

## Sexual dimorphism and phenotypic correlations among growth traits of exotic turkey (*Meleagris gallopavo*)

<sup>1</sup>Adeoye, A. A. and <sup>2</sup>Oladepo, A. D.



<sup>1</sup>Animal Production and Health, Ondo State University of Science and Technology, Okitipupa.

<sup>2</sup>Agricultural Science, Adeyemi College of Education, Ondo

e-mail address: [adeomoh@yahoo.com](mailto:adeomoh@yahoo.com); Phone No. 08138273174

### Abstract

*This study was conducted to determine sexual dimorphism and phenotypic correlations among growth traits of six month old exotic turkeys raised at the Turkey Unit, Teaching and Research Farm of Ondo State University of Science and Technology, Okitipupa. Bodyweight, shank length, thigh length, body length, wing length, wing span and breast girth for Meleagris gallopavo (female and male) were measured using standard methods. Data collected on 102 exotic turkeys comprised of 61 female and 41 male were subjected to analysis of variance and Pearson's correlation. Bodyweight, shank length, thigh length, body length, wing length, wing span and breast girth for females were 8.16 kg, 8.31 cm, 22.29 cm, 68.47 cm, 32.93 cm, 73.65 cm and 57.24 cm respectively, while the corresponding values for males were 8.84 kg, 9.97 cm, 23.40 cm, 76.27 cm, 35.87 cm, 80.27 cm and 60.20 cm. The effect of sex on the variables was significant ( $p < 0.05$ ) except on bodyweight and thigh length. The bodyweight and thigh length were numerically higher in males (8.84 and 23.40) and lower values observed in females (8.16 and 22.29). The correlation coefficients were all positive for both sexes except in females where the correlation between bodyweight and shank length was negative (-0.031). Among the males the correlation coefficients ranged between 0.447 and 0.859 while in the females it ranged between -0.031 and 0.539. Sexual dimorphism was displayed virtually in all the variables considered and in a similar trend bodyweight could be predicted virtually by all the linear body measurements considered.*

**Keywords:** Sexual dimorphism, phenotypic correlation, bodyweight, shank length, thigh length

### Introduction

Poultry is now by far the largest livestock species worldwide (FAO, 2000), accounting for more than 30% of all animal protein. Turkey is either of two species of birds in the family *Meleagrididae* (order *Galliformes*). The best known is the common turkey (*M. gallopavo*), a native game bird of North America but widely domesticated for the table. Turkey is not common among poultry growers in Nigeria: a number of farms are beginning to breed the bird at commercial level owing to increasing interest as a provider of meat complementing chicken. They are mostly located in urban areas and are gradually spreading even to village farms. The fast

growth in the industry requires a serious research approach to improve its production especially considering the potentials associated with it. The first approach in livestock characterization apart from evaluation of its production performance is the evaluation of body size and conformation (Ibe, 1989). The developmental processes of males and females are governed by partially different hormonal and physiological controls (Nestor *et al.*, 2000). Such sex differences in physiological parameters may translate into sex-specific responses to selection among males and females of the same age and, ultimately, can lead to a rapid change in sexual size dimorphism even under

## *Sexual dimorphism and phenotypic correlations among growth traits of exotic turkey*

constraints of shared gene pool (Rhen, 2000). Bodyweight has a direct relation to the production and profitability of any livestock enterprise. It has been reported by Nwosu *et al.*, (1985) that body weight is the best parameter for making management, health and production and marketing decisions. As a result, there is need to develop objective means for describing and evaluating bodyweight and conformation characteristics especially in smallholder livestock and poultry production sector where measuring scales are unavailable.

The biometric measurements are used to assess several characteristic of animals. These measurements provide important evidences for the growth of the breed and the properties that change with environmental effects and feeding factors. In addition, body measurements are important data sources in terms of reflecting the breed standards (Riva *et al.*, 2002) and are also important in giving information about the morphological structure and development ability of the animals. Body measurements differ according to the factors such as breed, gender, yield type and age. The most common parameters used for body measurements in turkey are; shank length, breast girth, keel length, body length and thigh length (Ilori *et al.*, 2010). Assessment of bodyweight and linear body measurements have been found useful in quantifying body size and shape (Ibe and Ezekwe, 1994). Linear body measurements have also been used to predict live weight in poultry (Gueye, 1998). Correlation is a measure of strength of the relationship between records for a trait in a population. It represents the degree of association between measurements on the same animal for traits. Correlation study is of great importance in the profitability of the poultry industry. The strength and direction of correlation between traits give

an indication of the extent to which selection applied at any stage will affect subsequent flock performance (Ibe, 1995). The multitudes of different body measurements available have resulted into the use of multivariate techniques by several researchers to simultaneously examine the relationship among body measurements and production traits. Therefore, the aim of this present study was to determine the effect of sex and phenotypic correlations among growth traits of an exotic turkey reared in South-West Nigeria.

