

## Biometric Differentiation of Local and Exotic Turkeys (*Meleagris gallopavo*) in Southwest Nigeria

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### ABSTRACT

Data on body weights and linear body measurements collected at six month of age on one-hundred and two (102) exotic turkeys and one –hundred and twenty-four (124) Nigerian local turkeys reared at Teaching and Research Farm of Ondo State University of Science and Technology, Okitipupa, were subjected to statistical analysis to determine the effects of breed and sex on the body weights and the linear body measurements, and the correlation coefficients among the variables. Breed had significant effect ( $p < 0.05$ ) on all the variables. The exotic breed had higher values in all the variables compared with the local breed. Sexual dimorphism was observed with higher values observed in the male. The body weight, shank length, thigh length, body length, wing length, wing span and breast girth for male were 5.28 kg, 9.29 cm, 22.19 cm, 66.90 cm, 33.45 cm, 75.04 cm and 46.06 cm while the corresponding values for female were 5.02 kg, 7.69 cm, 19.69 cm, 60.60 cm, 30.08 cm, 67.81 cm and 44.57 cm respectively. The correlation coefficients among the variables in the exotic and the local breeds were positive and significant ( $p < 0.05$ ,  $P < 0.01$ ;  $p < 0.001$ ) and ranged between 0.142 and 0.878. Body weight and linear body measurements are good tools to differentiate between breeds and sex in turkey.

**Key words:** Body weight, breed, linear body measurements, sex, turkey

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### INTRODUCTION

The fast growth in turkey industry in Nigeria requires an intensive research approach to boost 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 important criteria for judging market broilers are body size and body conformation or type. A quantitative measure of conformation will no doubt enable reliable genetic parameters for the traits to be estimated but also make it possible to include conformation in breeding programme. Body weight has been commonly used to measure body size. Assessment of body weight 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 (Chhabra *et al.*, 1972; Monsi, 1992; Gueye, 1998).

Phenotypic characterization of Animal Genetic Resources (AnGR) is the process of identifying distinct breed populations and describing their external and production characteristics in a given environment and under given management, taking into account the social and economic

factors that affect them. The information provided by characterization studies is essential for planning the management of AnGR at local, national, regional and global levels. The *Global Plan of Action for Animal Genetic Resources* (FAO, 2007) recognizes that “A good understanding of breed characteristics is necessary to guide decision-making in livestock development and breeding programmes”. Therefore, the objectives of this study are (i) to differentiate between Nigerian local turkey and the exotic one using growth traits (ii) to determine the effect of sex on the body traits (iii) to determine the correlations among the growth traits.

### MATERIALS AND METHODS

The study was carried out at Commercial Farm, Ondo State University of Science and Technology, Okitipupa Area in Ondo State, Nigeria. The farm is located between latitude 6°53' N and longitude 4°53' E (Worldatlas.com). The area lies within the rainforest zone of Nigeria. The animals used for the study comprised 102 exotic turkeys (61-females and 41- males) and 124 local turkeys (81- females and 43- males) at six month of age. The birds were housed

permanently in deep litter and fed with commercial mash. Water was supplied *ad-libitum*.

**Data collection**

Linear body measurements were taken as suggested by Gueye et al. (1998) and Solomon (1996). The weights of the birds were obtained using a 20kg weighing scale, while a measuring tape was used for body measurements in centimetre. 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). Chest Circumference (CC) was taken under the wing at the edge of the sternum while wing span 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 to minimize error in the measurements

**Data analysis**

The data collected were subjected to analysis of variance to determine the effect of breed and sex on the growth traits using SAS (2007). Pearson correlation was used to determine the correlation coefficients among the traits. The statistical model used is as follows:

$$Y_{ijk} = \mu + S_i + B_j + BS_{ij} + e_{ijk}$$

where:

Y = Observations of each growth traits

$\mu$  = Universal mean

$S_i$  = Effect of sex

$B_j$  = Effect of breed

$BS_{ij}$  = interaction between breed and sex  
 $e_{ijk}$  = Error

**RESULTS**

Table 1 shows the summary statistics of body weight and linear body measurements of the exotic and local turkeys. The values recorded for the variables were higher in exotic than the local. Highest coefficient of variation was recorded in body weight for both breeds.

