Effects of Dietary Intake of *Moringa oleifera* Leaf Meal on The Growth Performance of Pullet Chicks

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**ABSTRACT**

This study determined the effects of dietary intake of *Moringa Oleifera* (*M. oleifera*) leaf meal on growth performance of pullets. Two hundred and forty Isa Brown day-old chicks were randomly allotted to 4 different treatment groups and each treatment had 3 replicates of 20 chicks each. At 4th week of age, birds in group 1 (T1) were fed with 16% crude protein (CP) grower diet (control feed; 0.0% *M. oleifera*) whereas birds in groups 2 (T2), 3 (T3) and 4 (T4) received the control feed supplemented with 2.5%, 5.0% and 7.5% *M. oleifera* leaf meal, respectively. Results indicate that although intake of *M. oleifera* leaf meal did not affect final body weight and weight gain of the pullets (*P > 0.05*), feed intake of the pullets declined significantly (*P < 0.05*) as the amount of dietary *M. oleifera* intake was increased from 2.5% to 7.5%. Feed conversion ratio of T4 group was better (*P < 0.05*) than those of control birds.

**Key words:** *Moringa oleifera* leaf meal, Performance, Pullet.

**INTRODUCTION**

Pullets are the young female fowls reared for egg production. Adequate feeding with proper diets is essential for profitable farm enterprise (Singh et al., 2017). The basic information essential for the producers to make proper decision concerning pullets are the body weight, feed intake, feed conversion ratio, the level of energy, protein and calcium in the feed (Oderkirk, 2013). It is essential to monitor feed consumption on a daily basis so that energy level, as well as feed density, can be adjusted to daily feed intake (Holik, 2015). Production parameters of pullets can be improved by the inclusion of additives in feeds.

Feed additives are non-nutritive substances used in poultry feed, including antibiotics, enzymes, antioxidants, pellet-binders, antifungals, coloured pigments and flavouring agents (Elagib et al., 2013). They have been widely used in the poultry industry to improve growth, feed efficiency and layer performance. However, the use of organic additives has gained acceptance worldwide. *M. oleifera* which is an organic additive has antioxidant property due to its high amount of polyphenols (Sreelatha and Padma, 2009). *M. oleifera* leaf meal can be included in the feed to promote certain qualities in pullets.

*Moringa oleifera* is a medium-sized tree (about 10 meters high) belonging to the *Moringaceae* family with 14 known species (Maroyi, 2005). It has an impressive range of medicinal uses, including growth promotion, antimicrobial and antioxidant effect (Moyo et al., 2011). However, the presence of oxalates and Phytic acids in Moringa leaves are likely to reduce the bioavailability of nutrients contained in the leaves (Foidl et al., 2001). Results of a study (Nkukwana et al., 2014) indicated that supplementation of *M. oleifera* leaf meal in feed significantly improved feed utilization efficiency and tissue accretion in broiler chickens.

Hens fed with *M. oleifera* leaf meal in Ethiopia were found to have total feed intake higher in the group that received control feed and those fed with 10% *M. oleifera* leaf meal while the lowest intake was recorded in those that received 5% *M. oleifera* leaf meal, body weight gain was higher in hens fed with 5% and 10% *M. oleifera* leaf meal than those that received control feed and 15% *M. oleifera* leaf meal while FCR was higher in hens fed with 5% *M. oleifera* leaf meal than the other groups (Alebachew et al., 2016). Supplementation of *M. oleifera* leaf meal in the diet of pullets in Cameroon was reported to decrease the feed intake and live body weight but, did not significantly affect the FCR, though, pullets fed with 10% and 5% supplemented *M. oleifera* leaf meal exhibited the highest and lowest FCR, respectively (Raphaël et al., 2015; Ng’ambi et al., 2019). There was no identified study on the effect of *M. oleifera* leaf meal additive on the weight gain, daily feed consumption and FCR of Isa brown pullets in Nigeria. Therefore, this study was aimed at determining the effect of dietary intake of *M. oleifera* leaf meal on growth performance of pullets during grower phase of production.
MATERIALS AND METHODS
The experiment was carried out in accordance with the regulatory guidelines of the University of Nigeria Animal Care Ethics Committee (UNN-ACEC).

Experimental procedure
The experiment was conducted in 2018 in the Department of Agricultural Education Research Farm, University of Nigeria, Nsukka. A total of 252 Isa Brown chicks were stocked and 240 chicks were randomly allotted to 4 different treatment groups of 60 chicks. Birds in each group were randomly assigned into 3 replicates of 20 chicks. At 4th week of age, birds in group 1 (T1) was fed with 16% crude protein (CP) grower diet (control feed; 0.0% M. Oleifera leaf meal) whereas birds in groups 2 (T2), 3 (T3) and 4 (T4) received the control feed supplemented with 2.5%; 5.0% and 7.5% M. oleifera leaf meal, respectively. Management of the chicks was carried out based on the procedure described in Cuxhaven (2005). The birds were weighed weekly.

