

Correlation between body weight and morphometric traits in local and exotic chickens to dietary levels of *Moringa oleifera* (Lamarck) seed meal

¹Akintunde, A. O., ²Toye, A. A., ²Ademola, A. A. and ³Jubril, A. E.

¹Department of Agriculture & Industrial Technology, Babcock University, Ilishan-Remo, Ogun State, Nigeria.

²Department of Animal Production, University of Ilorin, Ilorin, Nigeria.

³Department of Animal Science, University of Abuja, Abuja, Nigeria.



Corresponding author: yinkaoye2k3@yahoo.com, ayo.toye@btinternet.com

Abstract

Moringa oleifera (Lamarck) seed is a novel feedstuff that can be incorporated into poultry nutrition and a potential cheaper alternative than the current conventional feedstuff in Nigeria. The aim of the study was to determine the effect *Moringa oleifera* seed meal (MOSM) on the relationship between body weight and body morphometric parameters of local and exotic chickens. The total sum of one hundred and ninety two chickens comprising of ninety six Nigerian Ecotype local chickens and Marshall broiler chickens in four dietary treatments with three replicates (of eight birds per replicate for each genotype of chicken) per treatment. Four experimental diets containing 0, 5, 10 and 15 % MOSM were used. Data were analyzed using the Pearson Correlation model. The study showed that the association between morphometric parameters and body weights decreased significantly ($p < 0.05$) with increasing levels of MOSM (r decreased from 0.72 to 0.52) however all the associations were positive which signified that the inclusion of MOSM influenced the level of relationship between body weight and body morphometric parameters. This study concluded that 5% dietary inclusion of MOSM would improve growth performance in YENLC and Marshall broiler chickens.

Keywords: Nigerian Ecotype local chickens, Marshall broiler chickens, morphometric parameters

Introduction

Recently, there has been interest in the utilization of *Moringa oleifera* commonly called horseradish tree or drumstick tree, as a protein source for livestock (Makkar and Becker, 1997; Sarwatt *et al.*, 2002). *Moringa oleifera* has quality attributes that make it a potential replacement for soyabean meal or fish meal in non-ruminant diets. *Moringa oleifera* can easily be established in the field, has good coppicing ability, as well as good potential for forage production. Sarwatt *et al.* (2004) reported that *Moringa oleifera* foliages are potential inexpensive protein sources for livestock feeding. The advantages of using *Moringa oleifera* for a protein resource are numerous, and include the fact that it is a perennial plant that can be harvested several times in one growing season and

also has the potential to reduce feed cost. *Moringa oleifera* is in the group of high-yielding nutritious browse plants with every part having food value (Duke, 1998). The effect of MOSM on body parameters was necessary as it is established that diets influenced the phenotypic expressions of different genotypes of chickens. However, body weight of chicken is a phenotypic expression of their genetic make-up under prevailing environmental condition and feeding regime. It is established that body weight plays a pivotal role in the marketability of chickens. Variations in the body weight within a flock can be ascribed to variation in the genetic make-up and environmental condition (diet composition/quality inclusive) (Fayeye and Owoeye, 2016). For effective livestock characterization as it relates to different

Correlation between body weight and morphometric traits in local and exotic chickens

genotypes, the evaluation of body size and conformation are highly important as reported by Ibe (1989). Morphometric or qualitative analyses of form, structure, shape and size of an animal were reported useful in contrasting, size and shape of animals (Ajayi *et al.*, 2008). Morphometric indices would also point to the potentials of some body parts and the impact of genotype on these parameters when fed graded level of MOSM. Phenotypic correlation between body weight and morphometric traits of different genotypes and the impact of MOSM on these traits could help in the selection programme and also the developmental response of different genotype to the same diet under the similar environmental condition. The study thus evaluated the effects of dietary inclusion of *Moringa oleifera* Seed Meal (MOSM) on the correlation between body weight and morphometric body parameters of local and exotic chickens.