Table 2 shows the effects of breed and sex on the variables. Breed had significant effect ( $p < 0.05$ ) on all the variables considered with highest values recorded in the exotic breed. The body weight, shank length, thigh length and body length for the exotic breed were  $8.37 \pm 0.24$ ,  $8.82 \pm 0.18$ ,  $22.63 \pm 0.48$  and  $70.86 \pm 0.90$  respectively, while the corresponding values for the local turkey were  $3.29 \pm 0.06$ ,  $7.99 \pm 0.12$ ,  $19.50 \pm 0.24$  and  $58.53 \pm 0.53$ . The wing length, wing span and breast girth were  $33.83 \pm 0.45$ ,  $75.67 \pm 0.90$  and  $58.14 \pm 0.67$  for the exotic while  $29.94 \pm 0.32$ ,  $67.62 \pm 0.67$  and  $37.80 \pm 0.41$  for the local turkey. Effect of sex was significant in all the traits except in body weight. The values for all the traits were higher in male than female. The phenotypic correlations among the traits are shown in Table 3. The correlations for the exotic turkey are shown on the upper diagonal while the lower diagonal is for local turkey. The correlations between body weight and the body measurements were positive and significant for the two breeds. This is applicable to the relationships among the body measurements in the two breeds except for the correlations between breast girth and shank length; thigh length; wing length that were not significant in exotic breed.

**Table 1:** Summary statistics of growth traits in Nigerian local and exotic turkeys at six months of age

Breed	Traits	N	means	Std. dev	min	max	Coef.var.
Exotic	Body wt.(kg)	102	8.37	1.72	4.5	13	20.54
	Shank length(cm)	102	8.82	1.26	7	12	14.35
	Thigh length(cm)	102	22.63	3.39	16	35	14.97
	Body length(cm)	102	70.86	6.36	62	86	8.98
	Wing length(cm)	102	33.83	3.15	27	43	9.3
	Wing span(cm)	102	75.67	6.39	62	91	8.45
	Breast girth(cm)	102	58.14	4.69	45	67	8.07
Local	Body wt.(kg)	124	3.29	0.61	1.5	4.5	18.43
	Shank length(cm)	124	7.99	1.09	6	10	13.67
	Thigh length(cm)	124	19.5	2.23	16	24	11.45
	Body length(cm)	124	58.53	4.91	47	70	8.39
	Wing length(cm)	124	29.94	3.03	24	36	10.11
	Wing span(cm)	124	67.62	6.27	56	80	9.27
	Breast girth(cm)	124	37.8	3.81	28	45	10.07

**Table 2:** Effects of breed and sex on the growth traits of exotic and local turkeys

Traits	Exotic	Local	Male	Female
Body weight	8.37±0.24 <sup>a</sup>	3.29±0.06 <sup>b</sup>	5.28±0.37	5.02±0.29
Shank length	8.82±0.18 <sup>a</sup>	7.99±0.12 <sup>b</sup>	9.29±0.14 <sup>a</sup>	7.69±0.09 <sup>b</sup>
Thigh length	22.63±0.48 <sup>a</sup>	19.50±0.24 <sup>b</sup>	22.19±0.42 <sup>a</sup>	19.69±0.30 <sup>b</sup>
Body length	70.86±0.90 <sup>a</sup>	58.53±0.53 <sup>b</sup>	66.90±1.11 <sup>a</sup>	60.61±0.78 <sup>b</sup>
Wing length	33.83±0.45 <sup>a</sup>	29.94±0.32 <sup>b</sup>	33.45±0.45 <sup>a</sup>	30.08±0.35 <sup>b</sup>
Wing span	75.67±0.91 <sup>a</sup>	67.62±0.67 <sup>b</sup>	75.04±0.99 <sup>a</sup>	67.81±0.67 <sup>b</sup>
Breast girth	58.14±0.67 <sup>a</sup>	37.80±0.41 <sup>b</sup>	46.06±1.39 <sup>a</sup>	44.57±1.19 <sup>b</sup>

a,b means with different superscripts along the same row are significantly different (p<0.05)

**Table 3:** Phenotypic correlation between body weight and linear measurements in local and exotic turkeys at six months of age

