

EFFECT OF AQUEOUS ADMINISTRATION OF *MORINGA OLERIFERA* LEAF AND SEED EXTRACTS ON THE GROWTH PHYSIOLOGY OF LOCAL MALE TURKEYS.

Ogbu, O.C.

Department of Agricultural Technology, Federal Polytechnic, Oko Anambra State Nigeria.

Corresponding author: ogbuonyinyeac@gmail.com

ABSTRACT

The aim of the study was to evaluate the effect of *Moringa olerifera* leaf and seed extracts on the growth physiology of male turkeys. A total of 36 turkeys of about 8 – 9 weeks were used. There were nine turkeys per treatment groups, grouped as; T₁ (control) T₂ (1% leaf w/v) T₃ (0.5% leaf and 0.5% seed w/v) and T₄ (1% w/v) Each group was replicated three times with three turkeys per replicate. The study lasted for 154 days with all routine management practices duly observed. Data were collected from body weight gain, feed intake, feed conversion efficiency, carcass cut part weight, visceromatic index on the internal organ weights. The result of the experiment showed that, average final body weights were improved significantly ($P < 0.05$) by the administration of *Moringa* extracts with T₄ (6.20 ± 0.02^a) having the highest weight. Feed efficiency was also better ($P < 0.05$) among the *Moringa* administration group than the control with the T₄ (3.90 ± 0.00^c) been most efficient. The viscera-somatic index differed significantly ($P < 0.05$) in the mean percentage size of the pancreas, gizzard and gall bladder only, but did not take adequate pattern that can be attributed to the *Moringa*. The cut parts were greater ($P < 0.05$) quarter thigh weight(kg) and asymmetry half carcass cut(kg) which are prime cut parts. These differences were higher among the *Moringa* extract group. In conclusion, *Moringa* seed and leaf extracts improved the growth on male local turkeys with the leaf extract alone (T₄ 1% w/v) giving the best results.

Key words: Turkey, Growth, Extracts.

INTRODUCTION

The local turkeys in Nigeria are gradually becoming endemic. The poultry population in the country is estimated at 104.3 million comprising 72.4 million chickens, 11.8 million ducks, 4.7 million fowl, 15.2 million pigeon and only 0.2 million turkeys (FDLPCS 1992). Despite the quick return rate to investment, turkey production has not been as successful as chicken production. Its production in Nigeria is largely on a backyard small scale level. Therefore to improve this, there is need for additives preferably natural ones that can improve maturation rate so as to generate, quicker returns to investment. *Moringa olerifera* plants are loaded with lots of chemicals like phenols substances, antioxidants, vitamins, minerals and earth rare metals found to improve general well-being. *Moringa* leaf extract has been used to check growth performance apparent digestibility of broiler chicken (Alshukri *et al.*, 2018). Khan *et al.*, (2017) have studied the effect of *Moringa olerifera* leaf powder supplements on growth rate as well as intestinal morphology of broiler chickens and had a positive observation. Hence, using both the leaf and seed of *Moringa olerifera* on local male turkeys will bring to lime light a serious improvement in the turkey production industry.

MATERIALS AND METHODS

The experiment lasted for 154 days. It was approved and supervised by the Michael Okpara University of Agriculture Umudike (CASAP) Research and Experiment committee and was carried out at the Poultry unit of Chirex Agro Services Limited in Abakuru, Ohaji-Egbema Local Government Area of Imo State Nigeria.

Collection and Preparation of experimental material

The freshly harvested leaves and seeds were sorted to remove contaminants sand particles and dead matter. They were shade dried in an open well ventilated room for about one week at room temperature. The seeds and the foliage were ground separately into power and stored in separate clean dry containers. Treatment one (T₁) was the control group with no *Moringa* powder. One gram of the seed powder was diluted in 1000mls of clean water, sieved with cheese cloth and served as drinking water for treatment two (T₂). Treatment three (T₃) had 0.5g of leaf powder and 0.5g seed powder diluted with 1000mls of clean water sieved with cheese cloth and served as drinking water. One gram of the leaf powder was

diluted in 1000mls of clean water, sieved with cheese cloth and served as drinking water for treatment four (T₄).

Experimental animals and their management

Thirty six (36) local male strains of turkeys of white, black and lavender plumage averagely eight (8) weeks old were used for the study.

