GROWTH PERFORMANCE OF BROILER CHICKENS FED DIETS CONTAINING LEVELS OF BOILED MORINGA (*Moringa oleifera*) SEED MEAL

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ABSTRACT
A feeding trial was conducted to evaluate the growth performance of broiler chickens fed boiled *Moringa oleifera* seed meal (MOSM) diets. Three hundred (300) "Ross" unsexed day old broiler chicks with an average initial live weight of 38g were fed diets containing graded levels of MOSM. Five experimental diets (T_1, T_2, T_3, T_4, and T_5) were formulated and the inclusion levels of MOSM in the diets were 0.0, 2.5, 5.0, 7.5 and 10%, respectively. The treatments were replicated three times with twenty birds per replicate and a total of sixty birds per treatment in a completely randomized design. Parameters measured were initial weight, final weight, total weight gain, average daily weight gain, total feed intake and daily feed intake. Feed conversion ratio, feed cost of bird per kilogram and weight gain were computed. The mortality rate was recorded as they occurred. Data generated were subjected to analysis of variance (ANOVA) using the general linear model procedure of Statistical Analysis Systems and separated using Duncan Multiple Range Test Procedure. The result showed final body weight, weight gain, daily weight gain, total feed intake, average daily feed intake, feed conversion ratio and feed cost/kg gain were significantly ($P<0.05$) affected across the dietary treatments while mortality recorded were not significantly ($P>0.05$) different. Birds fed 7.5% MOSM had significantly ($P<0.05$) higher final weight (714.83g), weight gain (676.51g) and daily weight gain compared to other treatment groups. The finisher phase of the study revealed that MOSM in the diets of broiler chicken significantly ($P<0.05$) enhanced live weight, weight gain and daily weight gain respectively. The results from this study suggested that the inclusion of 7.5% MOSM in the diet of broiler chickens improved growth performance at finisher phases.
Key words: Broiler, Chickens, Moringa, Seed meal, Growth.

INTRODUCTION
The poultry industry in Nigeria have been plagued by a variety of problems which includes the search for feed ingredients for livestock which will not compete with man for utilization (Siyanbola and Amao, 2016). The rapid growth of human and livestock populations create increasing demands for food and nutrition security in the least developed countries, thus alternative feed resources must be identified and evaluated (Olugbemi e*t al.,* 2010). The most logical step to take in solving the shortage and dwindling raw material supply is to direct efforts towards utilizing plant by-products and wastes for feeding poultry birds (Banjo, 2012). The use of unconventional feedstuff in animal feeds had been recommended (Adeola and Olukosi, 2008).
There is need to determine the extent to which *Moringa oleifera* seed meal can be utilized by broiler chickens for improved performance. This study was carried out to evaluate the growth performance of broiler chickens fed diets containing levels of boiled *Moringa oleifera* seed meal.

MATERIALS AND METHODS
The study was carried out in the Poultry Unit of the Teaching and Research Farm, Department of Animal Science, Ahmadu Bello University, Zaria. The farm is located in the Northern Guinea Savannah zone of Nigeria, latitude 11^0 9' 14'' N and longitude 7^0 38' 45'' E and at an altitude of 610mm above sea level (Ovimaps, 2015).

Source and Processing of Moringa seeds
Moringa seeds used for this research were sourced at Giwa market, Zaria, Kaduna State. The dry Moringa seeds were sorted, remove from the pods and cleaned. The quantity of seeds used were weighed and then poured into a pot containing boiled water at 100^oC. The sample was allowed to boil

for about 60 minutes, after which the water was drained out and the sample was spread in aluminium metal trays to sun dry for 3 days (Edegbo, 2009).

Design and Management of Birds

A total of three Hundred (300) day old Ross strain of broiler chicks were purchased from Agrited Farm Limited, Ibadan, Oyo State, Nigeria. The chicks were randomly distributed into five treatment groups of 60 chicks each with three replicates of 20 chicks per pen in a completely randomized design (CRD). Five experimental diets (T_1, T_2, T_3, T_4, and T_5) were formulated and the inclusion levels of Moringa seed meal in the diets were 0.0, 2.5, 5.0, 7.5 and 10%, respectively. The birds were housed in a deep litter system and subjected to the same experimental and management conditions. Feed and water were given *ad libitum* throughout the period of the experiment.

Data Collection and Analysis

The chicks were weighed on arrival and weekly thereafter with the following parameters measured. Initial weight, final weight, total weight gain, average daily weight gain, total feed intake, daily feed intake. Feed conversion ratio, feed cost of bird per kilogram and weight gain were computed. The mortality rate was recorded as they occurred. The data obtained from the study were analyzed using One-way ANOVA using the General Linear Model procedure of the Statistical Analysis System (SAS, 2003). Significant differences among the means were separated using Duncan's Multiple Range Test Procedure (Duncan. 1955).

