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MEASUREMENT OF GROWTH PERFORMANCE INDICES IN FINISHER BROILERS FED DIETS CONTAINING EQUI-PROTEIN REPLACEMENT OF SOYABEAN MEAL WITH *MORINGA OLEIFERA* LEAF MEAL

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ABSTRACT
This study was carried out to assess the effects of equi-protein replacement of soyabean meal (SBM) with Moringa oleifera leaf meal (MOLM) on performance indices in broiler chickens. Five experimental diets were formulated in which the dietary SBM protein was replaced with MOLM protein at 0, 25, 50, 75 and 100%. A total of 200 4-week old broiler chickens were randomly allocated to the 5 dietary treatments with 10 birds per replicate and 4 replicates per treatment in a completely randomized experimental design. The feeding trial lasted 4 weeks during which feed and water were provided ad-libitum. Records of feed intake and weight gain were taken and the feed conversion ratio (FCR) calculated. The growth performance of chickens fed diets containing MOLM was not significantly (p>0.05) different from the control at up to 50% level of MOLM inclusion. It was concluded that dietary SBM protein could be replaced with that of MOLM at up to 50% without adverse effect on performance.
Keywords: Equi-protein, Soyabean meal, *Moringa oleifera*, *ad-libitum*, adverse

INTRODUCTION
Prices of conventional protein sources in Nigeria such as soyabean and groundnut cake have become extremely high in recent years. Therefore, it is important to expand the raw material base for livestock feed formulation to accommodate other non-conventional feed resources. *Moringa oleifera* is very important in animal nutrition especially for growing birds such as chicken because it possess more liberal supply of minerals, such as calcium and phosphorus and larger amounts of vitamins. Commonly called horseradish or drumstick tree, *Moringa oleifera* has been of interest as a protein source for livestock (Makker and Becker, 1997and Sarwatt *et al.*, 2002). Moringa leaves have quality attributes that make it a potential replacement for soyabean meal in non-ruminant diets. Sutherhand *et al*. (1990) and Kimoro (2002) reported that *Moringa oleifera* leaves have appreciable crude protein levels while Makker and Becker (1997)reported that its leaves and green fresh pods are rich in carotene and ascorbic acid with a good profile of amino acids. The present study aimed at measuring growth performance indices in finisher broilers fed diets containing equi-protein replacement of soyabean meal with *Moringa oleifera* leaf meal.

MATERIALS AND METHODS
Experimental Site
The experiment was carried out at the Poultry Demonstration Unit of the Livestock Farm of Federal College of Agriculture, Akure, Ondo State.
Preparation of *Moringa oleifera* leaf meal (MOLM), feed preparation and experimental treatments

Fresh *M. oleifera* leaves harvested from a paddock at the Horticulture Section of Federal College of Agriculture, Akure were spread out on a floor and allowed to dry for a period of 3-4 days under shady and aerated conditions. The dried leaves were milled to produce the leaf meal. Five isonitrogenous and isocaloric diets were formulated and fed *ad-libitum* in conical troughs for 4 weeks. Drinking water was also provided *ad-libitum*. 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 was replaced at 25, 50, 75 and 100% by that of *M. oleifera* leaf meal (MOLM) in diets 2, 3, 4, and 5 respectively. Two hundred and fifty (250) day-old chicks were subjected to a pre-experimental brooding period of 4 weeks during which conventional broiler starter diet (23% CP) were fed *ad-libitum.* After the brooding period, 200 finisher 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.

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

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.

Data collection

Proximate analysis of Moringa oleifera leaf meal and experimental diets.

The proximate composition of the MOLM and experimental diets were determined according to the methods outlined by A.O.A.C. (1995).

Determination of growth parameters

Weekly feed intake and weight gain were taken by subtracting the weight of left over feeds and final weight gain from weight of original feed given and initial weight of birds respectively. Feed conversion ratio of the birds were calculated using the formula FCR = $\frac{\text{Feed intake}}{\text{Weight gain}}$

Statistical analysis

All data generated were subjected to one-way analysis of variance using the general linear model (GLM) procedure of SAS (1998). Significant differences were separated using the Duncan Multiple Range Test of the same statistical package.

Proximate composition of *moringa oleifera* leaf meal and experimental diets

From Table 2, crude protein (CP) content of MOLM obtained in the present study (28.44%), compared favourably well with the values of 29.6%, 27.5% and 28.2% reported by Marker and Becker (1997), Oduro *et al.*, (2008) and Melesse *et al.*, (2009) respectively. It was however lower than the values of 36.0% and 32.1% reported by Negesse *et al.*, (2009) and by Soliva *et al.* (2005) respectively.

