PERFORMANCE AND PHENOTYPIC CORRELATIONS OF GROWTH TRAITS OF F_1 LOCAL TURKEYS IN THE HUMID TROPICS OF NIGERIA

[1]Ogbuagu, K.P., [1]Abel-Achimugu, J., [2]Obasi, E.N., Abdullahi, H.R., [1]Ishaya, E.Z. [2]Obi, O.C., and [2]Nwachukwu, E.N.

Department of Animal Science, Federal University of Lafia, Nigeria

[*]Department of Animal Breeding and Genetics, Michael Okpara University of Agriculture, Umudike, Nigeria

Correspondent Email: neneobrown@gmail.com

ABSTRACT

Numerous research reports on evaluation of growth traits, performance and phenotypic correlations between body weight and linear body traits of three strains of F_1 local turkey crossbred (Meleagric gallapavo) are still limited; hence the need for this study. Therefore, performance and phenotypic correlations between body weight and linear body traits of three strains of F_1 local turkey crossbred (Meleagric gallapavo) in the humid tropics were evaluated. A total of 215-day-old poults were used for the study. The experiment was conducted using three phenotypes of indigenous domestic turkeys with the plumage colour: black, white and lavender (spotted). The poults used for the study were hatched from a foundation stock of 86 turkeys comprising 25 Hens and 5 Toms for black and white phenotypes each, respectively and 21 Hens and 5 Toms for lavender (spotted) phenotype. Randomized complete block design (RCBD) was also used to analyze the data with phenotypic class as a major factor and batch as block. The parameters measured are Body weight (BWT), Average daily feed intake (ADFI), Brooding mortality (BM), Body length (BDL), Shank length (SL), Keel length (KL), Wing length (WL), Breast width (BW), Drumstick length (DL) and Neck Length (NL). Data were subjected to analysis of variance (ANOVA). Results showed that body weight (BW) and Linear body measurements (body length, wing length, drumstick length, breast width, shank length, keel length and neck length) had a significant increase as age (weeks) increased for the main crossbred (black x lavender (spotted), BxS) and Lavender x Black compared with its purebred (Black x Black, (BxB), White x White (WxW) and lavender x lavender (SxS) counterparts. final body weights for main crossbred (3710.25, 3732.42 and 3738.66g) and reciprocal crossbred (3791.58, 3795.72 and 3797.44g) differed significantly (P<0.05) across the weeks. Results showed positive and significant phenotypic correlations were observed between linear body parameters and body weight of (BxW, BxS, and WxS) and reciprocal crossbreds (WxB, SxB and SxW) studie. Body weight (BW) and linear body measurements (body length, wing length, drumstick length, breast width, shank length, keel length and neck length) had significant increases as age (weeks) increased for the main crossbred (black x lavender (spotted), BxS) and Lavender x Black compared with its purebred (Black x Black, (BxB), White x White (WxW) and lavender x lavender (SxS) counterparts. final body weights for main crossbred (3710.25, 3732.42 and 3738.66g) and reciprocal crossbred (3791.58, 3795.72 and 3797.44g) differed significantly (P<0.05) across the weeks.

Keywords: Growth performance, Phenotypic, Correlation, Traits, Turkeys

INTRODUCTION

Turkey is not common among poultry growers in Nigeria. However, some farms are beginning to rear the bird at commercial level owing to increasing interest in turkey as a provider of meat complementing chicken (Amao *et al*., 2015). They are mostly located in farms close to urban cities and are gradually spreading even to village farms. The fast growth in the industry requires an intensive research approach to boast its production especially considering the potentials associated with it (Amao *et al*., 2015). Improvement in economic characters of local turkeys can be achieved by incorporating the local turkey into breeding programmes aimed at producing an indigenous meat and egg type breed adapted to the tropical environment with a heterozygous advantage (Khawaja *et al*., 1999; Amao *et al*., 2015)..

Growth is normally accompanied by an orderly sequence of maturational changes and involves accretion of proteins and increase in length and size, not just an increase in body weight (Gous, 1999). Mendes *et al*. (2005) have reported that body weight is one of those important economic traits in the

selection of animals. Increased body weight and linear traits have been used as pre-requisite for selection by most local poultry farmers and researchers (Olowofeso, 2009). Body weight of local turkeys at 27 weeks ranges from 7 to 8 kg in males and from 4 to 5 kg in hens (Singh and Sharma, 2005). Growth traits are useful to livestock farmers and geneticists in improving the market quality of breeding stocks (Nwachukwu *et al*., 2011).