### **Materials and methods**

One-hundred and two (102), one day-old turkeys (poults) bought from a reputable hatchery in Ibadan were reared at the Turkey Unit of Teaching and Research Farm of Ondo State University of Science and Technology, Okitipupa. Okitipupa is located between latitude 6°53' N and longitude 4°53' E (Worldatlas.com). The area lies within the rain forest zone of Nigeria. The management system was intensive whereby the turkeys were fed with commercial feed and water supplied *ad libitum* in deep litter housing till six months of age. At sixth month of age the weights of the birds were obtained using a 20 kg weighing scale, while a measuring tape was used for body measurements (cm). Wing Length (WL) was taken from the shoulder joint to the extremity of terminal phalanx while Shank Length (SL) was measured from the hock joint to the spur. Thigh Length (TL) was taken as the distance between the hock joint and the pelvic joint. Body Length (BL) is the length between the tip of the *rostrum maxillare* (beak) and that of the *cauda* (tail, without feathers). Breast girth (BG) was taken under the wing at the edge of the sternum while wing span (WS) is length between tips of right and left wings after both are

stretched out in full .To ensure accuracy, each measurement was taken twice and the mean was used in subsequent analysis. All the measurements were taken by the same person

The data collected were subjected to analysis of variance to determine sex effect on the growth traits using SAS (2003). Pearson correlation was used to determine the relationship correlation among the traits on sex basis.

**Results and discussion**

Table 1 shows the descriptive statistics of the body weight and linear body

measurements of male and female exotic turkey. The body weight, shank length, thigh length, body length, wing length, wing span and breast girth for female were 8.16 kg, 8.31, 22.29, 68.47 32.93, 73.65 and 57.24 cm, respectively while the corresponding values for male were 8.84 kg, 9.97, 23.40, 76.27, 35.87, 80.27 and 60.20 cm, respectively. The effect of sex on the variables was significant ( $p < 0.05$ ) except on body weight and thigh length. Though the body weight and thigh length were numerically higher in male (8.84 and 23.40) and lower values observed in female (8.16 and 22.29).

**Table 1: Descriptive statistics of growth traits of exotic turkey by sex**

Variables	Sex	Mean	Minimum	Maximum	CV
Body weight (kg)	Male	8.84±0.63 <sup>a</sup>	4.50	13.00	27.60
	female	8.16±0.22 <sup>a</sup>	5.40	11.00	15.62
Shank length (cm)	Male	9.97±0.38 <sup>a</sup>	8.00	12.00	14.74
	female	8.31±0.13 <sup>b</sup>	7.00	10.00	8.89
Thigh length (cm)	Male	23.40±1.33 <sup>a</sup>	16.00	35.00	22.14
	female	22.29±0.38 <sup>a</sup>	17.00	27.00	9.97
Body length (cm)	Male	76.27±2.10 <sup>a</sup>	63.00	86.00	10.67
	female	68.47±0.58 <sup>b</sup>	62.00	77.00	4.97
Wing length (cm)	Male	35.87±0.94 <sup>a</sup>	30.00	43.00	10.16
	female	32.93±0.42 <sup>b</sup>	27.00	37.00	7.46
Wing span (cm)	Male	80.27±2.10 <sup>a</sup>	62.00	91.00	10.16
	female	73.65±0.72 <sup>b</sup>	65.00	84.00	5.67
Breast girth (cm)	Male	60.20±1.33 <sup>a</sup>	51.00	67.00	8.54
	female	57.24±0.73 <sup>b</sup>	45.00	66.00	7.43

a,b means with different superscript in the same column are significantly different ( $p < 0.05$ )

Table 2 shows the correlation coefficients among bodyweight and linear body measurements. The upper diagonal is for male while the lower diagonal is for female. The correlation coefficients were all positive for both sexes except in female

where the correlation between body weight and shank length was negative (-0.031). Among the males the correlation coefficients ranged between 0.447 and 0.859 while in the females it ranged between -0.031 and 0.539.

**Table 2: Correlation coefficient among body weight and linear body measurement in male and female exotic turkey**

	BWT	SL	TL	BL	WL	WS	BG
BWT	1.000	0.471	0.662**	0.772**	0.447	0.479	0.859***
SL	-0.031	1.000	0.668*	0.786**	0.773**	0.868***	0.204
TL	0.158	0.386*	1.000	0.712**	0.589*	0.591*	0.509
BL	0.432*	0.489**	0.549**	1.000	0.719**	0.792**	0.630*
WL	0.048	0.280	0.489**	0.239	1.000	0.833***	0.108
WS	0.305	0.439**	0.530**	0.579**	0.514**	1.000	0.223
BG	0.539**	-0.072	-0.226	0.147	-0.053	0.177	1.000

