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Original scientific article

GENETIC AND PHENOTYPIC CORRELATION COEFFICIENTS OF QUANTITATIVE TRAITS IN TWO CHICKEN GENOTYPES

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This study was carried out to estimate genetic and phenotypic correlations of morphometric traits of a newly developed Nigerian poultry breed (FUNAAB Alpha) and Noiler chickens. A total of 300 unsexed day-old-chicks comprising 150 each of the two genotypes were raised for eighteen weeks. Superior individuals (4 cocks and 20 hens per genotype) from first phase were selected based on weight to constitute parents of 100 birds per genotype raised in second phase for 12 weeks. Body weight, and linear body measurements (body circumference, breast girth, thigh length, shank length and wing length) were taken on weekly basis. Growth data were analysed using Generalized Linear Model of SAS and least significant difference (LSD) test was used to separate significant means for the genotypes. Computed variances and covariances (PROC MIXED DATA) were used to estimate genetic and phenotypic correlations. Results showed that Noiler chicken had higher ($p<0.05$) body weight and linear body measurements from 10 to 18 weeks with average weight of 2079.55 g compared with 1895.29 g for FUNAAB Alpha. Positive genetic correlations were observed among the traits of interest in both FUNAAB Alpha and Noiler with the latter having higher genetic correlation coefficients which ranged between 0.573 (TL x SL) and 0.953 (BG x BC) at week 12. Sexual dimorphism favoured male birds in all the traits measured. The implication of these results is that it is important to know both the effect of the trait actually being selected and its effect on the other traits. Genetic correlations result from pleiotropic effects of genes on multiple traits or from chromosomal linkage of genes affecting different traits. It estimates the degree to which the traits studied are affected by the same genes (Pleiotropic) or pairs of genes.
Keywords: Chicken, genotype, morphological traits, correlation

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INTRODUCTION

Food insecurity and protein malnutrition in Nigeria represent serious impediments to sustainable development, poverty reduction, equity and overall wellbeing of the populace. Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 2012a). It has four dimensions: Food availability, access to food, stability of supply and safe and healthy food utilization. Protein alleviation depends majorly on poultry production both at the smallholder and commercial levels. Chickens have short generation interval and a high rate of productivity; they can also be transported with ease to different areas and are relatively affordable and consumed by the rural people compared with other farm animals such as cattle and small ruminants. The commercial production depends on income, markets, price fluctuations, political and economic factors (FAO, 2006). According to WEIGEL and ARMIJOS (2015), over 820 million people in developing countries are undernourished, i.e., their diets are protein-deficient. Even if a person consumes enough calories, this does not guarantee adequate intake of essential nutrients. This can be viewed as an infringement on the human right to adequate food, which implies availability and accessibility of food in sufficient quantity for all. Populations at greater risk from food insecurity includes, smallholder and subsistence farmers, pastoralists, traditional societies and indigenous people (FAO, 2006).

Improvement of low productivity of indigenous chickens in developing countries has been the main objective of poultry development initiatives reported by several authors (SAFALAOH, 2001; COPLAND and ALDERS, 2005; MACK *et al.,* 2005; RIISE *et al.,* 2005). Studies in Nigeria have identified different limitations to increased productivity of indigenous chickens including low genetic potential of the chickens, inadequate nutrition and disease outbreaks (OKITOI *et al.,* 2000; KAUDIA and KITALYI, 2002). A number of genetic improvement programmes with varying degrees of success have been recorded by poultry breeders in Nigeria (ADELEKE *et al*., 2011; ADEBAMBO, 2015). This was aimed at meeting the urgent need of developing chickens to appreciable size within a shorter duration that could favourably compete with broiler chickens. Hence, the objective of this study is to make recommendations based on the genetic and phenotypic correlation coefficients to poultry breeders to further improve the growth traits and rate of our locally adapted breeds of chickens. As this will lead to total reliance of the populace on our indigenous chicken breeds and consequently leads to it commercialization.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Poultry Breeding Unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. The site is located on latitude 7°10’N and 3°2’E in Odeda Local Government Area, Ogun State, Nigeria. This lies in the tropical climate with an average rainfall of 1100 mm, a mean temperature of about 34°C and a yearly average relative humidity of 82%. The vegetation represents an inter-phase between the tropical rainforest and the derived savannah (AGROMET, FUNAAB, 2015; GOOGLE EARTH, 2018).