Materials and methods

The study was carried out at the Livestock Section of the Teaching and Research Farm of the Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan. The city has coordinates of 70 24' 7.0632" N and 30 55' 2.3268" E. The test ingredient, *Moringa oleifera* seed, was sourced from Kaduna metropolis. The seeds were air dried at room temperature after which the meal was prepared. The seeds of *Moringa oleifera* were then milled and incorporated into the chickens' diets in appropriate proportion. The eggs of Yoruba Ecotype Nigeria Local Chickens (YENLC) were sourced from Ayede and Erunmu environments in Egbeda Local Government, Oyo State and hatched at Bronco Hatchery, Oluyole Extension, Ibadan. Marshall broiler chicks were sourced from Obasanjo Farm, Ibadan, Oyo State.

Ninety-six Marshall broiler chicks and

ninety-six YENLC of mixed sexes were randomly allotted to four dietary treatments containing graded levels of MOSM: 0% (diet 1), 5% (diet 2), 10% (diet 3), 15% (diet 4) fed independently to the broiler chicks and local chickens such that each treatment comprised of three replicates of eight birds each in a 2 x 4 factorial design. The experimental animals were weighed before feeding at the commencement of the feeding trial and every 7 days thereafter until the end. The experiment lasted for eight weeks. The morphometric indices were determined to enable the comparative studies between the exotic and the local chickens. Linear body measurements - shank length (SL), thigh length (TL), keel length (KL), body girth (BG), wing length (WL) and body length (BL) were determined. Pearson correlations between body weight and morphometric quality traits were assessed for the two genotypes of chickens and the four graded levels of MOSM for all the chickens irrespective of the genotypes using SPSS Version 20 (2012).

Results and discussion

There were positive correlations between the body weights and all the morphometric indices measured. There was low and no significant ($p > 0.001$) relationship between body weight and wing length, shank length, body length, keel length and body girth in YENLC (Table 1). There were high positive significant ($p < 0.001$) relationship between body girth and body length ($r=0.757$) and thigh length and body length ($r=0.702$) for Marshall Broilers (Table 2). There were positive correlations between the body weights and all the morphometric indices measured. However, there were high positive significant ($p < 0.001$) relationship between all the morphometric parameters and body weights of birds YENLC and Marshall Broilers fed then control diet (0% MOSM). (Table 3) while it was observed that there were positive correlations

between the body weights and all the morphometric indices measured. However, there were high positive significant ($p < 0.001$) relationship between all the morphometric parameters and body weight of birds YENLC and Marshall Broilers fed with diets with 5% MOSM. (Table 4). The relationship however compared well with the control (0% MOSM). Also, there were positive correlations between the body weights and all the morphometric indices measured for birds fed 10% MOSM. However, there were high positive significant ($p < 0.001$) relationship between all the morphometric parameters and body weights of birds YENLC and Marshall Broilers fed with diets with 10% MOSM except with body length and keel length with significant ($p < 0.01$) low positive correlation coefficient ($r = 0.482$), (Table 5). However, when compared with the control

(0% MOSM), the association between body length and keel length and keel length and thigh length decreased from high to medium.

There were positive correlations between the body weights and all the morphometric indices measured for birds fed 15% MOSM (Table 6). However, there were high positive significant ($p < 0.001$) relationship between all the morphometric parameters and body weights of birds YENLC and Marshall Broilers fed with diets with 10% MOSM except with body length and keel length with significant ($p < 0.01$) low positive correlation coefficient ($r = 0.482$). When compared with the control (0% MOSM), the association between body length and body weight and body girth and body weight reduced from high to medium while MOSM at 15% in the diet strengthened the relationship between keel length and wing length.