Bwt-body weight,SL-shank length,TL-high length; Bl-body length;Wl-winglength;Ws-wingspan;Bg-breast girth

## *Sexual dimorphism and phenotypic correlations among growth traits of exotic turkey*

The non-significant effect of sex observed in the live bodyweight and thigh length of exotic turkey in this study is contrary to the report of Djebbi *et al.* (2014) who reported significant difference in the body weight and thigh length of male and female local turkey in Tunisia. Similar report was also given by Ogah (2011) for Nigeria Indigenous turkey. The values, 8.84 Kg and 8.16 Kg observed in bodyweights for male and female respectively, are higher than 3.38 Kg and 2.65 Kg reported by Ogah, (2011) and similarly, 23.40 cm and 22.29 cm observed for male and female thigh length are more than 22.40 cm and 18.44 cm reported by Djebbi *et al.*, (2014). This could be attributed to the improved nature of the exotic turkey compare with the local turkey. The statistical effect observed in shank length, body length, wing length, wing span and breast girth with higher values in favour of male is similar to the findings of (Oblakova, 2007; Janjecic and Muzic, 2007; Djebbi *et al.*, 2014 and Ogah, 2011). However, higher values were reported in this study. In the male, the correlations between the body weight and other growth traits ranged between medium to high, positive and significant ( $p < 0.01$ ;  $p < 0.001$ ) except with shank length and wing span that were not significant. The positive correlation between the bodyweight and other variables indicate pleiotropy which means that bodyweight can be predicted by any of the variables. Similar trend was also observed in the female. The positive and high correlations observed among the growth traits in the male and female are in line with the reports of Djebbi *et al.*, (2014) and Ogah (2011). Sexual dimorphism was displayed virtually in all the variables considered and in a similar trend bodyweight could be predicted virtually by all the linear body measurements considered.

### **Conclusion**

It could be concluded that, there was an outstanding effect of sex on virtually all the linear body measurements considered and the correlation between bodyweight and these linear body measurements are positive and ranged between moderate and high in both sexes. The use of linear body measurements is hereby recommended for the prediction of live bodyweight of exotic turkey at six month of age based on the high positive correlations between the body weight and the body linear body measurements observed in this study.

### **References**

- Food and Agriculture Organization (FAO) 2000.** FAOSTAT. Statistical database of Food and Agriculture Organization of the United Nations, Rome., Italy.
- Gueye, E. F., Ndiaye, A. and Branckaert, R. D. S. 1998.** Prediction of body weight on the basis of body measurement in mature indigenous chickens in Senegal. *Livestock Research for Rural Development*, 10: 3.
- Ibe, S. N. 1995.** Repeatability of growth in Nigerian local chickens using early records. *Nigerian Journal Animal Production*, 23(2):103-106.
- Ibe, S. N. 1989.** Measurement of size and confirmation in commercial broilers. *J. Anim. Breed and Genet.*, 1989, vol. 106, p. 461-469.
- Ibe, S. N. and Ezekwe, A. G. 1994.** Quantifying size and shape differences between Muturu and N'Dama breeds of cattle. *Nigerian Journal of Animal Production.*, 21: 51-58.
- Ilori, B. M., Peters, S. O., Ikeobi, C. O. N., Bamgbose, A. M., Isidahomen, C. E. and Ozoje, M. O. 2010.** Comparative Assessment of Growth

- in Pure and Crossbred Turkeys in a Humid Tropical Environment *International Journal Poultry Science*, 9 (4): 368-375.
- Janjecic, Z. and Muzic, S. 2007.** Phenotypic traits in Zagorje turkey. *Acta Agraria Kaposvariensis*, 1(8):1-5.
- M'hamdi, N., Haddad, I. and Chriki, A. 2014.** Phenotypic Characterization Of The Indigenous Turkey (*Meleagris gallopavo*) In The North West Regions Of Tunisia. *Sci. Agri.* 6(1): 51-56
- Nestor, K. E., Anderson, J. W. and Patterson, R. A. 2000.** Genetics of growth and reproduction in the turkey. 14. Changes in genetic parameters over thirty generations of selection for increased body weight. *Poul. Sci.* 79:445–452
- Oblakova, M. 2007.** Weight development and body configuration of turkey –broiler parent Big 5. *Trakia J. of Science*, 5(1): 28-32.
- Rhen, T. 2000.** Sex-limited mutations and the evolution of sexual dimorphism. *Evolution* 54:37–43
- Riva, J., Rizzi, R., Marelli, S. and Cavalchini, G. 2002.** Body Measurements in Bergamasca Sheep, *Small Ruminant Research*, 221-227.
- SAS. 2003.** SAS users guide: Statistics released version 8-2. *Statistical Analysis System Institute Inc. Cary, North Carolina*

*Received: 9<sup>th</sup> July, 2018*

*Accepted: 21<sup>st</sup> December, 2018*