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ASSESSING THE EFFICIENCY OF *MORINGA OLEIFERA* LEAF MEAL ON THE GROWTH PERFORMANCE OF BROILER CHICKEN

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ABSTRACT. High cost of poultry feed and limited fishmeal are currently the major challenges in poultry production. To reduce cost while maximizing production, there is the need to use cheap but high nutritional feed sources like *Moringa oleifera*. The aim of the study was to assess the effects of *Moringa oleifera* on the growth performance of broiler chicken by measuring their live weight, rate of mortality, feed conversion ratio and benefit cost (b/c) ratio. Field experiment was carried out at the Animal Science Department farm, located in the Kwame Nkrumah University of Science and Technology, Kumasi-Ghana. A total of 30-day old chicks were raised for eight weeks under the required conditions, with all vaccines administered appropriately. The experiment was laid in a Complete Randomized Design with five treatments namely T1= 100% conventional feed only (as control), T2= 50% MoLM (*Moringa oleifera* Leaf Meal) + 50% conventional, T3= 75% MoLM + 25% conventional, T4= 25% MoLM + 75% conventional, T5= 80% MoLM and each treatment replicated six times. The result showed no significant differences between the various treatment for the feed conversion ratio and live weight at different growth periods. The benefit/cost ratio of T1 was more than one while the other treatments were less than one. T4 (25% MoLM) had a b/c ratio close to one. In conclusion, *Moringa oleifera* leaf meal at different levels can be used to supplement the fishmeal component in the poultry diet of broiler chicken to produce similar results as that of the conventional feed. The study recommends that farmers can adopt *Moringa oleifera* based poultry feed for their bird production when they cannot afford the conventional feed (fish meal-based feed) to cut down cost economically while increasing productivity.

Keywords: *Moringa oleifera*, broiler chicken, growth performance, Conventional feed, Poultry feed.

INTRODUCTION

Moringa oleifera is a perennial tree thought to be native to India, but now widely introduced and naturalized across the tropics and subtropics (CABI, 2021). Just like any other tree, *Moringa oleifera* has several essential uses. All parts of the *Moringa oleifera* tree (bark, pods,

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leaves, nuts, tubers, roots and flowers) are used either as source of food/feed or medicine (Gopalakrishnam *et al.*, 2016, FAO, 2021). The leaves contain minerals like calcium, potassium, zinc, magnesium, iron and copper and can be used in the diet of people with obesity because of the low calorific value (Gopalakrishnam *et al.,* 2016). Other uses of *Moringa oleifera* includes, it being used for cosmetic purposes, traditional herbs and serving as feed for livestock including poultry (CABI, 2021). For instance, El-Hack *et al.* (2018) stated that *Moringa oleifera* can be used as animal feed because of its high nutritional content. Chicken feed with *Moringa oleifera* proved to be economically profitable than the conventional feed (Ayssiwede *et al.*, 2011).

"Poultry are generally known to be domesticated birds kept by humans for eggs, meat or features" (Hobby Farms, 2017). Skarp *et al.* (2016) study on campylobacteriosis shows that most people consume poultry meat. "Commercial poultry production in Ghana can be categorized into large-scale (over 50,000 birds), medium-scale (10,000 – 50,000 birds) and small-scale (less than 10,000 birds) enterprises. Domestic commercial farms are privately owned by individuals or a family" (Ministry of Foriegn Affiars, 2020). Poultry production is concentrated in the middle belt, primarily in the Ashanti and Brong Ahafo regions; these represents about 70% of the total poultry production in the country (Andam *et al.*, 2017). A recent report indicates that poultry meat consumption in Ghana is dominated by chicken meat, but other poultry products consumed are guinea fowls, ducks, turkeys and ostrich" (Ministry of Foriegn Affiars, 2020).