Harvesting and processing of M. oleifera leaves
Harvesting and processing of Moringa leaves into meal were done according to the procedure described by Mishra et al. (2012). The proximate composition of the moringa leaf meal was determined according to the methods of AOAC (2005).

Feed formulation
The composition of control and experimental diets was given in Table 1. The feeds were formulated using feed formulation software called FeedWin developed by PTC+, located in Barneveld, the Netherlands while dosing, grinding and mixing were done in Chidera Feed Mill, Nsukka, Nigeria.

Determination of Average Weight Gain
The Average Weight Gain (AWG) was represented as the difference between the Average Weight of the current week (AWC) and Average Weight of the previous week (AWP).

\[ AWG = AWC - AWP \]

Determination of the Average Feed Intake
The Average Feed Intake/bird/day (AFI/B/D) was the total Quantity of Feed Consumed (QFC) on a given period multiplied by the number of days divided by the Number of Subjects Fed (NSF) for the same period.

\[ AFI/B/D = \frac{QFC \times ND}{NSF} \]

Determination of Feed Conversion Ratio (FCR)
The Feed Conversion Ratio (FCR) for each week was the total feed intake for the week divided by the total weight gain for the same week.

\[ FCR = \frac{TFI (Kg)}{TWG (Kg)} \]

Statistical analysis
Data were analyzed by one-way analysis of variance (ANOVA) according to a completely randomized design (CRD) using Statistical Package for Social Sciences (SPSS) version 20.0 software (IBM Corp., Armonk, NY, USA). Significant differences between means were separated using Duncan multiple range test as found in the computer statistical package. The null hypotheses were tested at 0.05 level of significance (P<0.05).

RESULTS AND DISCUSSION
Proximate composition of M. oleifera leaf meal
Proximate composition of M. oleifera leaf meal was shown in Table 2. The result was numerically higher than the findings of Aja et al. (2013) where proximate contents were carbohydrate, 23%; crude protein, 1.40%; ash, 10%; calcium, 151.1mg/100g and phosphorous, 3.85mg/100g. Conversely, the content of ether extract, 20% and crude fibre, 35% were reported by Aja et al. (2013). In another study, Ogbe and Affiku (2012) reported that Moringa Oleifera leaves contained crude protein, 17.0%; carbohydrate, 63.11%; crude fibre, 7.09%; ash, 7.93% and crude fat, 2.11%. Variations in proximate composition of M. oleifera leaf meal could be attributed to differences in the soil characteristics where the leaves were sourced, processing and analytical methods, the age of harvest, etc. These attributes were in line with the findings of Salim et al. (2018) where the nutritional content of the bud, young and old moringa leaves varied significantly. The amount of ash, protein, fat, crude fibre and carbohydrate were found to be higher in moringa leaves when dried with lower temperature than higher temperature (Olabode et al., 2015). Olayemi et al. (2011) reported a significant increase in the carbohydrate content of M. oleifera leaves dried with multipurpose drier and sun drying than the air-dried method with a corresponding decrease in the protein and fat contents of the different products.

Growth performance
There was no significant difference (p>0.05) in the final body weight of the pullets fed with or without M. oleifera leaf meal (Table 3). However, the pullets fed with 2.5% M. oleifera leaf meal had the highest mean final weight (1449.33 ± 70.15g) but did not differ significantly from those of other treatments. Although there was no significant differences (P>0.05) in daily weigh gain of the pullets fed without or with M. oleifera supplemented diets, weight gains of pullets fed M. oleifera leaf meal declined as the quantity of inclusion of moringa in the diet was increased. In line with results of the present study, Gadzirayi et al. (2012) and Akhoui, et al (2013) reported non-significant difference in the body weight gain of broiler chicken fed with moringa leaf meal and the control. Average daily body weight gain was reported to be higher in broilers fed with moringa leaf-based feed than the control (Nkukwana et al. (2014). However, Richter et al. (2003) observed a decrease in the average weight gain with inclusion of higher dose of moringa leaf meal. The variability in the weight gain might be due to the variability in the animals studied, between and within breed differences,
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### Table 1: Composition of the experimental diet (%).

| Ingredients                      | Control (T1) | T 2 | T 3 | T 4 |
|----------------------------------|--------------|-----|-----|-----|
| Maize                            | 60.00        | 60.00 | 60.00 | 60.20 |
| Groundnut Cake                   | 10.00        | 2.00 | 5.00 | 2.00 |
| Wheat Bran                       | 1.28         | 2.87 | 2.08 | 3.70 |
| Bone Meal                        | 1.50         | -   | -   | -   |
| Soybean Meal                     | 12.10        | 18.80 | 14.20 | 5.00 |
| Rice Bran                        | 10.00        | 10.00 | 9.80 | 7.73 |
| Moringa Leaf Powder              | 1.50         | 2.87 | 2.08 | 3.70 |
| Salt                             | 1.50         | 1.50 | 1.50 | 1.50 |
| Limestone                        | 1.76         | -   | -   | -   |
| Lysine                           | 0.18         | 0.05 | 0.15 | 0.10 |
| Methionine                       | 0.09         | 0.09 | 0.08 | 0.08 |
| Soybean Oil                      | 1.50         | 2.10 | 2.10 | 2.10 |
| Toxin Binder                     | 0.09         | 0.09 | 0.09 | 0.09 |
| Total                            | 100          | 100 | 100 | 100 |