Correlation of traits in domestic turkey is high. Many characters in different strains of turkey are found to associate with one another such that the improvement of one may lead to the improvement or otherwise of the other (Ilori *et al*., 2010). This is the concept of correlation, which is a measure of the degree to which some traits vary together or measure of the intensity of linear association among traits (Singh and Kumar, 2005). Genetic correlation occurs due to additive effects of genes (Ibe, 1998). Ojedapo and Amao (2015) reported a strong improvement in the local and exotic turkey's crossbreds. The positive and strong correlation between body weight and body measurement traits means that body weight could be estimated from body measurements. This is because growth in animals could be evaluated from the component parts of the animal. This means that improvement in the body measurements will invariably lead to a corresponding improvement in the body weight of the indigenous Nigerian turkeys especially if the correlation is positive as was observed by Ojedapo and Amao (2015).

MATERIALS AND METHODS

Location of Study

The study was conducted in the Poultry Unit of Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, Abia State. Umudike lies between latitude 05° 29^1 N, longitude 07° 33^1 E and altitude of 122 m above sea level. The town is within the humid rain forest zone of Southeastern Nigeria and has a bimodal rainfall pattern with a total annual rainfall range of 1700 mm to 2100 mm. The minimum and maximum daily temperatures of the area ranges from 18.6^0 to 23^0C and from 26^0 to 36^0C during the rainy and dry seasons, respectively while the humidity range from 57.0% to 91.0% depending on the season of the year. The climatic data were taken from the meteorological station of the National Root Crops Research Institute, Umudike.

Mating Design

The mating design was as follows:

Pure crosses: Black male x Black female, White male x White female, Lavender male x Lavender female

Main Crosses: Black Male x White female, Black male x Lavender female, White male x Lavender female

Reciprocal Crosses: White male x Black female, Lavender male x Black female, Lavender male x White female.

Management of Experimental Birds

A total of 86 adult local turkeys of three phenotypic classes based on colour (Black, White and Lavender) were used as a parent population: 28 Black, 28 White and 30 Lavender phenotypes to generate the 251 F_1 poults for the study. They were brooded differently according to phenotypic group (Black, White and Lavender) from day-old to six weeks in a battery cage system after which they were transferred to deep litter pen at six weeks of age and reared till week 24. Dry wood shavings were used as litter material. Fresh clean water was given *ad libitum* to the poults during this period. Routine management operations were carried out on daily basis. Prophylactic antibiotics and anticoccidial drugs were administered to the birds every month for six months. The birds were dewormed and provided with feed twice daily and drinking water *ad libitum*. Poults (0-6weeks) were fed starter mash containing 28% crude protein and 2800 kcal ME/kg (as labeled). Growing turkeys (7-20 weeks) were fed growers mash containing 20% crude protein and 3000 kcal ME/kg (as labeled). Laying hens (21-30 weeks) were fed layers mash containing 18% crude protein and 3200kcal ME/kg (as labeled) at 5% egg production. At 16 weeks of age, sexing was done, and all the males were transferred to different pens for mating and crossing with other phenotypic groups. Massage method was used for collection of semen from the mature selected males at the farm during the mid-day hours of 12-1pm and inseminated artificially. Eggs produced by the base population turkey hens were collected daily and identified properly with markers and incubated for 28 days in four sets and hatched to generate the F1 progenies. The incubator had a relative humidity of 80%, temperature of

55^0C and proper ventilation.

Parameters Measured

Body weight (BWT), Average daily feed intake (ADFI), Brooding mortality (BM), Body length (BDL), Shank length (SL), Keel length (KL), Wing length (WL), Breast width (BW), Drumstick length (DL) and Neck Length (NL). All parameters except BWT were measured weekly using a tailor's tape calibrated in cm. Phenotypic correlations between body weight and each of the linear body traits and among the linear body traits were determined for the different phenotypic classes using Pearson's Product-Moment Correlation Coefficient (r) as described by Snedecor and Cochran (1980).

Statistical Analysis

Analysis of variance (ANOVA) procedure was used to analyse the data on growth traits and linear body parameters using SPSS (2010) analytical package. Duncan's new multiple range test (Duncan, 1955) was used to compare significant means of the nine (9) phenotypic classes of local turkey.