Experimental Birds

The experiment was in two phases, for the first phase, a total of 300 unsexed pure line day-old chicks comprising 150 each of two chicken genotypes (FUNAAB Alpha and Noiler) were procured from two reputable hatcheries in Abeokuta (Ogun State) and Awe (Oyo State) respectively. Each genotype was housed in a separate deep litter pen at day-old and the birds were wing-tagged for identification purpose using different colour tags for each genotype. Brooding was done for three weeks and the birds were reared for a period of 18 weeks following standard routine management practices as described by FAO (2012b).

The second phase of the research made use of superior stocks based on body weight, selected from among chickens raised for 18 weeks during the first phase. Four (4) cocks and twenty (20) hens each of FUNAAB Alpha and Noiler chickens were selected in ratio 1:5 and raised till 22 weeks to attain sexual maturity before artificial insemination was carried out.

Semen Collection and Artificial Insemination

The cocks were trained for semen collection for four (4) weeks (19^{th} – 22^{nd} week) using abdominal massage technique (ADELEKE *et al.,* 2004). The birds were massaged at the back and stroked close to the tail while the inseminator also applied a slight finger pressure around the base of the tail to achieve semen collection into microcentrifuge tube. Semen collection and artificial insemination (AI) were done thrice a week.

AI was accomplished using micro pipette which was inserted into the inverted oviduct deep enough to deposit sperm into the vagina. Fertile eggs were collected and labeled according to the chicken genotypes. Hatchable eggs were stored in a cool room of 20 to 25^{o}C and 80% relative humidity for five days to get an appreciable number of fertile eggs before being transferred to the hatchery. They were set in the incubator and fertility was determined after candling on the 18^{th} day, following which 100 fertile eggs were hatched per genotype after 21 days. The chicks were raised for twelve weeks during which their productive performance was recorded and compared.

Management of Chicks

The management system used was intensive. Few days before arrival of day-old chicks, pens were thoroughly disinfected and wood shavings evenly spread on the floor. Feeders and drinkers were made available, heat source was provided through high voltage bulbs and charcoal heated coal pots were provided as alternative source of heat for the chicks. Wood shavings were changed when necessary to ensure good hygiene for the chickens throughout the experimental period. Commercial feed and water were provided to bird's *ad libitum*. The two genotypes were subjected to the same management system from day-old to 18 weeks of age for the first phase and day-old to 12 weeks for the second phase, though they were separated into two different pens.

Feed and Feeding

The birds were fed *ad libitum* with a commercial feed containing 23% crude protein and 2840 kcal/kg metabolisable energy (ME) from day-old to 5 weeks of age, and also with commercial feed containing 19% crude protein and 2875 kcal/kg ME from 6 to 18 weeks of age. Clean drinking water was also provided *ad libitum* to the birds.

Data Collection

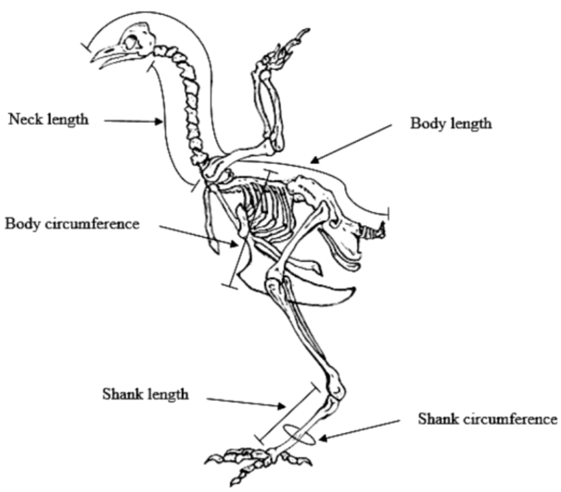
Individual bird weight was taken on a weekly basis starting from the 1st week till the 18th week of age. Each bird was weighed with a sensitive scale (Camry IS09001 Dial Spring Scale) calibrated to 5 kg to obtain the body weight. The linear body measurements (body circumference, breast girth, shank length, thigh length and wing length) were measured on weekly basis using a measuring tape as described by UDEH *et al*. (2011); DONALDSON *et al*. (2012); MUSHI *et al*. (2020).