The local turkeys were procured from a reputable farm, in Ikenga, Aguata Local Government Area in Anambra State. Before commencement of the experiment, the local turkeys were quarantined and allowed to acclimatize for 14 days in the Poultry unit. During the acclimatization period, the turkeys were given routine management practices which included deworming with Ivermectin solution (1%w/v) against endo and ecto parasites. Suitable vaccinations for their age was also given prior to the commencement of the experiment. The 36 male turkeys were randomly allotted into treatments. There were four (4) treatments in all with nine (9) turkeys per treatment. Each treatment group was replicated three times to contain three (3) turkeys per replicate. The treatment groups were administered 0 gram of *Moringa* (T₁), 1 gram of *Moringa* seed alone (T₂) combination of 0.5g of *Moringa* seed and 0.5gram of *Moringa* leaf (T₃) and lastly 1 gram of *Moringa* leaf alone (T₄). Experimental material was given to the male turkeys at 10 weeks of age. The treatment was administered to the turkeys via drinking water between hours of 7am to 10am after which they were given clean drinking water throughout the rest of the day. The turkeys were given commercial feed during the first 14 weeks of the experiment. From 24 weeks of age formulated ration in Table 3.1 was used. The feed sample was determined to ensure quality assessment in Table 3.1 by livestock feeds Plc with the aid of the apparatus; DA1650 near infra-red Spectrophotometer.

Table 1: Feed Formula for the Experimental Diet

Ingredients		(%)
Groundnut		21.00
Fish meal		2.00
Maize		35.00
Wheat offal		37.00
Bone meal		2.50
Oyster shell		1.50
Methionine		0.25
Lysine		0.25
Salt		0.25
Vitamin Mineral	Premix	0.25
Total		100
Determined values		
Crude protein	-	19.85
Crude fibre	-	7.44
Fat	-	5.01
Moisture	-	8.28
Ash	-	6.99
Energy	-	3018.8 kcal/kg

Vitamins and trace mineral declaration: 2.5kg of premix contains.

Vitamin A (I μ) 12,500.00, Vitamin D₃ (i μ) 2,500,000.00, vitamin E (mcg) 40,000.00, Vitamin K₃ (mg) 2,000.00, vitamin B (mg) 3,000.00, vitamin B₂ (mg) 5,500, vitamin B₆ (mg) 5,000, Nicocin (mg) 55,000.00, calcium pantothenate (mg) 11,500.00, Vitamin B₁₂ (mg) 25,000, Chlorine Chloride (mg) 500,000.00, Folic acid (mg) 1,000.00, Biotin (mg) 80.00, Manganese (mg) 120,000.00, Iran (g) 100,000.00, Zinc (mg) 80,000.00. Copper (mg) 8,500.00, Iodine (mg) 1,500.00, Cobalt (mg) 300.00, Selenium (mg) 120.00, Antioxidant (mg) 120,000.00.

Experimental Design

The experiment was completely randomized design (CRD). It consisted of four treatments; T₁, T₂, T₃ and T₄ containing 0g, 1g of seed, combination of 0.5g of seed and 0.5g of leaf and 1gram of leaf, respectively. There were nine male turkeys in each treatment with 3 replicates of 3 turkeys per replicate.

Data collection

Growth performance

Daily feed intake was measured by weighing the quantity of feed given to the turkeys and their left over with the Dana weighing scale. The initial body weight was taken before the commencement of the experiment and final body weights taken at the end of the study. These data were used to calculate;

$$\text{Daily weight gain} = \frac{\text{final body weight} - \text{initial body weight}}{\text{number of turkey per treatment} \times \text{number of days}}$$

$$\text{Feed efficiency} = \frac{\text{Quantity of feed consumed}}{\text{weight gained}}$$

$$\text{Weight gain} = \text{final body weight} - \text{initial body weight}$$

Carcass evaluation

Three turkeys from each treatment was scarified at the end of the experiment. The carcass was carefully sectioned into parts thigh, shank, and head, quartered and symmetrical half body measurements were weighed with the aid of Dana weighing scale. While their lengths were measured with tape rule. The internal organs (liver, heart, kidney, lungs, gizzard, bile, large, intestine and small intestine were weighed using Ohaus electronic scale.

Data analysis

Data collected were subjected to analysis of variance using SAS (2008).

RESULTS AND DISCUSSION

Growth performance

The growth performance of male local turkeys administered aqueous *Moringa* extracts is shown in Table 2.