RESULTS AND DISCUSSION

Table 1: Phenotypic correlations of growth traits of Purebred F_1

BW	BL	WL	BRW	DS	SL	KL	NL
WK 14							
BW	1						
BL	0.766**	1					
WL	0.860**	0.475**	1				
BRW	0.844**	0.912**	0.665**	1			
DS	0.697**	0.777**	0.532**	0.601**	1		
SL	0.586**	0.699**	0.614**	0.714**	0.622**	1	
KL	0.822**	0.678**	0.603**	0.447*	0.474*	0.732**	1
NL	0.734**	0.711**	0.557**	0.678**	0.533*	0.451*	0.641**
1							
WK 16							
BW	1						
BL	0.819**	1					
WL	0.653**	0.556*	1				
BRW	0.811**	0.942**	0.763**	1			
DS	0.901**	0.932**	0.779**	0.921**	1		
SL	0.840**	0.789**	0.601**	0.831**	0.792**	1	
KL	0.884**	0.847**	0.763**	0.368*	0.968**	0.678*	1
NL	0.817**	0.935**	0.717**	0.942**	0.633*	0.774**	0.893**
1							

*= correlation is significant at the 0.05 level i.e P<0.05; **=P<0.01, BW= body weight, SL = shank length, NL = neck length, BRW = Breast width, BL = body length, KL = keel length, WL = wing length and DS = drum stick, Purebred = WxW, BxB and SxS.

Phenotypic correlations of growth traits of Purebred F_1 Progeny are shown in Table 1.

There were positive and significant correlations in both weeks 14 and 16 among the growth traits measured. The result is similar to the findings of Ojedapo and Amao (2015) who reported significant (P<0.05) positive correlations between body weight and body length, breast girth and drumstick with high correlation values of 0.69-0.93 on three phenotypes of Exotic turkey in the first and second weeks of age.

Similarly, Ali *et al*. (2003) and Oyetade (2011) reported significant (P<0.05, 0.01) positive phenotypic correlations between body weight and linear body measurements at various ages of purebred and crossbred broiler chicken. Therefore, positive and significant phenotypic relationships between linear

body parameters and body weight indicates that an improvement in one trait could lead to a concomitant improvement in the other, if environmental factors are negligible.

Table 2: Phenotypic correlations of growth traits of Main crossbred F_1 progeny

	BW	BL	WL	BRW	DS	SL	KL	NL
WK 14								
BW	1							
BL	0.879**	1						
WL	0.733**	0.728**	1					
BRW	0.850**	0.912**	0.758**	1				
DS	0.739**	0.945**	0.711	0.901**	1			
SL	0.853**	0.937	0.687**	0.841**	0.737**	1		
KL	0.913**	0.664**	0.647**	0.358*	0.950**	0.532*	1	
NL	0.811**	0.953**	0.703**	0.932**	0.577*	0.951**	0.841**	1
WK 16								
BW	1							
BL	0.819**	1						
WL	0.653**	0.669**	1					
BRW	0.811**	0.942**	0.763**	1				
DS	0.901**	0.932**	0.779**	0.921**	1			
SL	0.840**	0.789**	0.601**	0.831**	0.792**	1		
KL	0.884**	0.847**	0.763**	0.368*	0.968**	0.678*	1	
NL	0.817**	0.935**	0.717**	0.942**	0.633*	0.774**	0.893**	1

*= correlation is significant at the 0.05 level i.e P<0.05; **=P<0.01, BW= body weight, SL = shank length, NL = neck length, BRW = Breast width, BL = body length, KL = keel length, WL = wing length and DS = drum stick, Main crossbred = BxW, BxS and WxS.

Phenotypic correlations of growth traits of Main crossbred F_1 progeny is shown in Table 2.

There were positive and significant correlations in both weeks 14 and 16 among the growth traits measured. Okon *et al*. (1996) reported significant (P<0.001) positive correlations between body weight and some linear body measurements (BL, BG, KL, SL and DS) in three strains of local turkey. Ali *et al*. (2003) similarly, reported significant (P<0.05, 0.01) positive phenotypic correlations between body weight and linear body measurements at various ages in their study which is also in line with results obtained in this study.

