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Effects of Moringa Oleifera Leaf Meal on the Growth Performance and Carcass Characteristics of Broiler Birds

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Abstract: *This study was conducted to evaluate the effects of Moringa oleifera leaf meal (MOLM) on growth performance and carcass characteristics of boiler chicks. A total of 120 day-old broiler chicks of the ANAK – 2000 strain were weighed and allotted to four (4) experimental groups in a Completely Randomized Design and fed graded levels (0.0%, 5.0%, 7.5% and 10%) of MOLM for seven weeks (49 days). The experimental groups, which were designed as Treatment T_1, T_2, T_3 and T_4 respectively were further replicated three times with 10 birds per replicate so that each group had a total of 30 birds. Treatment I, which contained 0% MOLM served as the control. Growth parameters determined were average final live weight and average daily weight gain, average daily feed intake and feed conversion ratio. At the end of the feeding trial, three birds per treatment were randomly selected from each of the replicates, starved overnight and slaughtered to evaluate carcass characteristics. Internal organs such as the gizzard, thigh, shank, breast, wings, spleen, neck, lung, drum stick, heart, liver and kidney were removed and grossly examined for any pathological changes. The results showed that there was no significant difference ($P > 0.05$) in growth performance parameter (average daily feed intake, average daily weight gain, feed conversion ratio) and the economic parameters (revenue, gross margin, cost of a kg weight gain). There was significant difference ($P < 0.05$) in organ weights (wings, shank, drumsticks, kidney, liver, gizzard) and some cut parts between the experimental and control groups. These results suggest that Moringa oleifera leaf meal can replace protein source (soyabean and groundnut cake) up to 10% in broiler diets without any adverse effects on growth and carcass qualities, and could marginally reduce feed cost in broiler production.*

Keywords: *Moringa oleifera, Growth Performance and Carcass Characteristics.*

I. Introduction

Moringa oleifera (syn. M. pterygosperma) which belongs to the family Moringaceae, is widespread throughout the tropics. It is a small graceful tree with sparse foliage, white flowers and long pods, often planted in farms and compounds or used as fence, especially in northern Nigeria. The plant posses multiple advantages, because different parts of the tree (leaves, fruits, immature pods and flowers) are edibles and entered in traditional diets in many tropics and sub-tropics countries. (Olugbemi et al., 2010) reported that Moringa oleifera leaf have antimicrobial effects and are good source of fats, proteins, and minerals.

In Nigeria, commercial poultry meat production is expanding day by day. There is also a tremendous scope and opportunity for the Nigerian poultry industry to make profit . However, the recent hike in the prices of conventional feed ingredients is a major factor affecting net return from the poultry business. This is because 80% of the total cost of the operation is spent on feed. This scenario has compelled animal nutritionists to explore the incorporation of non conventional feedstuffs in poultry diets. Their inclusion in the diets could help reduce feed cost and competition between man and the livestock industry for the available conventional feedstuffs. The economization of feed cost using cheaper and unconventional feed resources is an important aspect of commercial livestock production.

The incorporation of protein from leaf sources in diets for broilers is fast gaining ground because of its availability, abundance and relatively reduced cost (Onyemonyi and Onu, 2009). According to (Ravindra, 2007) leaf meal do not only serve as protein sources but also provide some necessary vitamins, minerals and also oxycarotenoids which causes yellow colour of broiler skin, shank and egg yolk.

Moringa oleifera is cultivated across the tropics and used for a variety of purposes. Its seed powder is a good water purifier; and contains polyelectrolytes, which constitute active ingredients in water treatment. Aqueous extract of mature seeds from trees and shrubs of Moringacae family are effective in clarifying turbid and waste water in tropical countries, especially during rainy season.

Moringa oleifera seeds have been used in the treatment of hard water, and proved that hardness removal efficiency of Moringa oleifera increased with increasing dosage. The purpose of this study was to evaluate

growth performance and carcass characteristics of broilers fed Moringa oleifera leaf meal as a protein supplement in broiler diet.

II. Material And Methods

Location of the Experiment

The study was conducted at the poultry unit of Teaching and Research Farm, Michael Okpara University of Agriculture, Umudike, Abia State of Nigeria.

