

GROWTH AND ECONOMIC INDICES OF SUBSTITUTING A COMMERCIAL PREMIX WITH HORNED MELON MEAL IN BROILER FINISHER DIETS

***[‡]Mosobalaje, M. A., [‡]Oloko, A. B. and ©Adeaga, L. S.**

[‡]Department of Animal Health and Production, ©Department of Animal Health Technology, Oyo State College of Agriculture and Technology, Igboora, Nigeria.

*Corresponding author. Email: jamademosobalaje@gmail.com; Tel: +234 08034780805.

Abstract

The increasing cost of feed premixes, coupled with their dependency on imported raw materials, has presented economic challenges for poultry farmers particularly in developing countries. This study evaluated the performance and cost of the performance of broilers finishers fed diets partially substituted with horned melon meal (HMM) as a replacement for a commercial premix. A total of 160 broiler finishers were randomly assigned to four dietary treatments with graded levels of HMM inclusion (0%, 25%, 37.5%, and 50%) in a completely randomized design over four weeks. Growth performance parameters and economic indices were assessed. Results showed no significant differences ($P>0.05$) in growth performance parameters, including weight gain, feed intake, and feed conversion ratio (FCR) across the treatments. However, broilers in the control group (0% HMM) consistently exhibited slightly higher values for this parameters (3173.50g/bird, 1442.50g/bird and 2.20, respectively). Economic analysis indicated that the diet with 50% HMM inclusion had the lowest cost of feed intake and cost of weight gain, (N2107.76/bird and N4572.75/bird, respectively) demonstrating potential cost savings. Horned melon meal can partially replace commercial premix in broiler diets without compromising growth performance and it offers economic advantages at higher inclusion levels.

Keywords: Broiler, Economic indices, Growth performance, Horned melon meal

Description of Problem

Commercial premixes are widely used in broiler diets to deliver essential vitamins, minerals, and bioactive compounds that are not adequately present in basal feed ingredients. These premixes play a crucial role in enhancing nutrient absorption, maintaining metabolic balance, and promoting optimal growth and productivity in broilers (1). However, the increasing cost of premixes, coupled with their dependency on imported raw materials, has presented economic challenges for poultry farmers, particularly in developing countries. In addition, there are concerns about the sustainability of synthetic additives in natural and locally available alternatives that can serve as effective feed supplements (2). Nowadays, the agricultural industry focuses more on sustainability and reduction strategies of environmental impact on feed production. Natural feed additives like horned melon (HMM) has the potential to offer a sustainable alternative to synthetic vitamins in poultry feed (3).

Horned melon (*Cucumis metuliferus*) is an underutilized fruit indigenous to Africa. It is a drought-tolerant species that grows primarily in arid and semi-arid regions of Africa. It demonstrating remarkable resilience to harsh environmental conditions such as drought and poor soil fertility (4) and can thrive with minimal water (5). Horned melon has essential macronutrients like carbohydrates, proteins, and fats, along with significant micronutrients such as vitamins, minerals, and antioxidants (6), this presents it as an alternative to commercial premix. Mosobalaje *et al.* (7) showed that vitamins A, D, E, K, B1 B2, B12, Folic acid and Biotin of horned melon meal were higher than those in the commercial premix. This study was conducted to evaluate the effect of substituting HMM for a commercial broiler premix on growth and economic indices.

Materials and methods

The experiment was carried out at the poultry unit, Teaching and Research Farm of Oyo State College of Agriculture and Technology Igboora. This location

lies at the geographical coordinates of 7°15'N latitude and 3°30'E longitude. It has an average annual rainfall is 139.39 mm, relative humidity of 76% and temperature of between 22 – 29°C.

One hundred and sixty (160) day old broilers were purchased from a reputable farm, then raised for four weeks before grouped into 4 treatments with four replicates of ten birds each, in a completely randomized design. The gross composition of the four

diets is as shown in table 1. The experimental birds were fed the diets for four weeks. The following parameters were measured; initial weight, weight gain, feed intake, final weight, feed conversion ratio and mortality rate. Data obtained from the study were subjected to analysis of variance (ANOVA) and where differences exist between means, Duncan Multiple Range Test was used to separate the means at 5% probability level.

