RESEARCH ARTICLE Agricultural Science Digest, Volume 40 Issue 2: 194-198 (June 2020)

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

C.U. Ugwuoke[1], G.E. Eze[1], R.N. Mgbenka[1], B.A. Omeje[1], E.C. Osinem[1], N.S. Machebe[2]

10.18805/ag.D-189

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.

[1]Department of Agricultural Education, University of Nigeria, Nsukka, Nigeria.
[2]Department of Animal Science, University of Nigeria, Nsukka, Nigeria.

Corresponding Author: C.U. Ugwuoke, Department of Agricultural Education, University of Nigeria, Nsukka, Nigeria.
Email: cajethan.ugwuoke@unn.ed.ng

How to cite this article: Ugwuoke, C.U., Eze, G.E., Mgbenka, R.N., Omeje, B.A., Osinem, E.C. and Machebe, N.S. (2020). Effects of Dietary Intake of *Moringa oleifera* Leaf Meal on The Growth Performance of Pullet Chicks. Agricultural Science Digest. 40(2): 194-198.

Submitted: 16-08-2019 **Accepted:** 30-03-2020 **Published:** 06-06-2020

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 (AW_C) and Average Weight of the previous week (AW_P).

$$AWG\ (g) = AW_C\ (g) - AW_P\ (g)$$

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.

$$AFI/B/D\ (g/d) = \frac{QFC \times ND \left(\frac{g}{d}\right)}{NSF}$$

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. Athough there was no signicant 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 Akhouri, *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,

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	-	2.50	5.00	7.50
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 (%)				
Crude protein	16.07			
Crude fibre	6.00			
Ether extract	5.60			
Ash	5.41			
Calcium	0.45			
Phosphorous	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	Treatments				
	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^{a}	41.50 ± 5.87^{ab}	38.15 ± 5.48^{b}	36.2 ± 5.49^{b}	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^{a}	4.82 ± 0.32^{ab}	4.54 ± 0.31^{ab}	4.35 ± 0.34^{b}	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.

REFERENCES

Abou-Elezz, F.M.K., Sarmiento-Franco, L., Santos-Ricalde, R. and Solorio-Sanchez, F. (2012). The nutritional effect of *M. oleifera* fresh leaves as feed supplement on Rhode Island Red hen eggs production and quality. Tropical Animal Health Production. 44(5): 1035-1040.

Aja, P.M., Ibiam, U.A., Uraku, A.J., Orji, O.U., Offor, C.E. and Nwali, B.U. (2013). Comparative proximate and mineral composition of *Moringa Oleifera* leaf and seed. Global Advanced Research Journal of Agricultural Science. 2(5): 137-141.

Akhouri, S. Prasad, A. and Ganguly, S. (2013). *Moringa oleifera* leaf extract imposes better feed utilization in broiler chicks. Journal of Biological and Chemical Research. 30 (2): 447-450.

Alabi, O.J., Malik, A.D., Ng'ambi, J.W., Obaje, P. and Ojo, B.K. (2017). Effects of aqueous *M. oleifera* (Lam) leaf extract on growth performance and carcass characteristics of Hubbard broiler chicken. Brazilian Journal of Poultry Sciences. 19(2): 273-280. http://dx.doi.org/10.1590/1806-9061-2016-1373.

Alebachew W., Tesfaye E. and Tamir B. (2016). Effects of feeding different dietary levels of *Moringa oleifera* leaf meal on egg production, fertility and hatchability of dual purpose Koekoek hens. Middle-East Journal of Scientific Research. 24: 2909-2920.

AOAC. Official Methods of Analysis. (2005). Association of Official Analytical Chemists; Arlington, VA, USA.

Ashok, P.K. and Upadhyaya, K. (2012). Tannins are Astringent. J Pharmaco and Phytochem. 1(3): 45-50.

Cuxhaven (2005). Management guide for laying hens in deep litter, perchery and free-range systems. Retrieved on 09/03/15 from http://lohmann-information.com/content/l_i_43_artikel6.pdf.

Elagib, H.A.A.; EL-Amin, W.I.A.; Elamin, K.M. and Malik, H.E.E. (2013). Effect of dietary garlic (*Allium sativum*) supplemen--tation as feed additive on broiler performance and blood profile. Journal of Animal Science Advancers. 3(2): 58-64. Doi: 10.5455/jasa.2013021910429.

Foidle, N; Makkar, H. P. S. and Becker, K. (2001). The potentials of *Moringa oleifera* for agricultural and industrial uses in: [Fuglie and Lowele, J. (Ed)]. The Miracle Tree: The Multiple Uses of Moringa, CTA, Wangeningen, the Netherlands pp 45-76.

Gadzirayi C.T., Masamha, B., Mupangwa, J.F. and Washaya, S. (2012). Performance of broiler chickens fed on mature *Moringa oleifera* leaf meal as a protein supplement to soyabean meal. International Journal of Poultry Science. 11(1): 5-10.

Holik, V. (2015). Management of laying hens under tropical conditions begins during the tearing period. Lohmann Information. 50(2): 16-23.

