ECONOMIC BENEFITS OF DIETS CONTAINING VARYING LEVELS OF MORINGA (*MORINGA OLEIFERA*) LEAF MEAL FED TO BROILER CHICKENS

Ishaya, A., *Millam, J.J., Abubakar, A. and Abbaya, H.Y.
Department of Animal Production, Adamawa State University, Mubi, Nigeria.
*Corresponding author: jacobjafiya@gmail.com

ABSTRACT
The study was conducted at the Teaching and Research Farm, Adamawa State University to evaluate the cost benefits of feeding broiler chickens with diets containing varying levels of Moringa leaf meal (MLM). A total of 150-day-old unsexed OLAM Cobb 500 broiler chicks were purchased from Olam Feeds and Hatchery in Kaduna, Kaduna State, Nigeria. The experimental pen housing the birds was partitioned into 15 units that accommodated 10 birds per unit, and these served as the replicates. The profitability of feeding the broiler chickens with the experimental rations was assessed using a cost-benefit analysis. Inputs and product costs were calculated based on the cost of goods at the current market prices in 2024 (April–June). The value of gain was determined to examine the returns of broiler chickens fed with MLM based rations. Data on cost/kg feed, total cost of feeding, feed cost/kg gain, and cost savings were determined. The results showed a lower value of cost/kg feed and total cost of feed in the group of birds that received 0.5MLM (₦1294.36) and 1MLM (₦2352.01), respectively. The feed cost/kg gain and cost saving were observed to be better in the group of birds receiving 1.5MLM (₦3178.70 and ₦554.91, respectively) compared to the other treatment groups. From the study, it was concluded that feeding Moringa leaf meal at 1.5 g/kg in the diets of broiler chickens can cause a reduction in feed cost and is therefore recommended.
Keywords: Cost benefits, Moringa, Diets, Chickens

INTRODUCTION

Poultry production constitutes 80% of livestock production, which is fundamental to the sustainable economic development of Nigeria as a country (Chiekezie *et al*., 2022). The poultry sub-sector is the most commercialised of all Nigeria's agricultural sub-sectors, with 180 million birds' population producing up to 300 metric tonnes of meat and 650 metric tonnes of eggs per year (Agriculture and Food, 2024). According to the report of FAO (2019), the Nigerian poultry sector contributes 30% to agricultural GDP, making it the largest poultry producer and fourth largest meat producer in Africa (Chiekezie *et al*., 2022). This informs the assertion by the World Bank, that the income and nutritional security of rural households' hinge on the poultry sub-sector, as it provides about 37% of their total intake (World Bank, 2017 as cited by Akerele *et al.,* 2017). Broilers are meat-producing birds of the poultry, and their production is considered a lucrative niche in the poultry farming business (Nigerian Finder, 2019; Adeyonu *et al*., 2021). Broiler production is unique in that it offers the highest turn-over rate and the quickest returns to investment outlay in the livestock enterprise (Chiekezie *et al*., 2022).

Protein is a major nutrient for the growth, upkeep, and repair of all body's cells, and its deficiency in the body has various negative health complications, including kwashiorkor, impaired mental health, wasting and shrinkage of muscle tissues, marasmus, impaired mental health, oedema, organ failure, and immune system wasting and shrinkage of muscle tissues (Khan *et al*., 2017). Adequate consumption of high-quality protein is indispensable for optimum and healthy human life (Obayelu *et al*., 2022). The recommended dietary allowance for protein is 133 mg nitrogen per kg of body weight per day, or 0·83 g protein per kg of body weight per day to meet the needs of a healthy population, irrespective of age, representing 10 to 35 percent of daily calories (WHO, 2007 as cited by Agriculture and Food, 2024). Nigeria is a populous and sundry country, with the high prevalence of nutritional deficiency varying widely across its borders owing to the high cost and inadequate supply of animal protein (Adekunmi *et al*., 2017; SPRING, 2018). As of 2019, Nigeria's per capita daily protein intake (45.4 g) was lower than both the Food and Agriculture Organisation's recommended minimum per capita daily protein intake of 53.8 g and the global daily intake (64 g), indicating that the country is faced with protein deficiency (Agriculture and Food, 2024). Protein-energy malnutrition is still prevalent in Nigeria as a result of the decline in protein intake owing to scarcity and the unaffordable price of animal protein food sources (De Vries-ten Have *et al*., 2020).

This study will provide information to help guide rural/urban dwellers on the need to intensify boiler production in order to close the existing gap in animal protein supply. Significantly, it will provide data on the importance of the use of herbs instead of synthetic substances in poultry and broiler production, as well as data proving the economic benefit of using moringa leaf meal in broiler production. Therefore, this research was geared towards evaluating the economic gain for feeding diets containing varying levels of moringa leaf meal fed to broiler chickens.

MATERIALS AND METHODS

Study area

The study was conducted at the Poultry Unit of Adamawa State University Teaching and Research Farm, Mubi Local Government Area. The area lies within the northern-guinea savannah zone of Nigeria. It is geo-located between latitude 10°16.6'6.9" north of the equator and longitude 13°16'1.2" East Greenwich meridian with 560 meters above sea level (Metrological Enclosure, 2023).

Processing of moringa

Fresh moringa leaves were harvested 120 days after planting and were used for the experiment. The Moringa leaves were separated from its branches and shed dried/air dried. It was milled using a local roller mill grinder into powder according to the procedure of Singh (2020). After milling, the moringa leaf meal (MLM) was stored in an airtight plastic bag until required for the experiment.