Ojedapo and Amao (2015) reported outstanding correlations between body weight and body length, breast girth and drumstick with correlation values of 0.69-0.93 in their study with Exotic turkey. The results of these studies above are in line with the positive correlation findings obtained in this present study although different breeds of turkeys where used.

This implies that positive and significant phenotypic relationships between linear body parameters and body weight indicates that an improvement in one trait could lead to a concomitant improvement in the other, if environmental factors are negligible.

Phenotypic correlations of growth traits of F_1 Reciprocal crossbred is shown in Table 3

There were positive and significant correlations in both weeks 14 and 16 among the growth traits measured. The results obtained in the study are similar to the findings of Oyegunle *et al.* (2008) who reported significant (P<0.001) positive correlations in local, crossbreed and Exotic turkeys between pairs body weight and linear body traits with values ranging from 0.27 to 0.48.

Ojedapo and Amao (2015) also reported significant (P<0.05) positive correlations between body weight and body length, breast girth and drumstick with high correlation values of 0.69-0.93.

Ali *et al*. (2003) and Oyetade (2011) also reported significant (P<0.05, 0.01) positive phenotypic correlations between body weight and linear body measurements at various ages in their study which is also in line with results obtained in this study.

Thus, positive and significant phenotypic relationships between linear body parameters and body weight indicate that an improvement in one trait could lead to a concomitant improvement in the other, if environmental factors are negligible.

Table 3: Phenotypic correlations of growth traits of F_1 Reciprocal crossbred

	BW	BL	WL	BRW	DS	SL	KL	NL
WK 14								
BW	1							
BL	0.669**	1						
WL	0.598*	0.826**	1					
BRW	0.781**	0.853**	0.650**	1				
DS	0.944**	0.960**	0.511**	0.783**	1			
SL	0.688**	0.763**	0.987**	0.669**	0.874**	1		
KL	0.943**	0.445*	0.588**	0.844**	0.678**	0.633**	1	
NL	0.980**	0.870**	0.677**	0.911**	0.711**	0.888**		
0.787**	1							
WK 16								
BW	1							
BL	0.843**	1						
WL	0.496**	0.694**	1					
BRW	0.742**	0.934**	0.798**	1				
DS	0.967**	0.911**	0.789**	0.941**	1			
SL	0.876**	0.832**	0.733**	0.755**	0.792**	1		
KL	0.631**	0.886**	0.654**	0.452*	0.947**	0.502*	1	
NL	0.777**	0.930**	0.901**	0.879**	0.671**	0.632**	0.658**	
1								

*= correlation is significant at the 0.05 level i.e P<0.05; **=P<0.01, BW= body weight, SL = shank length, NL = neck length, BRW = Breast width, BL = body length, KL = keel length, WL = wing length and DS = drum stick, Reciprocal crossbred = WxB, SxB and SxW.

Body weight (g) of the F_1Turkeys (purebred, main and reciprocal crossbred) at age 4 to 24 weeks

Table 4 shows body weight (g) of the F_1 Local Turkeys (purebred, main and reciprocal crossbred) at age 4 to 24 weeks. There were no significant (P>0.05) differences in weeks 4 and 6 among the purebred, main crossbred and reciprocal crossbred. However, significant (P<0.05) differences were observed from week 8 to 24 with the reciprocal crossbred and main crossbred having better performance than their purebred counterparts. However, the reciprocal crossbred progeny had significantly (P<0.05) higher body weight than the main crossbred in weeks 8, 12, 14, 18, 20, 22 and 24. The main crossbred were significantly (P<0.05) higher in body weight than the reciprocal crossbred only in week 10. There was no significant difference (P>0.05) between the two in week 16.

The significant increase in the mean body weight of crossbred turkey phenotypes suggests that the crossbreds may have potentials for fast growth. This result is similar to the findings of Amao *et al.* (2015) who reported a significant increase in body weights as age increase in main and reciprocal crossbreds of Nigerian Indigenous turkey breeds and their exotic counterparts. This increase in body weight as age increased was probably due to high genetic potentials for growth in the F_1 progeny as they attain sexual maturity age (Ibe, 1993; Peters *et al.,* 2007).