In Ghana, the demand for poultry meat exceeds local production, therefore, the majority of Ghanaians depend on imported chicken. The major reason for the low production is high cost of poultry feed, which accounts over 70% of the production cost (Netherlands Enterprise Agency, 2020). For instance, the major component in poultry feed (maize and wheat bran) is imported and expensive beyond the reach of the smallholder poultry farmers, therefore, manufacturers have rather considered using low-cost substitutes such as palm kernel cake and groundnut cake (Netherlands Enterprise Agency, 2020).

Fortunately, commercial production, processing, and utilization of *Moringa oleifera* have increased in many countries including Ghana, especially as source of animal feed (Adu-Dapaah *et al.,* 2015). Therefore, we assessed the efficiency of *Moringa oleifera* leaf meal feed on the growth performance of broiler by evaluating the live weight, feed conversion ratio, mortality and benefit cost ratio in broilers fed with the *Moringa oleifera* leaf meal (MoLM) and that of the conventional feed.

MATERIALS AND METHODS

Description of Study area

The experiment was conducted at the Animal Science Department of the Kwame Nkrumah University of Science and Technology (KNUST) Kumasi, Ghana. The area for the study is found within the moist semi-deciduous forest belt of Ghana and has

a bimodal rainfall pattern. The recorded annual rainfall on the site is 1194mm with the maximum and minimum temperature for site were 34ºC and 21.4ºC (Ansah *et al*., 2010). The experimental site lies between Latitude 06º43'N and Longitude 1º36'W (Osman *et al*., 2019).

Experimental procedure

A total of 50 one-day old chicks were purchased from a recommended source in Kumasi. Thirty of the day-old chicks were used for the experiment. The remaining 20 birds were not used in the experiment. At the experimental site, the pens were prepared to host the day-old chicks for the eight-week period. At the brooding stage, the birds were fed with the broiler starter mash for "2 weeks". Water and other necessary vaccinations such as coccidiostat were given to the birds ad libitum. The treatment was administered to the birds from the third week to the eighth weeks.

Experimental design and layout

The experiment was laid out in a Complete Randomized Design with five treatments and six replicates.

The treatments were allocated as follows;

i. T1= 100% conventional feed only (as control). The conventional feed comprises of the starter feed, the grower feed and the finisher feed at different growth periods in the experiment. The composition of the conventional feed used were; (maize - 58kg. fishmeal – 15kg, Wheatbran – 14kg, soyabean – 12kg, vitamin premix – 0.5kg, oyster shells – 0.25kg, salt – 0.25kg).

ii. T2= 50% MoLM + 50% conventional

iii. T3= 75% MoLM + 25% conventional

iv. T4= 25% MoLM + 75% conventional

v. T5= 80% MoLM + 20% of the fishmeal component of the diet.

Data collection

Data was collected on;

1. The feed conversion ratio (a/b, where **a** is the kilograms of feed consumed by the chicken and **b** is the weight gained by the chicken each week)

2. The live weight of the chicken was taken at different growth period (starter, grower, finisher)

3. The benefit cost ratio (c/d, where **c** is the selling price of the chicken and **d** is the cost of the different treatments).

4. The mortality rate per week ((Number of deaths / Number of days (7)) × 100%).

Data analysis

Data collected were subjected to One-way Analysis of Variance in Statistix 8.1 software. Results was presented in tables and graphs using Microsoft Excel.

RESULTS

Effects of treatments on growth parameters

In general, all the treatments supported growth of the broiler chickens. No statistical difference was observed among the treatments for feed conversion ratio and live weight at different growth intervals (starter and grower).

Feed conversion ratio

The feed conversion ratio was not statistically significant among the treatments.

Fig. 1 depicts the feed conversion ratio of the treatments across eight weeks. Generally, in week three, all treatments recorded a low feed conversion ratio. In week four, T3 increased compared to the other treatments. In week five, T2 recorded the highest feed conversion ratio and treatment one recorded a negative feed conversion ratio. In week six, there was a similar feed conversion recorded for all the treatments. In the seventh week,

T3 recorded the highest feed conversion ratio and the lowest was recorded in T4. In week eighth, the feed conversion ratio was similar for all the treatments but T3 recorded the highest FCR.