Preparation of experimental rations

The study evaluated the following rations: control; 0.5 g/kg MLM (0.5MLM); 1 g/kg MLM (1MLM); 1.5 g/kg MLM (1.5MLM); 2 g/kg MLM (2MLM). The rations were formulated using the least-cost ration formulation method. The formulation was made to meet the requirements of the birds (Table 1).

Table 1: Gross composition of experimental diets for broiler chickens

Ingredients (kg)	Control	0.5MLM	1MLM	1.5MLM	2MLM
Maize	28.90	28.76	28.62	28.50	28.37
Maize bran	14.43	14.38	14.31	14.25	14.18
Wheat bran	14.43	14.38	14.31	14.25	14.18
Soybean meal	24.23	24.06	23.91	23.74	23.58
Groundnut cake	12.11	12.03	11.95	11.87	11.79
MLM	0.00	0.50	1.00	1.50	2.00
Bone meal	5.00	5.00	5.00	5.00	5.00
Salt	0.30	0.30	0.30	0.30	0.30
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.20	0.20	0.20	0.20	0.20
Calculated analysis (%)					
Energy (ME kcal/kg)	2426.60	2418.10	2409.34	2401.16	2392.26
Protein	23.00	23.00	23.00	23.00	23.00
Crude fibre	5.77	5.84	5.91	5.97	6.04
Calcium	1.90	1.91	1.92	1.93	1.94
Phosphorus	1.32	1.32	1.32	1.33	1.33
Lysine	1.20	1.20	1.20	1.20	1.20
Methionine	0.49	0.49	0.49	0.49	0.49

MLM: Moringa leaf meal, ME: metabolizable energy,

**Composition of vitamin-mineral premix (BIO-ADDMIX®) supplying the following per tonne of feed: vitamin A 1000000 IU, vitamin D_3 200000 IU, vitamin E 10000 IU, vitamin K 2500 mg, vitamin B_1 2000 mg, vitamin B_2 70000 mg, vitamin B_6 2000 mg, vitamin B_{12} 15 mg, niacin 50000 mg, pantothenic 5000 mg, folic acid 750 mg, choline chloride 400 g, BHT 125 g, manganese 10 g, zinc 100 g, iron 30 g, copper 10 g, iodine 1.5 g, selenium 200 mg, cobalt 200 mg, lysine 15 g, methionine 20 g, biotin 100 mg.*

Experimental animals and management

A total of 150-day-old unsexed OLAM Cobb 500 broiler chicks were purchased from Olam Feeds and Hatchery in Kaduna, Kaduna State, Nigeria. The birds were raised in a well-ventilated and illuminated poultry house on deep litter. Brooding and management of the chicks was carried out using standard poultry management practices (NRC, 1994, as cited by Akure *et al*., 2021). Fresh feed and clean drinking water were supplied daily at 7:00 and 14:00 hours to the birds using ad libitum feeding regime throughout the period of the study.

Animal housing, design, and feeding

The experimental pen housing the birds was partitioned into 15 units that accommodated 10 birds per unit, which served as the replicates. The birds were randomly allotted into the five dietary groups in a completely randomised design. The starter and finisher phases were designed for four-week periods each, during which the birds will receive their corresponding starter and finisher rations, respectively.

Data Collection

The profitability of feeding the broiler chickens with the experimental rations was assessed using a cost-benefit analysis. Inputs and product costs were calculated based on the cost of goods at current market prices in 2024 (April–June). The value of gain was determined to examine the returns of broiler chickens fed with MLM-based rations.

RESULTS AND DISCUSSION

The cost benefits of feeding broilers chicken with diets containing varying levels of MLM are shown in Table 2. Lower values for cost/kg feed and total cost of feed were observed in the group of birds receiving 0.5MLM (1294.36₦/kg) and 1MLM (2352.01₦/kg), respectively. This could be attributed to the lower inclusion of MLM in the diet. Onibi *et al.* (2020) also reported a lower cost of feed/kg at lower inclusion of leaf meals. Lower results for total cost of feed could be attributed to the lesser feed consumed by the birds in the treatment group and relatively lower feed cost/kg. The finding of the present study was similar to the findings of Akhouri *et al.* (2013), indicating low cost of total feed consumed in treatment where less feed was consumed by the birds. The lowest feed cost/kg gain and higher cost savings were in the group of birds receiving 1.5MLM (₦3178.70 and ₦554.91, respectively) compared to the treatment groups. The lowest feed cost/kg gain could be attributed to the relatively lower cost of feed consumed. A similar observation was made by Zanu *et al*. (2020), showing low feed cost per kg gain as well as lower cost of feed consumed. Higher cost savings could be attributed to lower feed cost/kg gain. Abdulsalam *et al*. (2015) reported higher cost savings due to lower feed cost/kg gain.

Table 2: Cost benefits of feeding diets containing varying levels of MLM to broiler chickens

Parameters	Control	0.5MLM	1MLM	1.5MLM	2MLM
Cost/kg feed (₦)	1354.77	1294.36	1313.97	1333.56	1353.15
Total feed intake (kg)	2.96	2.41	1.79	2.01	2.83
Total cost of feed (₦)	4010.12	3119.41	2352.01	2680.46	3829.41
Total weight gain (kg)	1.07	0.96	0.73	0.84	1.02
Feed cost/kg gain (₦)	3733.61	3252.48	3228.27	3178.70	3743.31
Cost saving (₦)	0	481.14	505.35	554.91	–9.70

MLM: moringa leaf meal

CONCLUSION

From the study, it could be concluded that feeding MLM at 1.5 g/kg in the diets of broiler chickens can lead to a reduction in feed cost and is therefore recommended.

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