Table 2: Mean values of growth parameters of male turkeys administered aqueous extract of *Moringa* leaves and seeds

Parameters	T ₁	T ₂	T ₃	T ₄
Average Initial Body weight (kg)	0.70 ± 0.04	0.70 ± 0.01	0.70 ± 0.03	0.70 ± 0.00
Average Final body weight (kg)	5.80 ± 0.03 ^c	6.07 ± 0.36 ^b	6.02 ± 0.04 ^b	6.20 ± 0.02 ^a
Weight gain (g)	5103 ± 0.03 ^d	5407 ± 0.00 ^b	5307 ± 0.00 ^c	5503 ± 0.03 ^a
Daily weight gain (g)	28.60 ± 0.03 ^c	29.70 ± 0.03 ^b	29.70 ± 0.00 ^b	30.20 ± 0.03 ^a
Daily feed intake (g)	120.41 ± 0.02	118.50 ± 0.001	118.21 ± 0.002	117.78 ± 0.00
Dressing percentage (%)	87.93 ± 0.58 ^b	91.80 ± 0.58 ^a	91.67 ± 0.58 ^a	93.55 ± 0.58 ^a
Feed efficiency	4.21 ± 0.00 ^a	3.99 ± 0.00 ^b	3.98 ± 0.00 ^b	3.90 ± 0.00 ^c

Means with different superscripts ^{a, b, c} or ^d on the same row are significantly different (P<0.05).

The mean values of growth parameters of male turkeys administered aqueous extracts of *Moringa oleifera* leaves and seeds are shown in Table 2.2. There were significant differences (P<0.05) between the

treatments for the final body weight, weight gain, feed conversion ratio and daily weight gain. The mean final body weight was highest in T₄ (leaf extracts) 6.19 ± 0.02kg followed by T₂ (seed extracts) 6.07± 0.04kg, and T₃ (seed and leaf extracts) 6.02 ± 0.04kg, compared with T₁ (control) 5.84± 0.03kg. The mean weight gain was highest among the *Moringa* treated turkeys (T₄ 5.50 ± 0.03; T₂ 5.41± 0.00 and T₃ 5.31± 0.00kg) than the control treatment (T₁ 5.10± 0.03) kg.

The mean daily weight gain was also significantly higher ($P < 0.05$) in T₄ 30.20±0.00g, T₃ 29.70± 0.03g and T₂ 29.70± 0.33g than T₁ 28.60g± 0.03g. The feed conversion ratio was significantly ($P < 0.05$) lower among the treatment groups administered aqueous *Moringa* leaf and seed extract (T₄ 3.91± 0.00; T₃ 3.98±0.00 and T₂ 3.99±0.03) when compared with the control (T₁ 4.21±0.00).

The results suggest that *Moringaoleifera* improved the growth rate of male turkeys in this study. This could be due to high protein content of *Moringaoleifera* which is advantageous in poultry (Dong *et al.*, 2007; Krauze and Grela, 2016). This finding collaborates with the results of Nkukwana *et al.* (2014); Khan *et al.* (2017) and Sun *et al.* (2017) on the benefits of *Moringaoleifera*.

This improvement in weight gain could also be attributed to the nutrients and contents of the administered extracts which according to Sowande *et al.* (2008) is the basis for improved productivity. The increase in daily weight gain was significantly higher ($P < 0.05$) in the leaf extract treatment group than in the combined seed and leaf as well as seed extracts alone. This advantage may be due to the anti-nutrients like saponins found in *Moringa* which Francis *et al.* (2002) reported to have inhibitory properties. The leaves of *Moringa* according to Ferreira *et al.* (2008) are good sources of highly digestible protein. This could be the reason for their higher weight gain and better dressing percentage on T₄.

The mean values of feed efficiency (FE) were significantly lower in the *Moringa* extract administered treatments. Ogbonna *et al.* (2002) noted that low feed efficiency (FE) value is a measure of superiority of the treatment. There was higher weight gain and lower FE values among the local male turkeys administered aqueous *Moringa* leaf extracts. These facts therefore make T₄ the preferred treatment of choice among the groups.

Viscero-somatic index of male turkeys administered aqueous *Moringa* leaf and seed extracts

Viscero-somatic index of male turkeys administered aqueous *Moringa* leaf and seed extracts is shown in Table 3.

Table 3: The mean values of viscero-somatic index of male turkeys administered aqueous *Moringa* leaf and seed extracts

Parameter (%)	T ₁	T ₂	T ₃	T ₄
Live Weight	5.10 ±0.35	5.50±0.23	5.40±0.06	5.60±0.23
Spleen	0.06±0.04	0.06±0.01	0.05±0.01	0.06±0.01
Pancreas	0.14±0.01 ^a	0.12±0.00 ^{ab}	0.15±0.00 ^a	0.10±0.00 ^b
Heart	0.48±0.05	0.41±0.01	0.46±1.00	0.34±0.04
Kidney	0.32±0.02	0.39±0.04	0.38±0.03	0.31±0.04
Liver	1.41±0.02	1.51±0.16	1.57±0.18	1.22±0.08
Lungs	0.52±0.05	0.55±0.05	0.61±0.08	0.52±0.04
Gizzard	2.96±0.02 ^a	2.55±0.01 ^{ab}	2.56±0.12 ^b	2.36±0.01 ^c
Small Intestine	2.26±0.16	2.24±0.03	2.22±0.14	1.93±0.09
Large Intestine	0.87±0.03	0.82±0.10	0.78±0.12	1.00±0.19
Gall bladder	0.10±0.04 ^a	0.03±0.01 ^b	0.04±0.00 ^{ab}	0.06±0.00 ^{ab}

Means with different superscripts ^{a, b, c} or ^d on the same row are significantly different ($P < 0.05$).

