INFLUENCE OF MORINGA OLEIFERA SEED MEAL ON THE PERFORMANCE AND ECONOMIC EFFICIENCY OF BROILER FINISHER CHICKENS

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ABSTRACT
The increase in world population and broiler meat demand in Nigeria necessitates addressing malnutrition concerns. Feed costs account for 70-80 % of total production expenses, posing challenges to the poultry industry. To address these difficulties, this research explored the impact on cost and performance of broiler chicken fed varying inclusion levels of moringa oleifera seed meal (MOSM). A total of one hundred and twenty (21-day-old) Cobb 500 strain broiler chicken were used for the experiment. The birds were weighed and randomly allocated into one of four treatments with 3 replicates housing 10 birds per replicate. They were fed varied amounts of MOSM (0%, 5%, 10% and 15%). The results showed that there were significant difference (P<0.05) on final body weight, weight gain, and feed intake. However, the average daily weight gain and feed conversion ratio were not affected (P>0.05) by the treatments. Cost total of weight gain, cost differential, revenue and gross margin were significantly different (P<0.05) across each dietary treatments. However, the cost total of feed consumed only showed significant differences among their means. Cost study showed that MOSM incorporation reduces production costs and increases profitability. Despite prior research on moringa seed impacts, this study concludes that the inclusion of MOSM up to 10% dietary level has no marginal effect on the performance of broiler finisher and its production cost was drastically reduced.
Keywords: Broiler chickens, Moringa *oleifera* Seed Meal, Performance, and Revenue

INTRODUCTION

The pressing issue of a growing population and rising demand for poultry meat in Nigeria has increased the need to tackle malnutrition. According to Erdaw & Beyene, (2022), farmers strive to achieve the objectives of minimizing production costs while maximizing production. In order to make a significant impact on the Nigerian poultry sector, it is critical to address the rising costs associated with conventional feed ingredients. Inflationary feed costs, which account for 70-80% of total production expenses, have emerged as a key hindrance to the livestock sector especially the poultry industry. Thus, animal nutritionists have ventured into the exploration and incorporation of non-conventional feed resources into poultry diets (Akpodiete *et al*., 2014). Economizing feed costs by the utilization of affordable and unconventional feed resources has become a pivotal aspect of commercial livestock production (Ade *et al.,* 2023; Sanubi *et al*., 2023a). The need for feed resources grows in unison with the growth of human and livestock populations, highlighting the critical necessity to identify and evaluate alternate feed resources such as fluted pumpkin meal (Sanubi *et al.,* 2023b), sweet potato meal, and moringa oleifera meal (Obakanurhe & Okpara, 2016; Obakanurhe & Akpodiete, 2021; Irabor *et al*. 2021). Moringa stands out as an outstanding agricultural asset, celebrated for its versatility, adaptability, and ease of establishment. The tree remains productive for 30-40 years, making it a long-term agricultural investment. Moringa's inherent drought tolerance makes it an ideal choice for cultivation in marginal areas where the costs associated with other commercial crops are excessively expensive. With attributes such as drought tolerance, high biomass yield, substantial protein content, and disease resistance, moringa emerges as a cost- effective and sustainable incorporation in livestock production, particularly beneficial for small-scale farmers facing challenges in cultivating expensive cash crops in marginal areas (Akpodiete *et al.*, 2014). The primary objectives of this research are to analyse and assess the optimal level of Moringa *oleifera* seed meal (MOSM) inclusion in broiler finisher diets and evaluate its impact on the cost and performance parameters.

MATERIALS AND METHODS

The experimental study was carried out at the Poultry Research Unit of the Department of Animal production, Dennis Osadebay University, Anwai, Asaba, Nigeria.

Source and processing of moringa *oleifera* seed meal

The *Moringa oleifera* seed meal used for this study was collected from Department of Animal production, Dennis Osadebay University, Anwai, Asaba, Nigeria. The harvested seeds were air dried at room temperature. Hammer mill was subsequently used to ground the Moringa oleifera seeds to produce its seed meal (MOSM) suitable for incorporation into broiler finisher diets.

Experimental Diets

Four experimental finisher diets were formulated where T1 contained 0% MOLM and served as the control, while diets 2, 3, and 4 contained 5%, 10% and 15% MOLM and designated as T2, T3 and T4 diets respectively as recommend by (AOAC, 2015) Table 1.