Table 4. Body weight (g) of the F_1Turkeys (purebred, main and reciprocal crossbred) at age 4 to 24 weeks

Purebred	Main Crossbred	Reciprocal Crossbred

Weeks	WxW	BxB	SxS	BxS	BxW	WxS	WxB	SxW	SxB
4	620	623	622	660	662	663	664	667	665
	(2.71)	(2.73)	(2.74)	(26.98)	(27.27)	(28.56)	(27.55)	(27.83)	(27.61)
6	880	879	881	885	886	888	884	885	886
	(37.71)	(36.55)	(38.46)	(39.26)	(40.74)	(41.51)	(40.32)	(40.65)	(40.69)
8	1080^{c}	1082^{c}	1083^{c}	1206^{b}	1208^{b}	1210^{b}	1215^{a}	1218^{a}	1217^{a}
	(40.22)	(40.24)	(40.25)	(61.33)	(61.64)	(62.48)	(61.88)	(62.51)	(61.93)
10	1208^{c}	1211^{c}	1209^{c}	1515^{a}	1518^{a}	1522^{a}	1488^{b}	1490^{b}	1486^{b}
	(61.84)	(62.33)	(61.87)	(51.66)	(52.71)	(53.78)	(68.00)	(68.26)	(67.66)
12	1514^{c}	1517^{c}	1516^{c}	1881^{b}	1883^{b}	1886^{b}	1893^{a}	1895^{a}	1897^{a}
	(55.80)	(57.56)	(56.34)	(65.18)	(66.35)	(66.73)	(65.23)	(65.51)	(65.66)
14	1720^{c}	1718^{c}	1722^{c}	2159^{b}	2161^{b}	2164^{b}	2204^{a}	2206^{a}	2209^{a}
	(71.00)	(70.89)	(71.50)	(75.03)	(76.81)	(77.08)	(76.05)	(76.49)	(76.83)
16	1965^{b}	1966^{b}	1968^{b}	2630^{a}	2632^{a}	2638^{a}	2651^{a}	2653^{a}	2656^{a}
	(69.31)	(70.47)	(70.55)	(79.33)	(82.71)	(83.46)	(78.45)	(78.63)	(78.81)
18	2358^{c}	2361^{c}	2355^{c}	2960^{a}	2963^{a}	2966^{a}	2983^{b}	2986^{b}	2990^{b}
	(81.03)	(82.66)	(80.73)	(83.17)	(85.40)	(86.67)	(85.44)	(85.63)	(87.12)
20	2493^{c}	2503^{c}	2497^{c}	3260^{b}	3262^{b}	3263^{b}	3312^{a}	3317^{a}	3320^{a}
	(84.45)	(87.03)	(84.86)	(86.05)	(87.57)	(87.68)	(86.78)	(86.94)	(88.05
22	2755^{c}	2753^{c}	2765^{c}	3510^{b}	3512^{b}	3514^{b}	3528^{a}	3531^{a}	3534^{a}
	(85.41)	(84.87)	(86.16)	(89.03)	(90.57)	(91.68)	(89.32)	(90.52)	(91.64)
24	3018^{c}	3028^{c}	3016^{c}	3630^{b}	3633^{b}	3637^{b}	3750^{a}	3752^{a}	3754^{a}
	(83.38)	(84.93)	(83.15)	(91.84)	(92.56)	(93.65)	(92.93)	(94.93)	(95.93)

a-c means in the same row with different superscripts are significantly different (P<0.05).*S.E.M in Parenthesis, Purebred= BxB = Black x Black, WxW = White x White and SxS = Lavender x Lavender, Main crossbred= BxS = Black x Lavender, BxW = Black x White and WxS = White x Lavender, Reciprocal crossbred= WxB = White x Black, SxW = Lavender x Lavender, SxB = Lavender x Black.

CONCLUSION

Positive and significant phenotypic correlations were observed between linear body parameters and body weight of (BxW, BxS, and WxS) and reciprocal crossbreds (WxB, SxB and SxW) studie, which indicate that an improvement in one trait could lead to a concomitant improvement in the other, if environmental factors are negligible. Body weight (BW) and Linear body measurements (body length, wing length, drumstick length, breast width, shank length, keel length and neck length) had a significant increase as age (weeks) increased for the main crossbred (black x lavender (spotted), BxS) and Lavender x Black compared with its purebred (Black x Black, (BxB), White x White (WxW) and lavender x lavender (SxS) counterparts. final body weights for main crossbred (3710.25, 3732.42 and 3738.66g) and reciprocal crossbred (3791.58, 3795.72 and 3797.44g) differed significantly (P<0.05) across the weeks.

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