The mean values of viscero-somatic index of male turkeys administered aqueous *Moringa* leaf and seed extracts are shown in Table 3.

There were significant differences ($P<0.05$) in the mean percentage sizes of the pancreas, gizzard and gall bladder while the heart, kidney, liver, lungs, small intestine and large intestine did not differ significantly among the treatments.

The pancreas which performs dual function; digestion as well as to regulate blood sugar (Widmaier *et al.*, 2004), differed significantly ($P<0.05$) with T_1 (control $0.14 \pm 0.01\%$) and T_3 ($0.15 \pm 0.00\%$) been higher than T_2 ($0.12 \pm 0.00\%$) then T_4 (0.10 ± 0.00) as the least. The abnormal increase in size of the pancreas in the treatment T_1 may be attributed to the high level of glucose seen in this study on T_1 . Small sized of pancreas may mean that the pancreas was not over stressed trying to metabolise and digest micronutrient of digestion as was seen in T_4 . The size of gizzard differed significantly ($P<0.05$) among the Turkeys administered *Moringa* leaf and seed extracts. The *Moringa* extract groups had the significantly small sized gizzard which may have resulted due to the degrading effect of the aqueous extract on the feed particles thereby facilitating fast digestion rate of feeds. This affirms the reports of Amerahet *et al.* (2009) that coarse feed particles normally stimulate constriction of the gizzard, which affects its development and increases the size. This increase in size as a result of over work to augment the shortage or ameliorate the effect of excess supply of fiber was not witnessed among the *Moringa* groups.

There were significant differences ($P<0.05$) on the gall bladder size among the Turkeys administered *Moringa* leaf and seed extracts. The bile aids in emulsification of fat. Decreasing size of the bile organ could be attributed to the fact that extracts from *Moringa* aids degradation as well as emulsification of fats thereby reducing the work load of the gall bladder in secreting bile salt thus enhancing its functionality especially in the leaf extract treatment group as against the control group that had the biggest increase in gall bladder size.

Carcass parameters of male turkeys

Table 4: The mean values of cut parts of male turkeys administered *Moringa* leaf and seed extracts

Parameter	T_1	T_2	T_3	T_4
Dressed weight (kg)	5.10 ± 0.35	5.50 ± 0.23	5.75 ± 0.14	5.60 ± 0.23
Thigh Length (cm)	21.85 ± 0.32^a	17.85 ± 0.43^b	15.55 ± 0.43^c	18.00 ± 0.12^b
Thigh Width (cm)	17.60 ± 0.92	17.40 ± 0.52	17.80 ± 0.75	17.25 ± 1.13
Shank Length (cm)	11.65 ± 0.66	12.03 ± 0.03	11.60 ± 0.23	11.90 ± 0.06
Breast length (cm)	18.33 ± 0.17	18.45 ± 0.26	18.00 ± 0.12	18.15 ± 0.87
Back length (cm)	18.33 ± 0.17	18.45 ± 0.26	18.00 ± 0.12	18.15 ± 0.87
(Head to rum)				
Head Weight (g)	119.00 ± 0.58^b	126.50 ± 5.48^b	143.50 ± 0.87^a	124.05 ± 2.92^b
Paired shank weight (g)	106.50 ± 15.88^b	136.00 ± 5.20^a	126.50 ± 0.87^{ab}	147.00 ± 3.46^a
Neck weight (g)	525.00 ± 14.43	540.50 ± 23.38	445.00 ± 10.39	537.50 ± 108.83
Quarter wing weight (kg)	0.90 ± 0.00	0.93 ± 0.04	0.93 ± 0.04	1.000 ± 0.06
Quarter thigh weight (kg)	1.03 ± 0.01^b	1.15 ± 0.06^a	1.08 ± 0.02^{ab}	1.10 ± 0.29^{ab}
Half carcass symmetry (kg)	2.02 ± 0.02^{ab}	2.02 ± 0.09^{ab}	1.98 ± 0.01^b	2.15 ± 0.03^a

Means with different superscripts ^{a, b, c} or ^d on the same row are significantly different ($P<0.05$).