Table 1: Phenotypic Correlations between body parts and body weight of YENLC

| | BW | TL | WL | SL | BL | KL | BG |
|----|--------|---------|---------|---------|-------|---------|----|
| BW | 1 | | | | | | |
| TL | 0.301* | 1 | | | | | |
| WL | 0.225 | 0.653** | 1 | | | | |
| SL | 0.207 | 0.645** | 0.623** | 1 | | | |
| BL | 0.115 | 0.644** | 0.479** | 0.507** | 1 | | |
| KL | 0.138 | 0.244* | 0.298* | 0.350** | 0.062 | 1 | |
| BG | 0.197 | 0.455** | 0.306* | 0.331** | 0.217 | 0.587** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

Table 2: Phenotypic Correlations between body parts and body weight of Marshall broiler chickens

| | KL | BG | BW | TL | WL | SL | BL |
|----|---------|---------|---------|---------|---------|---------|----|
| KL | 1 | | | | | | |
| BG | 0.418** | 1 | | | | | |
| BW | 0.199 | 0.668** | 1 | | | | |
| TL | 0.218* | 0.651** | 0.470** | 1 | | | |
| WL | 0.203 | 0.533** | 0.355** | 0.608** | 1 | | |
| SL | 0.556** | 0.678** | 0.456** | 0.506** | 0.366** | 1 | |
| BL | 0.332** | 0.757** | 0.573** | 0.702** | 0.514** | 0.588** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

Correlation between body weight and morphometric traits in local and exotic chickens

Table 3: Phenotypic correlations between body parts and body weight of YENLC and Marshall broiler chickens fed 0% MOSM

| | BW | TL | WL | SL | BL | KL | BG |
|----|---------|---------|---------|---------|---------|---------|----|
| BW | 1 | | | | | | |
| TL | 0.816** | 1 | | | | | |
| WL | 0.855** | 0.874** | 1 | | | | |
| SL | 0.793** | 0.857** | 0.736** | 1 | | | |
| BL | 0.879** | 0.885** | 0.828** | 0.835** | 1 | | |
| KL | 0.722** | 0.781** | 0.665** | 0.871** | 0.764** | 1 | |
| BG | 0.923** | 0.912** | 0.888** | 0.869** | 0.936** | 0.811** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

Table 4: Phenotypic Correlations between body parts and body weight of YENLC and Marshall broiler chickens fed 5% MOSM

| | BW | TL | WL | SL | BL | KL | BG |
|----|---------|---------|---------|---------|---------|---------|----|
| BW | 1 | | | | | | |
| TL | 0.720** | 1 | | | | | |
| WL | 0.703** | 0.850** | 1 | | | | |
| SL | 0.803** | 0.868** | 0.859** | 1 | | | |
| BL | 0.811** | 0.891** | 0.871** | 0.928** | 1 | | |
| KL | 0.728** | 0.797** | 0.841** | 0.869** | 0.879** | 1 | |
| BG | 0.829** | 0.840** | 0.840** | 0.933** | 0.906** | 0.910** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

Table 5: Phenotypic Correlations between body parts and body weight of YENLC and Marshall broiler chickens fed 10% MOSM

| | BW | TL | WL | SL | BL | KL | BG |
|----|---------|---------|---------|---------|---------|---------|----|
| BW | 1 | | | | | | |
| TL | 0.778** | 1 | | | | | |
| WL | 0.707** | 0.806** | 1 | | | | |
| SL | 0.753** | 0.733** | 0.818** | 1 | | | |
| BL | 0.624** | 0.870** | 0.768** | 0.706** | 1 | | |
| KL | 0.782** | 0.566** | 0.741** | 0.826** | 0.482** | 1 | |
| BG | 0.837** | 0.818** | 0.807** | 0.787** | 0.706** | 0.794** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

Table 6: Phenotypic Correlations between body parts and body weight of YENLC and Marshall Broilers fed 15% MOSM

| | BW | TL | WL | SL | BL | KL | BG |
|----|---------|---------|---------|---------|---------|---------|----|
| BW | 1 | | | | | | |
| TL | 0.745** | 1 | | | | | |
| WL | 0.748** | 0.900** | 1 | | | | |
| SL | 0.699** | 0.877** | 0.952** | 1 | | | |
| BL | 0.524** | 0.795** | 0.762** | 0.756** | 1 | | |
| KL | 0.662** | 0.751** | 0.812** | 0.814** | 0.712** | 1 | |
| BG | 0.641** | 0.813** | 0.816** | 0.812** | 0.689** | 0.876** | 1 |