Table 1: Percentage Composition of Experimental Finisher Diets

Ingredient	T1	T2	T3	T4
MOSM	-	5.00	10.00	15.00
Maize	55.00	55.00	55.00	55.00
Soyabean meal	15.00	10.00	5.00	00.00
Groundnut cake	10.00	10.00	10.00	10.00
Wheat offal	10.20	10.20	10.20	10.20
Fish meal	4.00	4.00	4.00	4.00
Bone meal	3.50	3.50	3.50	3.50
Oyster Shell	1.50	1.50	1.50	1.50
Common salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Methionine	0.15	0.15	0.15	0.15
Lysine	0.15	0.15	0.15	0.15
Total	**100.00**	**100.00**	**100.00**	**100.00**
Cal C.P	20.65	20.17	20.11	20.06
ME (Kcal/kg)	2856.21	2845.42	2872.86	2901.40

* Cn/mineral premix per kg: Vitamin E, 25mg; Vitamin A, 6200 IU; Vitamin D3, 1300 IU; Vitamin K3, 25mg; Vitamin B1, 25mg; Vitamin B2, 60mg; Vitamin B6, 40mg; Vitamin B12, 2mg; Elemental calcium, 25mg; Elemental phosphorus, 9mg; Elemental magnesium, 300mg; Iron, 400mg; Selenium 1.0mg, Iodine 20mg, Copper 60mg, Magnesium 100mg, cobalt 10mg, Zink, 150mg; Sodium Chloride, 1.5mg; Choline Chloride, 500mg; cfu; Niacin, 40mg; Folic Acid, 1omposition of vitami0mg; d-Biotin, 5mcg.

Experimental Birds and Management

One hundred and twenty (120) three weeks old Cobb 500 strain was used for the experiment. The birds were weighed and randomly allocated into their respective treatments of 3 replicates housing 10 birds per replicate and their weights per replicates were recorded. Each dietary treatment was fed *ad libitum* for 3 weeks. Prior to the commencement of the experiment, an initial body weight was recorded and individual birds were weighed during the experimental period on weekly bases. Feed intake was computed daily and Feed conversion ratio. Vaccination and other routine poultry management were strictly observed.

Statistical Analysis

The experiment was subjected to one way analysis of variance (ANOVA) for Completely Randomized Design (CRD) using GenStat (Release 4.24) statistical package (Genstat, 2010). Duncan's Multiple Range Test (DMRT) was used to differentiate the means.

The following model: $Xij = \mu + \alpha i + eij$

Where Xij = the observed value of each of the response variable (broiler performance and cost characteristics.

μ = the overall population mean

α = observed effect of the ith dietary treatment

eij = random or residual error due to the experimentation

RESULTS AND discussion

The data on the initial body weight, final body weight, weight gain, feed intake, average daily weight gain and feed conversion ratio are presented in Table 2. Data on the cost of total feed concentrate, cost of total weight gain, cost differential, revenue and gross margin are presented in Table 3. Analysis of variance showed that final body weight, weight gain, and feed intake were significantly influenced ($P<0.05$) by the test diets. However, the average daily weight gain and feed conversion ratio were not affected ($P>0.05$) by the treatments.

Table 2: Performance characteristics of broiler chicken fed the finisher diet treatments

Parameters	T1	T2	T3	T4	SEM	P-value
Initial body Weight/bird/(kg)	1.28	1.26	1.28	1.29	0.07	0.14
Final body Weight/bird/(kg)	2.46^{b}	2.38^{d}	2.48^{a}	2.42^{c}	0.08	0.04
Weight Gain/bird/(kg)	1.18^{b}	1.12^{c}	1.20^{a}	1.13^{c}	0.09	0.02
Feed Intake/ bird (kg)	2.27^{b}	2.30^{ab}	2.29^{ab}	2.32^{a}	0.07	0.01
Average Daily weight gain/bird/(kg)	0.06	0.05	0.06	0.05	0.02	0.01
Feed conversion ratio	1.92	2.05	1.90	2.05	0.06	0.03

Treatment means within the same row are significantly P>0.05 not different; SEM = Standard error of mean