Live weight

The live weight of the chicken was not significantly different among the treatments. However, for each treatment and at different weighing weeks, the live weight differed significantly. The weight of chickens increased at week 8 while T2 (50% MoLM) had the lowest average weight of 1.73kg *(Table 1)*. Considering the growth rate for the mean live weight of the birds of the various treatments, which were calculated by: (final weight – initial growth weight divided by number of times recorded). T1 (control) had a growth rate of 0.265kg/week. T2 (50% MoLM) had a growth rate of 0.240kg/week. T3 (75% MoLM) had a growth rate of 0.256kg/week. The growth rate of birds in T4 (25% MoLM) was 0.313kg/week and that of T5 (80% MoLM) was 0.232kg/week. Treatment four recorded the highest growth and the lowest was recorded at treatment five.

Benefit -Cost Ratio

Table 2 depicts the total cost incurred and benefits gained in the production of the broiler chicken along with the benefit/cost ratio of the associated treatments. The benefit/cost ratio of treatment one is more than one whiles the other treatments is less than one. T4 (25% MoLM) has a b/c ratio close to one.

The dollar equivalent of one Ghana cedi is that, one-dollar equals is 6.08 Ghana cedis (Xe Currency Converter, 2022).

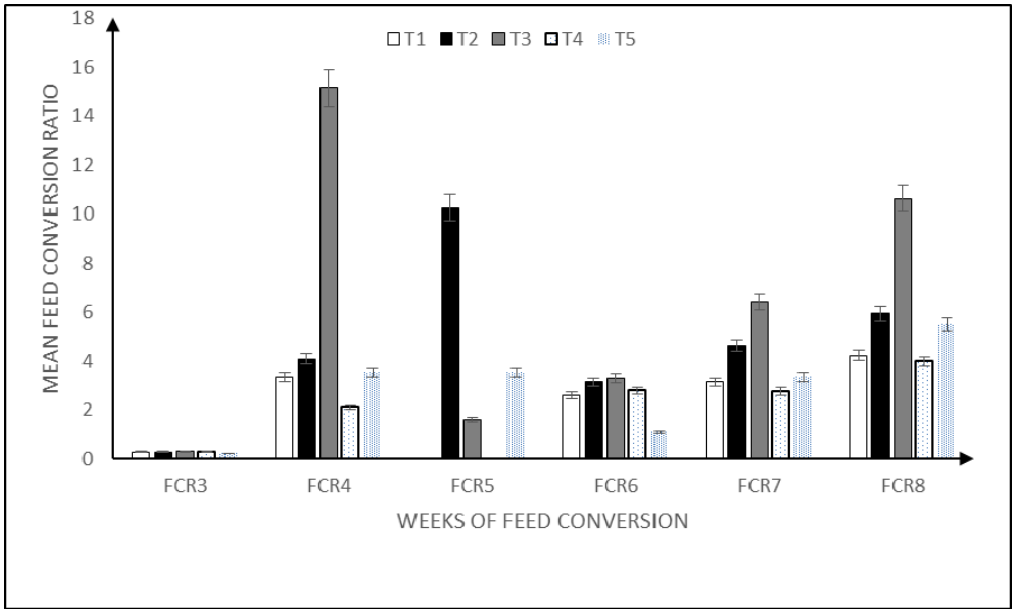

Figure 1 - Effects of the different treatment on the feed conversion ratio of broiler chicken. (Bars indicate errors for various treatments on the feed conversions across the weeks). FCR= (Feed Conversion Ratio)

Table 1 - Mean live weight of the various treatment from week three to eight

Treat-ments	Week3 (kg)	Week4 (kg)	Week5 (kg)	Week6 (kg)	Week7 (kg)	Week8 (kg)
T1	0.501±0.046	0.803±0.072	1.047±0.085	1.210±0.104	1.546±0.123	1.828±0.113
T2	0.526±0.046	0.788±0.072	0.955±0.085	1.232±0.104	1.451±0.123	1.726±0.113
T3	0.507±0.046	0.782±0.072	1.069±0.085	1.372±0.104	1.572±0.123	1.788±0.113
T4	0.525±0.046	0.87±0.072	1.135±0.085	1.442±0.104	1.810±0.123	2.09±0.113
T5	0.580±0.046	0.786±0.072	1.053±0.085	1.254±0.104	1.505±0.123	1.740±0.113
P-value	0.7567	0.8976	0.5914	0.4733	0.3121	0.1818