To ensure proper record-keeping, the birds were wing-tagged for identification purpose using different colour tags for each genotype which was attached to each bird's wing throughout the experimental period and at 12th week for the second phase, the birds were sexed using the natural secondary characteristics of their sex. In males, the combs and wattles were brighter in colour (red) and larger than those on females and the head appeared more angular in shape.

Growth Performance Evaluation

Body weight (BG): A sensitive scale was used to determine individual bird's weight in grams.

Body circumference (BC): The circumference of the bird's body was measured from the back to the chest region (Figure 1).



(MUSHI *et al*., 2020).

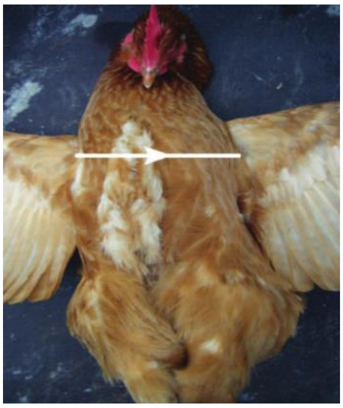
Figure 1. Pictorial representation of where various linear body measurements was taken

Breast girth (BG): The measurement of the chest circumference around the deepest region (hind breast) (Figure 2).

Shank length (SL): length from the hock joint to the tarsometatarsus of any leg (Figure 1)

Thigh length (TL): The thigh length was taken at the distance between the hock joint and the pelvic joint (ADELEKE *et al.,* 2011).

Wing length (WL): This was measured from the distance between the tip of the phalanges and the coracoid-humerus joint.



(DONALDSON *et al.,* 2012)

Figure 2. Pictorial representation of where breast girth measurement was taken

Genetic Parameter Estimates

Genetic parameters (genetic and phenotypic correlation) were estimated for the following growth parameters (body weight, body circumference, breast girth, shank length, thigh length and wing span) (ADELEKE *et al*., 2011).

Analysis of Growth Data

Growth data were subjected to least squares analysis of variance using the Generalized Linear Model of SAS 9.2 software and the model used was of the form:

$$Y_{ijk} = \mu + G_i + S_j + (GS)_{ij} + \varepsilon_{ijk}$$

where,

Y_{ijk} = Observation made on traits of interest (BW, BC, BG, SL, TL and WL)

μ = Overall estimate of the population mean.

G_i = Fixed effect of the i^{th} genotype of chickens (i = FUNAAB Alpha, Noiler)

S_j = Fixed effect of the j^{th} sex of chickens (j = male, female)

$(GS)_{ij}$ = Interaction between genotype and sex

ε_{ijk} = Random error associated with each measurement.

Least significant difference (LSD) method was used to separate means for factors that showed significant effect (LI *et al.*, 2000).

The Generalized Linear Model of SAS 9.2 software (PROC MIXED DATA) was used to estimate the variances and covariances of genetic and phenotypic correlations using the formulae below:

Genetic correlation:

$$r_g = \frac{\text{cov}_{xy}}{\sqrt{\left(\delta_x^2 \cdot \delta_y^2\right)}}$$

Phenotypic correlation:

$$r_p = \frac{\text{cov}_w(x,y) + \text{cov}_s(x,y)}{\sqrt{\left(\delta^2_{w(x)} + \delta^2_{s(x)}\right)\left(\delta^2_{w(y)} + \delta^2_{s(y)}\right)}}$$

Where,

σ_b^2 = Variance component between

δ_s^2 = Variance component of sire

δ_D^2 = Variance component of dam

δ_w^2 =Variance component within progeny

Cov_{xy} = Covariance of any two growth traits X and Y

X and Y = individual growth traits

RESULTS

Effect of Genotype and Sex on Body Weight and Linear Body Measurements of Chickens at Weeks 2, 4 And 6