Table 3: Economy of Feed Conversion of the Effect of Feeding Varying of *Moringa Oleifera* Seed Meal (MOSM) to Broilers finisher (21-42days)

Parameters	T1	T2	T3	T4	SEM	SIG
Cost of total feed Consumed (₦)	1271.2^{a}	1223.6^{b}	1154.2^{bc}	1104.3^{c}	6.77	0.04
Cost of total weight Gained (₦)	660.8^{a}	595.80^{c}	604.80^{b}	537.90^{d}	29.9	0.01
Cost Differ/kg Wt.G (₦)	0.00	47.60^{c}	117.00^{b}	166.9^{a}	28.3	0.04
Revenue (₦4500)	5310^{b}	5040^{d}	5400^{a}	5085^{c}	66.9	0.02
Gross Margin	810.00^{b}	540.00^{d}	900.00^{a}	585.00^{c}	64.7	0.02

a,b,c,d: Treatment means with different superscripts within the same row are significantly not different at P>0.05; SEM = Standard error of mean

Several researchers have investigated the impact of moringa seed on the growth performance of broiler chicken (*O*chi *et* al., 2015; Toana, 2021). Abbas and Ahmed (2012) discovered that incorporating moringa seed did not lead to an increase in the body weight gain of broiler chicken, in fact, a decrease in body weight gain was observed during the starter period. However, contrasting findings emerged in this present study as an increase in body weight gain was observed at different inclusion levels of MOSM. The weight gain of the birds in this experiment ranged from 1.12 to 1.20 kg/broiler which was dissimilar to the report of Ochi *et al*. (2015), who penned that adding moringa seeds to broiler diet reduced weight gain and body weight. The authors suggested that the decrease in weight gain and body weight could be attributed to the presence of phytate, an anti-nutritional component. Dwivedi & Ortiz, (2021) reported that phytate reduces mineral bioavailability in non-ruminant animals and decreases starch and protein digestibility. The highest body weight gain among the test dietary treatments was observed for birds fed with experimental diet T1 and T3. The marginal improved weight gain of birds fed MOSM diets showed that the birds efficiently metabolized their diets for growth. The average weight gain in the finisher phase showed that the test diets even at 10% MOSM inclusion can still be compared to the control diet. The lower weight gain of birds' on T4 diet compared to birds fed T1 and T3 diets could be partly ascribed to the antinutritional factors present in the seeds in T4 diet which has led to impaired nutrient digestion and absorption (Onu, 2010). These discrepancies observed in the weight gain of birds maintained on diets containing MOSM and other seed meal supplements might be explained by the high pepsin content and low anti-nutritional factors in Moringa seed meal compared to the other seed meals (Kibiwott, 2018). Ochi *et al*. (2017) in their report also observed no significant effect of diets containing moringa seed at 0.0%, 0.5%, 1.0% and 2.0% levels on feed conversion ratio of broiler chickens. There were marginal difference observed in feed conversion efficiency (FCR) recorded in their study compared to this study. The FCR recorded ranged from 1.90 -2.05 in this study is relatively within the range of 1.80 to 2.10 recorded by Toana, (2021) in Indonesia but higher than the values (1.68 – 1.77) reported by Ochi *et al*. (2015) in Sudan. However, birds fed varying levels of MOSM can still convert their feed intake into weight gain.

Cost total of weight gain, cost differential, revenue and gross margin are significantly different from each dietary treatments. But the cost total of feed consumed only showed significant differences

among their means. Furthermore, in enhancing performance, the cost of feeding birds with MOSM will definitely reduce production cost adversely. Based on cost total of feed consumed the cost total of weight gain was also reflected appreciably. Thus birds fed the test dietary treatment will be most profitably utilized base on the inclusion levels. Also, the lack of mortality among the broilers could be attributed to the antimicrobial properties and the presence of essential vitamins, proteins, and minerals in the moringa plant. This corroborates the results reported by Abbas & Ahmed (2012) who similarly observed no instances of mortality among the birds fed moringa seeds.

CONCLUSION

Conclusively, finisher broilers could tolerate up to 10% *Moringa oleifera* seed meal inclusion in their diets without adverse effects on their performance and the cost characteristics benefits. Thus, the reduced cost of production and the essential nutrients avail for the birds to utilize could be beneficial to poultry farmers and the sector's sustainability.

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