The similarities in chemical composition with other studies indicate that environmental factors such as season and geographical location plays a minor role in determining nutritive value of MOLM. The CP contents of the experimental diets varied between 18.56 to 20.48%. These CP levels were within the recommended levels for broiler finisher chickens as reported by Eekeren *et al.*, (1997) and Scanes *et al.* (2004). Nutrient composition of the experimental diets showed an increasing trend in crude fibre with higher levels of MOLM in the diet. This could be ascribed to the fibrous nature of MOLM, this agrees with the report of similar studies by Gadzirayi *et. al*., (2012).

RESULTS AND DISCUSSION

Table 2: Proximate composition (%) of *Moringa oleifera* leaf meal and Experimental diets

PARAMETERS		DIETS				
%RL	MOLM	0%	25%	50%	75%	100%
MC%	11.50	12.25	13.20	13.50	13.20	12.10
CP%	28.44	18.56	18.64	19.58	20.48	20.24
ASH%	8.00	11.20	11.70	11.90	9.92	11.22
CF%	8.25	5.99	6.24	6.23	6.27	7.01
EE%	3.00	4.37	5.55	6.41	4.89	6.15
NFE%	41.19	47.63	44.67	42.38	45.24	43.28

RL – Replacement levels of SBM with MOLM, MOLM – Moringa oleifera leaf meal, MC – Moisture content, CP – Crude protein, CF – Crude fiber, EE – Ether extract, NFE – Nitrogen free extracts.

Table 3: Growth performance in finisher broilers fed diets containing equi-protein replacement of SBM withMOLM.

PARAMETERS	Diets					
	1	2	3	4	5	
% RL	0%	25%	50%	75%	100%	±SEM
IW(g/bird)	838.90	855.60	856.89	832.56	821.44	7.83
FW(g/bird)	2315.10^{a}	2285.00^{a}	2238.90^{a}	1975.70^{b}	1743.20^{c}	9.84
TWG(g/bird)	1476.20^{a}	1429.40^{a}	1382.01^{a}	1143.14^{b}	921.76^{c}	2.31
TFI(g/bird)	5434.30^{a}	4834.40^{ab}	5068.70^{b}	4778.80^{ab}	5156.80^{b}	63.17
AFI(g/b/d)	194.08^{a}	172.66^{ab}	181.03^{b}	170.67^{ab}	184.17^{b}	2.26
AWG(g/b/d)	52.72^{a}	51.05^{a}	49.36^{a}	40.83^{b}	32.92^{c}	3.84
FCR	3.68^{a}	3.38^{a}	3.67^{a}	4.18^{b}	5.59^{c}	0.21

abc = Means along the same row with different superscripts are significantly different ($p<0.05$)
IW – Initial weight, FW – Final weight, TWG – total weight gain, TFI – Total feed intake, AFI – Average feed intake, AWG – Average weight gain, FCR – Feed conversion ratio

Growth performance

Results obtained in this study in feed intake demonstrate that MOLM is palatable and highly preferred by chickens. These findings were inconsistent with those reported in other leaf meals by (Ravindran *et. al*.,

1986; Osei *et. al*., 1990 and Bhatnagar *et. al*., 1996) where a depression in feed intake was observed when laying chickens were fed diets containing various levels of *Leucaena leucocephala* (LLM.). These variations probably suggest lower anti-nutritional factors and toxic materials in MOLM (Makker and Becker, 1997) than in other leaf meals. A progressive decrease in weight gain was noticed with increasing levels of MOLM in the diets, thus, birds on diet 1, (0% MOLM) had the highest weight while those on diet 5 (100% MOLM) had the lowest. Similar trends has been noticed in the studies of Olorode e*t. al*., (2007), Olugbemi *et al.*, (2010b) and Gadzirayi *et al*., (2012) who found that there were gradual decrease in weight of broiler chickens when placed on diets containing MOLM as the inclusion levels of the leaf meal increases. The decrease in weight gain along the treatments as levels of MOLM inclusion increases could be due to high fibre levels in the MOLM-based diets. This conforms to the general observation made by Ash *et al.*,(1992) that inclusion of leaf meal in broiler diet above 5-10% led to depressed performance. It could be noted that Feed Conversion Ratio (FCR) was lowest in birds placed on diet 2 (25% MOLM) and highest in birds placed on diet 5 (100% MOLM), this is also a direct effect of the fibre content of the diets. Similar result was obtained by Gadzirayi *et al*., (2012) who recorded the lowest FCR at 25% level of inclusion when MOLM was substituted for SBM in broiler finishers diets while Kakengi *et. al*., (2007) recorded the lowest FCR at 20% level of inclusion when MOLM was substituted for sunflower seed meal on the diet of laying birds.

CONCLUSION AND RECOMMENDATION

From the results obtained in this study, it could be seen that substitution of *Moringa oleifera* Leaf Meal for Soyabean Meal in the diets of broiler finisher did not impose detrimental effect on growth performance indices at up to 50% levels of replacement. It could therefore be concluded that dietary SBM protein could be replaced with that of MOLM at up to 50% without adverse effect on performance.

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