Experimental Birds and Management

The experimental diets were evaluated using one hundred and twenty (120) day-old chicks of ANAK 2000 heavy strain, purchased from Zartech hatchery, Ibadan, Nigeria. The birds were stabilized in the brooding room and fed ad libitum with commercial broiler starter ration for one week acclimatization period after arrival from the hatchery prior to the commencement of the experiment, and thereafter transferred to the rearing pens. The birds were randomly allocated to four (4) dietary treatment groups, so that each treatment group had a total of 30 birds. Each group was further replicated three times with 10 birds per replicate in a Completely Randomized Design (CRD). MOLM was incorporated into the diet at the expense of soyabean and groundnut cake (protein source) at the rate 0.0%, 5.0%, 7.5% and 10% for seven weeks (49 days) in dietary treatments designated as Treatment T_1, T_2, T_3 and T_4 respectively. The ingredients and nutrient composition of the experimental diets are presented in Table 1.

Experimental procedure and data collection

The experiment diets and water were provided ad libitum throughout the seven weeks (49 days) duration of the feeding trial. The feed intake was determined by the difference between the feed supplied and the left over in the feeding trough after 24hrs. Initial body weights of the birds were taken on replicate basis at the start of study and thereafter at the end of each period of seven days; the birds were weighed individually to determine body weight gain. Feed conversion (feed to gain ratio) was subsequently derived. At the eighth week of the experiment, three birds were randomly selected from each of the replicates and starved overnight in order to empty their crops. The birds were slaughtered by severing the jugular vein, ex-sanguinated, scalded in warm water for about a minute, defeathered manually, eviscerated and dressed to determine carcass characteristics. The gizzard, spleen, thigh, shank, breast, wings, neck, lung, drum stick, pancreas, heart, liver and kidney were removed and grossly examined for any pathological changes. Each cut-up parts and organs were separately weighed using a sensitive electronic scale and expressed as a percentage of dressed weight.

Proximate and statistical analyses

The proximate analysis to chemically evaluate the nutritional potential of the MOLM and experimental diets was determined by the methods of AOAC (2002). All other data were subjected to one way analysis of variance (ANOVA) in a Completely Randomized Design (CRD), by the method of Steel and Torrie (1980) and where significant differences were indicated, the means were separated using Duncan's Multiple Range Test (Duncan, 1955)

III. Results And Discussions

Results from Table 2 showed that birds fed diet with 0% Moringa oleifrea leaf meal gained significantly ($P < 0.05$) higher weight than birds fed Moringa oleifrea leaf meal based diets. Birds on T_2, T_3, and T_4 were observed to be analogous in average daily weight gain but its value decreased as inclusion of Moringa oleifrea leaf meal increased. This confirmed the observations made by Ash and Petaia (1992) and (Olugbemi et al., 2010) that increasing inclusion level of leaf meals in broiler diets results in depressed growth performance. This observation could be generally traced to increasing fiber content of the diet which may have impaired nutrient digestibility and absorption (Ige et al., 2006) and Onu, (2010). It could also be attributed to the crude protein content or palatability of the control feed which enhances its acceptability and utilization. The negative effect of the anti-nutritional factors and phytochemical compounds present in Moringa oleifrea leaf meal on the birds could be responsible for decreasing performance. Moringa oleifera leaves contain tannin at 1-23g/kg (Kakengi, 2003). Leaf meals are generally bitter in taste, therefore, the inclusion of MOLM in the diets could have resulted in reduced palatability and thus reduce feed intake of the broiler diets. Omekam (1994) observed that unpalatability nature of a feedstuff will consequently prevent chicks from consuming adequate quantity of the feed. There was a significant decrease in the feed conversion ratio of the birds fed Moringa oleifrea leaf meal based diets than birds that are fed without Moringa oleifrea leaf meal. This suggests that birds fed Moringa oleifrea leaf meal based diets had better utilization potential of the nutrients probably because of the increased bulkiness as inclusion level increased. There was significant ($p<0.05$) difference in carcass dressing weight between birds fed control diet and those fed the Moringa oleifera leaf meal diet. The decreased dressed weight at