The mean values of cut parts of male turkeys administered *Moringa* leaf and seed extracts are shown in Table 4.4. The thigh length, thigh weight, head weight, paired shank weight quartered thigh weight and half carcass symmetrically differed significantly ($P < 0.05$). However dressed weight, thigh width, shank length, breast length, back length, neck weight as well as quartered wing weight did not differ significantly ($P < 0.05$). From these results, the quartered thigh (kg) which is a prime meat cut differed significantly among the treatment groups with things of turkeys exposed to *Moringa* extracts having bigger weights ($P < 0.05$) compared with the control. This therefore implies that *Moringa* promoted muscle weight gain which may be due to the fact that it is rich in easily digestible protein found in the leaves (Ferreira *et al.*, 2008), thus making the leaf extracts a better option when muscle building in male turkeys is desired.

In conclusion, *Moringa* seed and leaf extracts improved the growth on male local turkeys with the leaf extract alone (T4 1% w/v) giving the best results.

REFERENCES

- Amerah, A. M., Ravindran, V. and Lentle, R. C. 2009.** Influence of insoluble fibre and whole wheat inclusion on the performance digestive tract development and ideal micobita profile of broiler chickens. *British Poultry Science*, 50: 366 - 375.
- Alshukri, A.Y., Ali, A., Rabia, J., Alkassar, A.M. and Jameel, Y. J. 2018.** N. Effect of Dietary supplementation with different levels of *Moringaoleriferameal* on the productivity and carcass characteristics of broiler chickens. *International Journal of Poultry Science*, 17: 536-542.
- Dong, X.F., Gao, W.W., Tong, T.M., Jia, Q.H., Sa, R.N. and Zhang, Q. 2007.** Effect of Polysavone (alfalfa extract) on abdominal fat deposition and immunity in broiler chickens. *Poultry Science*, 86: 1955-1959.
- FDLPSCS 1992.** Federal Department of livestock Pest control services. Nigerian National Livestock survey Aburu, Nigeria.
- Ferreira, P. M. P., Farias, D. F., Oliveira, J. A. and Carvalho, F. U. 2008.** *Moringaoleifera*: bioactive compound and nutritional potential (Review), 21(4): 33 - 48.
- Francis, G., Kerem, Z., Makkar, H. P.S. and Becker, K. 2002.** The biological actions of saponins in animal systems: a review. *British Journal of Nutrition*, 88: 587 - 605.
- Khan, I., Zaneb, H., Masood, S., Yusuf, M.S. Rehan, H.F. and Rehman, H. 2017.** Effect of *Moringaolerifera* leaf powder supplementation on growth performance and intestinal morphology in broiler chickens. *Journal of Animal Physiology and Animal Nutrition*, 101(51): 126-134.
- Nkukwana, T., Muchenja, V., Pieterse, E. and Dzoma, K. 2014.** Effect of *Moringaolerifera* leaf meal on growth performance, apparent digestibility, digestive organ size and carcass yield in broiler chickens. *Journal of Livestock Science*, 161: 139-146.
- Ogbonna, I. U., Oredein A. O. and Adeshinwa, A. O. K. 2002.** Effect of replacing groundnut cake with raw soybeans residue on diet in performance and nutrient digestibility of cockerel chicks; A preliminary study. *Nigeria Poultry Science Journal*, 1: 2.
- SAS, 2008.** Statistical Analysis System, SAS users guide: statistics. SAS institute inc. Cary N.C. USA
- Sowande, O. S., Aina, A. B. J., Oguntona, E. B., Fanimu, A. O., Unaka, V. U., Hassan, T. A. and Oseni, M. O. 2008.** Performance Blood chemical constituents and mineral balance of West Africa dwarf sheep fed preserved elephant grass, layer's droppings and cassava peel during dry season. *Nigeria Journal of Animal Production*, 35(1): 90 - 102.
- Sun, B., Zhang, Y., Ding, M., Xi, Q., Liu, G., Li, Y. Liu, D. and Chen, Y. 2017.** Effect of *Moringaolerifera* leaves as a substitute for alfalfa meal on nutrient digestibility, growth performance, carcass trait, meat quality, antioxidant capacity and biochemical parameters of rabbits. *J of Animal Physiology and Animal Nutrition*, 102:1.
- Widmaier, E.P., Ruff, H. and Strang, K. T. 2004.** Vand, Sherman and Luciano's Human physiology the mechanisms of body functions McGraw Hill Publishers. pp 563-600.