Table 1: Gross composition of the four diets fed to the experimental birds

Ingredients (%)	Treatment 1 (0% HMM)	Treatment 2 (25% HMM)	Treatment 3 (37.5% HMM)	Treatment 4 (50% HMM)
Commercial Premixes	0.30	0.22	0.19	0.15
Horned melon	0.00	0.08	0.11	0.15
Maize	60	60	60	60
Soya	34	34	34	34
Oyster shell	2	2	2	2
DCP	2	2	2	2
Salt	0.3	0.3	0.3	0.3
Methionine	0.2	0.2	0.2	0.2
Lysine	0.2	0.2	0.2	0.2
Total	100	100	100	100
Calculated protein (%)	2900	2915	2920	2925
Calculated Energy (Kcal/kg)	20.50	20.60	20.65	20.70

DCP: - Di-calcium Phosphate

Results and discussion

Table 2 showed the growth performance and the economy of growth of broilers fed diets containing different levels of horned melon meal (HMM). All the parameters were not significantly affected by the inclusion of horned melon meal. The final weight of broilers fed the control diet (0% HMM) achieved the highest final weight of 2052.50g, followed by treatment 4 (1980.75 g) and treatment 3 (1972.75 g) while treatment 2 (25% HMM) had the lowest final weight of 1914.75g. These differences, while notable, were not statistically significant ($P>0.05$). The weight gain followed a similar trend. Broilers in the control group (0% HMM) gained the most weight at 1442.50 g, followed by treatment 3 (37.5% HMM) with 1380.00 g and treatment 4 (50% HMM) with 1370.00 g. The lowest weight gain of 1322.50 g was recorded in treatment 2 (25% HMM). These differences were also not significant ($P>0.05$).

The total feed intake and feed conversion ratio reduced with increasing horned melon meal in the

diets. with the control group recorded the highest value (3173.50 g/day and 2.20, respectively), while the lowest feed intake of 2873.00 g/day and 2.17 were observed in treatment 4 (50% HMM). These differences were not statistically significant ($P>0.05$). Also mortality record was not significant ($P>0.05$) with the lowest value recorded in treatment 4 (1.23%,) followed by broiler fed 37.5% HMM (1.43%) and Treatment 2 (25% HMM) that recorded 1.45%, while the control group had the highest mortality rate of 1.50%. These differences were not statistically significant ($P>0.05$).

Cost of feed was made the same, assuming horned melon meal cost as much as the commercial premix. Cost of feed intake per bird and the average cost of weight gain per kilogram per bird decreased as HMM was increased in the diet and the values were not significantly different ($P<0.05$). Treatment 4 (50% HMM) had the lowest value of ₦2,107.26 and ₦4572.75 while the highest was recorded by birds fed the

control group (₦2249.38 and ₦4948.64, respectively).

The growth parameters (final weight, weight gain, and feed intake) of the control group demonstrated similar results to those fed diets containing HMM. Specifically, the final weight and weight gain of broilers in the 50% HMM group were relatively close to those in the control group, indicating that higher inclusion levels of HMM may still maintain acceptable growth performance. Horned melon meal was reported by (7) to contain higher vitamin/mineral content compared to the premix and capable of supporting growth performance of broilers. This result aligns with the findings of (8) and (2) that reported that fruit-based meals did not significantly alter broiler growth and feed efficiency, respectively when incorporated at moderate levels. Horned melon meal contained high protein, carbohydrate and fat and these nutrients will contribute to the proximate value of the feed (7). The reduced feed intake of birds fed horned melon meal based diets

might be due to proximate value of the HMM. The mortality rates across all treatments were low and comparable, indicating the safety of HMM inclusion.

Birds fed HMM diets demonstrated the lower cost of feed intake and weight gain, suggesting its potential for cost savings in broiler production. The reduced cost of production is due to reduced feed intake of broilers fed horned melon based diets. This observation is consistent with the findings of (9) that highlighted the economic benefits of using locally available and underutilized feed ingredients in poultry diets. Results indicated that although broilers in the control group (0% HMM) exhibited slightly better growth performance, the differences among treatments were not statistically significant. This finding suggests that horned melon meal (HMM) has the potential to serve as a partial feed ingredient for broiler diets without significantly affecting performance.