**Proximate Composition (%)**

| Parameters                      | Proximate composition (%) |
|---------------------------------|---------------------------|
| Crude protein                   | 16.07                     |
| Crude fibre                     | 6.00                      |
| Ether extract                   | 5.60                      |
| Ash                             | 5.41                      |
| Calcium                         | 0.45                      |
| Phosphorus                      | 0.11                      |
| Metabolizable Energy Kcal/kg    | 2800                      |

### Table 2: Proximate composition of *M. oleifera* leaf meal.

| Parameters evaluated           | Proximate composition (%) |
|--------------------------------|---------------------------|
| Crude protein                  | 30.21                     |
| Crude fibre                    | 10.67                     |
| Ether Extract                  | 5.77                      |
| Total Ash                      | 12.00                     |
| Carbohydrate                   | 31.64                     |
| Metabolizable energy, Kcal     | 299.33                    |

temperature, source of moringa leaves and different forms of moringa used.

Daily feed intake of the pullets showed significant (P<0.05) differences among the treatment groups. Pullets in the control group fed without *M. oleifera* leaf meal in diets recorded higher daily feed intake (P<0.05) compared with those pullets fed *M. oleifera* supplemented diets. Pullets fed diets 3 and 4 consumed less feed (38.15 and 36.2 g, respectively) than those fed diets 1 and 2. There was no

significant difference in feed intake between the pullets fed with 5% and 7.5% *M. oleifera* leaf meal. Present findings was supported by Alabi *et al.* (2017), who found that birds in the control treatment had the highest feed intake value (84.70g/day) which was an indication that inclusion of *M. oleifera* leaf extract depressed feed intake. Decreased feed intake of pullets fed diet supplemented with *M. oleifera* leaf powder might be attributed to the change in taste and palatability resulting from the presence of tannin and saponin in Moringa leaves (Ndubuaku *et al.*, 2015). The presence of tannins in diets causes decreased feed consumption in pullets and reduces the palatability of feeds (Soetan and Oyewole, 2009; Shete *et al.*, 2011). Ashok and Upadhyaya (2012) reported that the intensity of bitterness in taste depends on the concentration of tannins in a plant. Behavioural and genetic evidence show that pullets have an accurate capacity to detect different taste modalities (Roura *et al.*, 2013). Change in taste imparted by the presence of tannin may limit feed intake.

### Table 3: Effect of dietary inclusion of *M. Oleifera* leaf meal on growth performance of grower pullets (Mean ± SE).

| Parameters                      | T1 (Control) | T2 | T3 | T4 | Prob.>F |
|---------------------------------|--------------|----|----|----|---------|
| Initial BW (g)                  | 53.41 ± 1.15 | 54.30 ± 2.65 | 53.33 ± 6.67 | 52.68 ± 1.86 | 0.9126 |
| Final BW (g)                    | 1340.67 ± 64.66 | 1449.33 ± 70.15 | 1413.36 ± 68.13 | 1378.72 ±66.40 | 0.7065 |
| Feed intake (g/bird/day)        | 44.65 ± 6.30 | 41.50 ± 5.87 | 38.15 ± 5.48 | 36.2 ± 5.49 | 0.0437* |
| Weight gain (g/bird/day)        | 7.11 ± 0.68 | 7.71 ± 0.70 | 7.51 ± 0.70 | 7.32 ± 0.69 | 0.9394 |
| Feed conversion                 | 5.69 ± 0.33 | 4.82 ± 0.32 | 4.54 ± 0.31 | 4.35 ± 0.34 | 0.0249* |

*a,b*Means in the same row with different superscript differ (P<0.05).
Present findings revealed that a significant difference existed (p<0.05) in the FCR of the pullets fed with the control and experimental diets (Table 3). The FCR of pullets fed with the control diet was statistically higher (P<0.05) than those fed 7.5% M. oleifera supplemented diets. There was no significant difference in the FCR between the pullets fed M. oleifera leaf meal. These findings were in agreement with Abou-Elezz et al. (2012) where they observed that layers fed with M. oleifera leaf meal had a better feed conversion ratio compared to those fed the control diet. Lower values of FCR were also recorded in broilers fed with varying quantities of M. oleifera leaf meal (Onunkwo and George, 2015; Alabi et al., 2017).

CONCLUSION

It is concluded that M. oleifera leaf meal could be included in the diet of pullets up to a level of 7.5% for better FCR without any adverse effect on the growth.

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