Table 2 - The average benefit cost ratio of the broiler chicken for the individual treatments

Treatments	Average		Discount Factor@12.61%	Discounted		B/C ratio
	Cost (Gh¢)	Benefit (Gh¢)		Cost (Gh¢)	Benefit (Gh¢)	
T1	19.19	21.93	0.89	17.08	19.47	1.14
T2	39.67	20.71	0.89	35.31	18.39	0.52
T3	49.90	21.46	0.89	44.41	19.05	0.43
T4	29.43	25.08	0.89	26.19	22.27	0.85
T5	51.45	20.88	0.89	45.79	18.54	0.40

Mortality

There was no mortality recorded throughout the experiment for birds fed with conventional feed (T1) as well as birds fed with Moringa oleifera based feed (T2, T3, T4 and T5).

DISCUSSION

Effect of *Moringa oleifera* leaf meal on the feed conversion ratio of broiler chicken.

In Abdulsalam *et al.* (2015) did not observe statistical differences infeed consumption and feed conversion ratio in response to *Moringa oleifera* feeding and control feeding in chickens, which could be attributed to presence of beneficial factors in the leaf of moringa and the additional antibiotic properties influencing feed conversion ratio of birds. The results of the study indicated that substituting the fishmeal component with different levels of *Moringa oleifera* not significantly affect FCR in comparison to the control. A similar observation was made by Olugbemi *et al.* (2010) showing no significant difference in FCR of birds between the substituted and the control groups. The findings of the present study are not in agreement of those of Akhouri *et al.* (2013) indicating significant differences in FCR among the MoLM fed and control groups.

Effect of *Moringa oleifera* leaf meal on the live weight of the broiler chicken.

The results of this study indicates that even though the general body weigh increased with time, however, there was non-significant difference between the means of the various treatment.

In line with the findings of this study, Gadzirayi *et al.* (2012) also showed that the live weight of the treatment was not significantly different from each other. It was suggested that the variability in the weight was due to

the different week (week factor). Folorunso and Onibi (2012), also observed no differences on mean weight gain, feed Intake and efficiency of feed conversion of broilers when fed with diets containing different levels of protein, reason being varying dietary protein levels showing that the birds were able to consume at fairly the same level regardless of the quantity of protein in the diet. On the contrary Abdulsalam *et al.* (2015), reported significant difference between the various treatments.

Effects of *Moringa oleifera* leaf meal on the benefit cost ratio of the broiler chicken

The benefit cost ratio of treatment one (100% conventional) was more than one. Treatment four (25% MoLM) had a b/c ratio close to one. *Moringa oleifera* leaf meal being included in the diet gives additional benefits to the birds such as the medicinal properties of the moringa.

Effects of treatments on Mortality

In this study no mortality was recorded throughout the experimental period. These results are in agreement with those of Gerondio *et al*. (2017). These results could be attributed to the antibiotic and medicinal nature of *Moringa* (Matic *et al.* 2018).

CONCLUSIONS

Moringa oleifera leaf meal at different levels of T2(50%MoLM), T3(75%MoLM), T4(25%MoLM) and T5(80%MoLM) can be used to substitute the fishmeal component in the poultry diet of broiler chicken to produce similar results as that of the conventional feed. The study recommends that, *Moringa oleifera* leaf meal be used as an alternate protein source of feed at levels of 25%, 50%, 75%, 80% of MoLM for the broiler chicken when the farmer cannot afford purchasing all the fishmeal required to formulate the poultry feed.

Conflict of interest: Authors declare no conflict of interest.

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