Table 3: Growth performance and economy of growth of broilers fed horned melon-based diets

Parameters	Treatment 1 (0% HMM)	Treatment 2 (25% HMM)	Treatment 3 (37.5% HMM)	Treatment 4 (50% HMM)	SEM	P-value
Initial Weight (g)	610.00	592.25	592.75	610.75	3.87	0.14
Total feed intake (g/day)	3173.5	3105.00	3028.53	2973.00	83.74	0.53
Final weight (g/bird)	2052.50	1914.75	1972.75	1980.75	64.34	0.11
Weight gain (g)	1442.50	1322.50	1380.00	1370.00	53.46	0.23
Feed conversion ratio	2.20	2.18	2.19	2.17	0.03	0.83
Mortality (%)	1.50	1.45	1.43	1.23	0.04	0.43
Cost of feed (₦/kg)	708.80	708.80	708.80	708.80		
Average cost of feed intake (₦/bird)	2,249.38	2,200.82	2,145.62	2,107.26	56.44	0.54
Average cost of weight gain (₦/kg/bird)	4,948.64	4,797.78	4,698.91	4,572.75	32.54	0.33

HMM = Horned Melon Meal

Conclusion and Application

Results obtained from this study revealed that partial substitution of broiler feed with horned melon meal (HMM) up to 50% does not significantly affect growth and economic parameters when compared to the control diet. While the control group exhibited slightly higher

weight gain and feed intake, the 50% HMM diet showed the lowest cost of feed intake and weight gain, suggesting its potential for cost savings in broiler production than weight gain. Overall, horned melon meal can serve as a cost-effective and viable alternative vitamin and mineral premix

in broiler feed without compromising performance.

References

1. Kidd, M. T. (2019). Nutritional strategies to optimize amino acid nutrition and feed efficiency in broiler production. *Journal of Applied Poultry Research*, 28(1), 1-10.
2. Akinola, O. S., Onimisi, P. A., and Apata, E. S. 2019. Effect of non-conventional feedstuffs on broiler performance and cost of production. *Tropical Animal Health and Production*, Vol. 51, No. (4): pp 923-930.
3. Lee, C. H., Park, K. H., and Lee, Y. J. 2022. Sustainable Feed Ingredients for Poultry: The Case of Horned Melon." *Journal of Cleaner Production*, 339, 130790.
4. Gordon, F. P., and Franklin, D. T. 2018. Utilization of alternative feed ingredients in poultry production: A review. *Animal Feed Science and Technology*, 21(4), 453-467.
5. Anderson, R. J., and Miller, S. K. 2020. Evaluating drought-resistant crops for sustainable livestock feed. *Journal of Sustainable Agriculture and Food Systems*, 10(4), 122-136.
6. Williams, C. R., and Adams, P. J. 2018. Cost-effective poultry production through the use of alternative feed resources. *Poultry Science and Nutrition*, 19(4), 332-342.
7. Mosobalaje, M. A., Oloko, A. B. Adeaga, L. S. Oyegunwa A. S. and Adedoyin, A. A. 2024. Comparative vitamin and mineral composition of horned melon as a substitute for commercial premix and egg quality characteristics of the fed layers. *Journal of Animal Science and Veterinary Medicine*. Volume 9(6), pp 390-396, December 2024 ISSN: 2536-7099
<https://doi.org/10.31248/JASVM2024.434>
<https://integrityresjournals.org/journal/JASVM>
8. Zhai, W., Neethirajan, S., and Torrey, S. 2021. Impact of fruit-based feed ingredients on poultry performance and welfare. *Poultry Science*, Vol. 100, No. (7): pp 101-111.
9. Adeola, O., and Iji, P. A. 2015. Alternative feed ingredients for broilers: Opportunities and challenges. *Poultry Science*, Vol. 94, No. (6): pp 1257-1268.