BW – Body Weight, TL - Thigh Length, WL – Wing Length, SL – Shank Length, BL – Body Length, KL – Keel Length, BG – Body Girth

The high correlation between body weight and morphometric measurement was in support with the report of Fayeye and Owoeye (2016) and Yahaya *et al.* (2012) who reported high correlation coefficients Isa Brown and Fulani Ecotype chickens and Hubbard and Arbor Acre broiler strains. The knowledge and information on morphometric parameters are highly essential for understanding an animal and its reproductive biology in particular (Ojedapo *et al.* 2012). The result was also in agreement with the report of Ojedapo *et al.* (2012) who reported that growth traits showed increase in all body measurements as growth line. It also agreed with the report of Pingel *et al.* (1990) that these morphometric relationships could be utilized for the genetic improvement of growth.

Conclusion

There were high positive correlations ($p < 0.01$) among the parameters in 0% and 5% MOSM inclusion, however at 5%, the association between body length and keel length and thigh length decreased from high to medium. At 15% MOSM, the association between body length and body weight and body girth and body weight reduced from high to medium. It is therefore recommended that feeding both genotypes of chickens - YENLC and Marshall broilers up to 5% MOSM would further improve the growth parameters.

References

- Ajayi, F. O., Ejiofor, O. and Ironkwe, M. O. 2008. Estimation of body weight from body measurements in two commercial meat type chicken. *Global Journal of Agricultural Science*, 7(1): 57-59.
- Duke, A. J. 1998. *Moringaceae*. Handbook of energy crops. Available: http://www/hort.purdue.edu/newcrop/duke_energy/morin ga. htm. Accessed on 04/05/2008
- Fayeye, T. R. and Owoeye, M. F. 2016. Correlation between body weight and morphometric traits in Isa Brown and Fulani ecotype chickens in Southern Guinea Savannah of Nigeria. *Gashua Journal of Irrigation and Desertification Studies*, Vol. 2. No. 2.
- Ibe, S. N. 1989. Measurement of size and conformation in commercial broilers. *Journal of Animal Breeding and Genetics*, 106: 461-469.
- Makkar, H. P. S. and Becker, K. 1997. Nutrients an antiquality factors in different morphological parts of the *Moringa oleifera* tree. *J. Agric. Sci.* 128:311-322.
- Ojedapo, L. E., Amao, S. E., Ameen, S. A., Adedeji, T. A., Ogundipe, R. I. and Ige, A. O. 2012. Prediction of Body Weight and other Linear Body Measurement of Two Commercial Layer Strain Chickens. *Asian Journal of Animal Sciences*, 6: 13-22.
- Pingel, H., Schneider, K. H. And Birla, M. 1990. Factors affecting meat quality in broilers. *Tierzucht*, 44(7): 300–301.
- Sarwatt, S. V., Kapange, S. S. and Kakengi, A. M. 2002. Substituting sunflower seed cake with *Moringa oleifera* leaves as supplemental goat feed in Tanzania. *Agro-forestry systems*, 56: 241-247.
- Sarwatt, S. V., Milang'ha, M. S., Lekule, F. P. and Madalla, N. 2004. *Moringa oleifera* and cotton seed cake as supplements for smallholder dairy cows fed Napier grass. *Livestock research for rural development*. Vol. 16 Art. # 38. <http://www.cipac.org.co/Irrd16/6/sarw16038.htm> Accessed on

Correlation between body weight and morphometric traits in local and exotic chickens

01/02/2006.

Yahaya, H. K., Ibrahim, H. and Abdulsalam, S. 2012. Correlation between body weight and body conformation of two broiler strains under the same dietary treatment. *International Journal of Animal and Veterinary Advances*, 4(3): 181-183.

Received: 10th November, 2019

Accepted: 17th February, 2020