	Bwt	Sl	Tl	Bl	Wl	Ws	Bg
Bwt	1	0.329*	0.500**	0.632***	0.314*	0.443**	0.693***
Sl	0.685***	1	0.540***	0.794***	0.657***	0.784***	0.229
Tl	0.722***	0.853***	1	0.625***	0.543***	0.565***	0.201
Bl	0.764***	0.798***	0.859***	1	0.628***	0.791***	0.474**
Wl	0.623***	0.752***	0.794***	0.798***	1	0.749***	0.142
Ws	0.673***	0.732***	0.800***	0.815***	0.878***	1	0.305*
Bg	0.762***	0.484***	0.494***	0.586***	0.422***	0.500***	1

The effect of sex by breed is shown on Table 4. Sex had significant effect (p<0.05) in virtually all the traits considered in the two breeds except in body weight and thigh length in exotic breed. However, the values recorded for male were higher than that of female in the two breeds.

**Table 4:** Effect of sex on body weight and linear measurements by breed

Traits	Breeds	Female	Male
Bwt.	Exotic	8.16±0.22 <sup>a</sup>	8.84±0.63 <sup>a</sup>
	Local	2.93±0.06 <sup>b</sup>	3.80±0.06 <sup>a</sup>
Sl	Exotic	8.31±0.13 <sup>b</sup>	9.97±0.38 <sup>a</sup>
	Local	7.27±0.11 <sup>b</sup>	9.01±0.08 <sup>a</sup>
Tl	Exotic	22.29±0.38 <sup>a</sup>	23.40±1.37 <sup>a</sup>
	Local	17.96±0.19 <sup>b</sup>	21.68±0.19 <sup>a</sup>
Bl	Exotic	68.47±0.58 <sup>b</sup>	76.27±2.10 <sup>a</sup>
	Local	55.37±0.44 <sup>b</sup>	63.00±0.52 <sup>a</sup>
Wl	Exotic	32.93±0.42 <sup>b</sup>	35.87±0.94 <sup>a</sup>
	Local	28.18±0.28 <sup>b</sup>	32.44±0.40 <sup>a</sup>
Ws	Exotic	73.65±0.72 <sup>b</sup>	80.27±2.11 <sup>a</sup>
	Local	63.92±0.51 <sup>b</sup>	72.86±0.90 <sup>a</sup>
Bg	Exotic	57.24±0.73 <sup>b</sup>	60.20±1.33 <sup>a</sup>
	Local	36.14±0.48 <sup>b</sup>	40.17±0.51 <sup>a</sup>

Bwt-body weight,Sl-shank length,Tl-thigh length; Bl-body length;Wl-wing length;Ws-wing span;Bg-breast girth  
a,b means with different superscripts along the same row are significantly different (p<0.05)

## DISCUSSION

The summary statistics shows that the values of the body weight and the linear measurements for the exotic breed were higher than that of the local turkey. This could be attributed to the undeveloped nature of the local breed. Breed effect was observed in all the growth traits considered with higher values in favour of the exotic breed. This could be attributed to unimproved nature of the local breed. Sex effect was significant (p<0.05) in all the traits considered except in body weight, the insignificant effect observed in body weight is contrary to the observations of Ogah (2016). Higher values were noted in the male compared to female in all the variables which indicate sexual dimorphism. This observation is similar to the report of Ogah (2016) who reported sex effect on Nigerian indigenous turkey. The 5.28 kg observed for male body weight in this study is lower than 6.01 kg reported by Kodinetz (1940) and Muzic (1990) for Zagorje turkey at five month of age while the observed 5.02 kg for the female is higher than 3.97 kg reported by the authors. The phenotypic correlations between body weight and other variables in the two breeds were positive and significant which means that improvement in any of the variables will result to improvement in body weight. Similar observations were reported by Ogah (2016) and Bachev and Lalev (1990). The correlations among the body measurements also follow the same trend in the two breeds except the correlations between breast girth and shank length; thigh

length; wing length in exotic breed that were not significant. Generally, improvement in one of the variables leads to improvement in others.

The effect of sex by breed was significant ( $p < 0.05$ ) among all the variables except in the body weight of the exotic breed which was not significant ( $p < 0.05$ ). The sex effect observed for the local breed is similar to the report of Ogah (2016) for the same breed, but at the fifth month of age. However, the values observed for the exotic are higher than the values reported by Ogah (2016). This could be attributed to the improved nature of the exotic breed. Morphometric traits are good tools in differentiating between breeds and in designing breeding programme for improvement of body weight and other linear body measurements.

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