Maroyi, A. (2005). The utilization of *Moringa Oleifera* in Zimbabwe. Retrieved on 03/03/2015 http://www.jsd-africa.com/Jsda/Summer_2006/PDF/ARC_UtilizationMOeifera.pdf.

Mishra, S.P.; Singh, P. and Singh, S. (2012). Processing of *Moringa oleifera* leaves for human consumption. Bulletin of Environ--ment, Pharmacology and Life Sciences. 2(1): 28-31.

Moyo, B.; Masika, P.J.; Hugo, A. and Muchenje, V. (2011). Nutritional characterization of Moringa (*Moringa oleifera* lam) leaves. African Journal of Biotechnology. 10: 12925-12933.

Ndubuaku, U.M.,Nwankwo, V.U.,Baiyeri, K.P. and Ukonze, J. (2015). Anti-nutrient, vitamin and other phytochemical compositions of old and succulent Moringa (*M. oleifera Lam*) leaves as influenced by poultry manure application. African Journal of Biotechnology. 14(32): 2501-2509. https://doi.org/10.5897/AJB2015.14848.

Ng'ambi, J.W., Molepo, L.S. and Ginindza, M.M. (2019). Effect of dietary *Moringa oleifera* seed meal inclusion on perfor--mance and carcass quality of female Ross 308 broiler chickens. Indian Journal of Animal Research. 53(5): 628-633.

Nkukwana, T.T.; Muchenje, V.; Pieterse, E.; Masika, P.J.; Mabusela, T.P.; Hoffman, L.C. and Dzama, K. (2014). Effect of *Moringa oleifera* leaf meal on growth performance, apparent digestibility, digestive organ size and carcass yield in broiler chickens. Livestock Science. 161: 139-146. http://dx.doi.org/10.1016/j.livsci.2014.01.001.

Oderkirk, A. (2013). Layer management: Egg size control. Retrieved on 06/03/2015 from http://www.perennia.ca/Fact% 20Sheets/Livestock%20and%20Poultry/Non-Ruminant/Poultry/layer%20management%202.pdf

Ogbe, A.O. and Affiku, J.P. (2012). Proximate study, mineral and anti-nutrient composition of Maringa oleifera leaves harvested from Lafia, Nigeria: Potential benefits in poultry nutrition and health. Journal of Microbiology, Biotechnology and Food Sciences. 1(3): 296-308.

Olabode, Z., Akanbi, C.T., Olunlade, B. and Adeola, A.A. (2015). Effect of drying temperature on the nutrients of moringa (*Maringa oleifera*) leaves and sensory attributes of dried leaves infusion. Direct Research Journal of Agriculture and Food Science. 3(5): 117-122.

Olayemi, F.F., Awagu, F.E. and Bamishaiye, I.E. (2011). Comparative analysis of the nutritional composition of three different drying methods of *Moringa oleifera* leaves. International Journal of Applied Agricultural Research. 6(2): 131-138.

Onunkwo, D.N. and George, O.S. (2015). Effects of *M. oleifera* leaf meal on the growth performance and carcass characteristics of broiler birds. IOSR Journal of Agriculture and Veterinary Science. 8(3): 63-66.

Raphael, K.J., Christian, K.T., Juliano, R.S., Lisita, F., Soultan, M.Y., Herve, M.K. and Alexis, T. (2015). Effect of substituting soybean with *Moringa oleifera* leaf meal in diets of layers and egg quality characteristics of KABIR chickens. Journal of Animal Nutrition. 1(1): 1-6.

Richter, N., Siddhuraju, P. and Becker, B. (2003). Evaluation of nutritional quality of moringa (*Moringa oleifera* Lam.) leaves as an alternative protein source for Nile tilapia (*Oreochromis niloticus* L.). Aquaculture. 217: 599-611.

Roura, E., Baldwin, M.W. and Klasing, K.C. (2013). The avian taste system: potential implications in poultry nutrition. Animal Feed Science and Technology. 180(1-4): 1-9. https://doi.org/10.1016/j.anifeedsci.2012.11.001.

Salim, A., Hasyim, M. and Adam, A. (2018). Nutrient contents of moringa leaves based on leaf age. Indian Journal of Public Health Research and Development. 9(1): 397-345.

Shete, S.M., Tomar, S.K., Sirohi, S.K. and Singh, B. (2011). Plant secondary metabolites as rumen fermentation modifiers: A review. Agricultural Reviews. 32(1): 1-13.

Singh, G., Sharma, R.B., Singh, M. and Sharma, S.K. (2017). Utilization of agricultural wastes in participatory poultry farming with women under climatic conditions of Tonk district of Rajasthan. Agricultural Science Digest. 37(1): 60-63.

Soetan, K.O. and Oyewole, O.E. (2009). The need for adequate processing to reduce the anti-nutritional factors in plants used as human foods and animal feeds: A review. African Journal of Food Science. 3(9): 223-232.

Sreelatha, S. and Padma, P.R. (2009). Antioxidant activity and total phenolic content of *Moringa Oleifera* leaves in two stages of maturity. Plant Foods for Human Nutrition. 64: 303-311.