RESULTS AND DISCUSSIONS

The result of the performance of broiler finisher chickens fed diets containing levels of Moringa seed meal (MOSM) is shown in Table 2. The study result revealed MOSM in the diets significantly ($P<0.05$) enhanced live weight, weight gain and daily weight gain of broiler chickens. Birds on 7.5% MOSM had the highest ($P<0.05$) final body weight (2509.87g), weight gain (1896.53g) and average daily weight gain (67.07g) when compared with the other treatment groups. The gain in body weight observed in this study may be attributed to the decrease in anti-nutritional factor of the boiled MOSM which enhanced palatability and easy digestion of the diet offered. The present result was not similar to those observed by Du *et al.* (2007) and Ferreira *et al.* (2008) who reported no significant effect of MOSM supplementation at 2.5%, 5% or 7.5% in the diets of broiler chickens on growth rate. The results of total feed intake (3309.87g), daily fee intake and feed cost/kg gain (420.23/kg) showed that birds on 10.0% MOSM diets had higher ($P<0.05$) values across dietary treatment groups. This agrees with the report of Ferreira *et al.* (2008) who revealed that higher levels of MOSM increased feed consumption by the broiler chickens. The numerical increase observed in the values of feed intake and feed cost/kg gain was due to increase in MOSM inclusion across treatments and as such feed cost is affected. The feed conversion ratio of the birds was significantly ($P<0.05$) improved in all the treatments and the inclusion of 7.5% MOSM in the diet showed better a feed conversion ratio across dietary groups.

CONCLUSION AND RECOMMENDATION

From the results of the feeding trial conducted, it can be concluded that boiled MOSM inclusion at 7.50% in the diet of broiler chickens improved growth performance by (1896.53g) at the finisher phase. However, it is recommended that more work should be conducted with other species of poultry birds and other classes of monogastric and ruminant animals as well.

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Table 1: Experimental Diets for Broiler Finisher with Moringa Seed Meal (MOSM)

Ingredients (%)	T1	T2	T3	T4	T5
Maize	59.35	58.35	57.35	56.05	55.05
MOSM	0.00	2.5	5.00	7.50	10.00
Groundnut cake	16.00	14.50	13.00	11.80	10.30
Soya bean meal	15.50	15.50	15.50	15.50	15.50
Maize offal	5.00	5.00	5.00	5.00	5.00
Salt	0.30	0.30	0.30	0.30	0.30
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	0.20	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
*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					
Energy (ME Kcal/kg)	2942.00	2961.00	2980.00	2997.00	3016.00
Crude Protein (%)	20.00	20.00	20.00	20.00	20.00
Crude Fiber (%)	3.74	4.01	4.28	4.55	4.82
Ether Extract (%)	5.65	5.91	6.27	6.64	6.99
Lysine (%)	1.05	1.04	1.04	1.04	1.04
Methionine (%)	0.52	0.52	0.53	0.53	0.54
Calcium (%)	1.20	1.21	1.23	1.25	1.26
Available-P (%)	0.80	0.81	0.82	0.82	0.83
Feed cost/kg (₦/kg)	141.60	163.40	185.30	207.00	228.80

*Bio-mix broiler starter premix per 2.5kg of diet: Vit A, 10,000 I.U; Vit D_3, 2,000 I.U; Vit E, 23,000mg; Vit K_3, 2000mg; Vit B1,(thiamine) 1,800; Vit B_2(riboflavin), 5,500mg; Niacin, 27,500; Panthonenic acid, 7,500; Vit B6(pyridoxine),3000mg; Vit B_{12}, 15.00; Folic acid, 750.00mg; Biotin H_2, 60.00mg; Cholin Chloride, 300,000mg; Cobalt, 200mg; Copper,3000mg; Iodine, 3,000mg; Iron, 1,000mg; Manganese, 40,000.00mg; Selenium, 40,000mg; Zinc, 200mg; Antioxidant,1,250mg . MOSM: Moringa Seed Meal, ME: Metabolisable Energy

Table 2: Growth performance of broiler chickens fed diets containing graded levels of boiled Moringa seed meal (5-8 weeks)

Parameters	T1	T2	T3	T4	T5	SEM
Initial wt. (g/bird)	614.67	616.00	616.00	613.33	620.67	6.02
Final wt. (g/bird)	2097.97^{c}	2242.90^{b}	2325.63^{b}	2509.87^{a}	2427.43^{ab}	46.93
Total wt. gain (g/bird)	1483.30^{c}	1626.90^{b}	1709.63^{b}	1896.53^{a}	1806.77^{ab}	48.22
Avg. daily wt. gain (g/bird	52.97^{c}	58.10^{b}	61.07^{b}	67.07^{a}	64.53^{ab}	1.72
Total feed intake (g/bird)	2817.13^{c}	2936.80^{c}	3104.23^{b}	3240.30^{ab}	3309.87^{a}	48.84
Daily feed intake (g/bird)	100.57^{c}	104.90^{c}	110.87^{b}	115.73^{ab}	118.20^{a}	1.67
Feed conversion ratio	1.90^{b}	1.81^{ab}	1.81^{ab}	1.71^{a}	1.84^{ab}	0.04
Feed cost/kg gain (₦/kg)	269.5^{a}	295.75^{b}	336.01^{c}	353.28^{c}	420.23^{d}	6.72
Mortality (%)	6.67	6.67	0.00	10.00	0.00	3.34

abc= Means with different superscripts in the same row are significantly different P< 0.05, Ave= Average, wt= weight, SEM= Standard Error of Mean