.34[a]	65.45[a]	53.44[c]	1.01
Monocytes (%)	1.67[b]	2.00[a]	2.11[a]	1.70[b]	1.36[b]	o.45
Eosinophil (%)	1.60[b]	1.53[b]	1.33[c]	1.80[a]	1.06[c]	0.08
Basophils (%)	1.22[b]	1.33[a]	1.23[b]	1.22[b]	1.11[c]	0.07

[abc]=means with different superscript on the same raw are significantly different (p<0.05)
SEM= Standard error of means

Conclusion

Based on the study, it was concluded that *Moringa oleifera* leaf meal can be included in the diet of broiler chicks up to 6% without any deleterious effect on growth response and haematological composition.

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