increased inclusion level could be as a result of effect of fibre which increased in the diets at higher inclusion level of MOLM in the diets. There was no significant (P<0.005) difference in carcass dressing percentage in all the dietary treatments, (Table 3) however, the highest carcass dressing percentage was recorded in birds fed control diet (71.59%) followed by treatment 2 and 3. Significant effect (P<0.05) of feeding Moringa oleifera leaf meal was observed on the carcass characteristics of the broiler birds (Table 3). The values obtained showed variation (P<0.05) across the row of the treatments except for the wing, thigh, lungs and heart. The proportions of drumstick, breast, crop and back had the highest value at 0.0% Moringa oleifera leaf meal (control diet). 10.0% inclusion of Moringa oleifera leaf meal had the highest value of thigh, shank, liver, kidney and spleen. Also, proportion of wing, neck, lungs had highest values at 7.5% Moringa oleifera leaf meal. However, significance was traced but no definite trend was followed, as such could not be totally attributed to the effect of Moringa oleifera leaf meal supplementation. It could be inferred from this result that utilization of Moringa oleifera leaf meal in broiler diet has no influence on the organ proportion of poultry bird.

The result of the carcass characteristics in this study is similar to the finding of Nuhu (2010) who reported that there were no significant differences among treatments for carcass characteristic for weaner rabbits fed Moringa oleifera leaf meal.

Dietary inclusion of Moringa oleifera leaf meal reduced the cost of producing a kilogram of feed and this was reflected in the cost of a kilogram weight gain. The lower feed cost per kilogram of meat produced on the leaf meal incorporated up to 7.5% level suggests that the material is economically viable alternative feed ingredient. The high cost feed/bird recorded in the control was due to non inclusion of MOLM. The cost of a kilogram of feed progressively declined with increased leaf meal incorporation in the diets. The cost of a kilogram weight gain was similar ($p > 0.05$) in all the treatment groups but higher in birds fed 10% leaf meal diet. The costs of a kilogram weight gain of the leaf meal based diets were lower than the control diet except diet T_4 (Table 3). This observation could be traced to reduced daily gain of the birds fed 10% Moringa oleifera leaf meal. This implies that it is cheaper to produce a kilogram of leaf meal based feed and one kilogram of broiler meat when Moringa oleifera leaf meal was incorporated up to 7.5% level in broiler diets. This was in agreement with the report by khule et al., (2007) that non-conventional feed stuff often reduces feed cost. This confirms that there is better economic gain by feeding MOLM to broilers since it has the potential of reducing feeding cost of broilers. Reduced cost of a kilogram of feed and cost of kilogram weight gain when oil palm leaf meal was incorporated up to 10% in the broiler diets have been reported (Esonu et al., 2008) this could be relatively cheaper leaf meal which replaced proportions of costlier soya bean and palm kernel meal in the leaf meal based diets.

The improved weight gain and FCR as the leaf meal was incorporated up to 7.5% level may have accounted for higher revenue (₦1487.5 : ₦1417.5) and gross margin (₦1305.65: ₦1243.46) for birds on diets 2 and 3 respectively compared to the control diet and diet 4 (Table 3). This supports the conclusion of several researchers that leaf meal supplementation in poultry rations has been proved as means of reducing cost and improving profit margin.

IV. Conclusion

It was very clear from the result obtained that MOLM can be used in broiler ration up to 10.0% level without adverse effect on performance. It has the potential of reducing the feeding cost of broilers.

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Table 1: Percentage Composition of Experimental Diets

Ingredients	**$T_{1\ (0\%)}$**	**$T_{2\ (5\%)}$**	**$T_{3\ (7.5\%)}$**	**$T_{4\ (10\%)}$**
Maize	52.00	52.00	52.00	52.00
Soya bean meal	23.50	22.30	21.78	21.15
Wheat offal	10.00	10.00	10.00	10.00
MOLM	0.00	5.00	7.50	10.00
Fish meal	3.00	3.00	3.00	3.00
Palm kernel cake	8.00	7.20	5.22	3.35
Bone meal	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25
Vit/Premix	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Analysis				
Crude protein (%)	21.29	21.05	21.22	21.16
ME (Kcal/kg)	2940.60	2938.80	2922.70	2910.74
Determined Analysis				
Crude protein	18.66	19.52	18.27	20.32
Crude fibre	4.35	4.80	4.97	5.17
Ether extract	3.84	3.81	3.83	3.85

* vitamin A – 15,000.00,lu Vitamin D3 - 3, 000,000lu, Vitamin E- 30,000,lu Vitamin K- 3,000mg Vitamin B1 3000,mg Vitamin B2 6000mg, Vitamin B6 5,000mg, Vitamin B 40mg, Biotin 200mg, Niacah-40,000mg, Pantothenic 15,000mg,Folic acid 2,000mg, choline 300,000mg,Iron 60,000mg, manganese 80,000mg, copper 25,000mg, Zinc 80,000mg cobalt 150mg, iodine 500mg, selenium 310mg, Antioxidant 20,000mg.

Table 2: Growth Performance And Economics Of Production Of Broiler Fed Varying Levels Of Moringa Oleifera Leaf Meal

Parameters	**T_1 (0%)**	**T_2 (5%)**	**T_3 (7.5%)**	**T_4 (10%)**	**SEM**
Initial weight (g)	50.33	50.37	50.41	50.00	0.24
Final weight (g)	2125.02	2048.36	2038.42	2025.50	5.22
Total weight Gain (g)	2074.69	1997.99	1988.01	1975.50	14.13
Ave. Daily Weight gain (g)	48.37	41.80	41.60	41.34	0.43
Total Feed Intake (g)	4704.08	4405.52	4355.92	4302.08	1.21
Average Daily Feed Intake (g)	96.00	93.73	92.67	91.53	0.52
Feed Conversion Ratio	2.27	2.20	2.19	2.17	0.07
Economic Parameters					
Cost of feed (₦/kg)	89.83	88.93	88.48	88.12	4.01
Cost of a kg weight gain (₦)	181.85	177.68	175.89	174.04	4.23
Revenue (₦)	1487.5	1433.6	1426.6	1417.5	10.02
Gross margin (₦)	1.305.65	1,255.92	1,250.71	1,243.46	13.36

Means in a row with no superscript are not significantly different ($p > 0.05$). SEM = standard error of the means.

Table 3: Carcass Characteristics Of Broiler Birds Fed Varying Levels Of Moringa Oleifera Leaf Meal

PARAMETERS	**T_1**	**T_2**	**T_3**	**T_4**	**SEM**
Live weight(g/bird)	2024	1998	1988	1975	5.22
Dressed weight(g/bird)	1455^{c}	1449^{c}	1398^{b}	1364^{a}	0.12
Dressing percentage (%)	71.59	71.42	68.97	67.32	
Cut Parts (g/bird)					
Wing	11.74	11.61	12.16	11.68	0.10
Drumstick	14.94^{a}	14.14^{ab}	13.48^{b}	14.04^{a}	0.15
Thigh	13.84	14.18	14.33	14.57	0.11
Breast	24.11^{a}	23.74^{ab}	21.07^{c}	243.32^{ab}	0.26
Back	20.07^{a}	19.43^{ab}	18.29^{b}	19.86^{ab}	0.26
Neck	6.47^{b}	5.96^{c}	7.00^{a}	6.76^{ab}	0.81
Crop	1.26^{a}	0.79^{b}	0.69^{c}	0.58^{c}	0.60
Shank	7.44^{b}	7.23^{b}	7.16^{b}	7.95^{a}	0.85
ORGANS (g/bird)					
Liver	2.34^{b}	2.43^{b}	2.55^{b}	2.62^{a}	0.06
Lungs	0.59	0.58	0.61	0.58	0.02
Kidney	0.42^{b}	0.43^{b}	0.52^{ab}	0.58^{a}	0.02
Spleen	0.11^{b}	0.11^{b}	0.15^{b}	0.72^{a}	0.01
Gizzard	3.65^{b}	4.06^{a}	3.66^{b}	3.65^{b}	0.09
Heart	0.55	0.54	0.41	0.57	0.04

Means on the same row with different superscripts differ significantly ($P<0.05$).