The least squares mean for body weight as affected by genotype and sex of the two chicken genotypes (FUNAAB Alpha and Noiler) at weeks 2, 4 and 6 are presented in Table 1. The results revealed that Noiler chickens performed better ($p<0.05$) when compared with FUNAAB Alpha chickens. Both chicken genotypes had good early start in life. The following weights were recorded for the two chicken genotypes (155.05±2.14 g and 161.08±2.40 g; 364.85±7.23 g and 355.20±7.23 g; 545.10±8.30 g and 527.53±8.89 g) at weeks 2, 4 and 6 for FUNAAB Alpha and Noiler respectively. The males were significantly ($p<0.05$) superior to the female counterparts in terms of body weight at weeks 2, 4 and 6 by a difference of 7.56 g, 59.94 g and 64.26 g, respectively.

Considering linear body measurements at week 2, FUNAAB Alpha had higher ($p<0.05$) least squares mean for breast girth and shank length when compared with Noiler chickens, while for body circumference, the latter was better. At week 4, Noiler significantly ($p<0.05$) exceeded FUNAAB Alpha in all linear body measurements and maintained similar trend in breast girth and thigh length at week 6. Body circumference and shank length were however not significantly (p>0.05) different at week 6 for the two genotypes. The males were superior (p<0.05) to their female counterparts in all linear body measurements considered at weeks 2, 4 and 6.

Table 1. Effect of genotype and sex on the body weight and linear body measurements of three chicken genotypes at weeks 2, 4 and 6 (LSM±SE)

AGE (Week)	Genotype / Sex	BW (g)	BC (cm)	BG (cm)	SL (cm)	TL (cm)	WL (cm)
2	FUNAAB Alpha	155.05 ± 2.14^{b}	15.81 ± 0.11^{b}	9.25 ± 0.06^{a}	4.75 ± 0.04^{a}	7.84±0.06	9.68±0.06
	Noiler	161.08 ± 2.40^{a}	16.90 ± 0.11^{a}	8.17 ± 0.06^{b}	4.55 ± 0.04^{b}	7.94±0.06	9.77±0.06
	Sex						
	Female	154.43 ± 2.34^{b}	16.27±0.13	8.62±0.09	4.62±0.04	7.83±0.07	9.74±0.07
	Male	161.99 ± 2.44^{a}	16.44±0.14	8.80±0.09	4.68±0.04	7.96±0.07	9.74±0.07
4	FUNAAB Alpha	364.85±17.23	22.22±0.32	10.31 ± 0.12^{ab}	5.88 ± 0.05^{b}	10.59 ± 0.10^{b}	13.26 ± 0.19^{b}
	Noiler	355.20±17.23	21.43±0.32	10.64 ± 0.12^{a}	6.31 ± 0.05^{a}	11.26 ± 0.10^{a}	13.85 ± 0.19^{a}
	Sex						
	Female	331.23 ± 20.36^{b}	21.28 ± 0.38^{b}	10.47±0.14	5.95 ± 0.05^{b}	10.77 ± 0.11^{b}	13.13 ± 0.22^{b}
	Male	391.17 ± 21.18^{a}	22.41 ± 0.39^{a}	10.47±0.14	6.25 ± 0.06^{a}	11.09 ± 0.11^{a}	14.02 ± 0.23^{a}
6	FUNAAB Alpha	545.10±8.30	24.51±1.34	11.47 ± 0.17^{b}	7.28±0.08	12.79 ± 0.10^{b}	15.72 ± 0.09^{b}
	Noiler	527.53±8.89	24.97±1.44	12.50 ± 0.18^{a}	7.45±0.08	13.70 ± 0.11^{a}	16.02 ± 0.10^{a}
	Sex						
	Female	506.63 ± 8.99^{b}	24.38 ± 0.16^{b}	11.93±0.17	7.11 ± 0.08^{b}	13.09±0.11	15.57 ± 0.09^{b}
	Male	570.89 ± 9.52^{a}	25.12 ± 0.17^{a}	11.97±0.18	7.64 ± 0.09^{a}	13.35±0.11	16.17 ± 0.10^{a}

[a, b,] Means on the same column for each parameter with different superscripts are significantly different (p<0.05)

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

Effect of Genotype and Sex on Body Weight and Linear Body Measurements of Chickens at Weeks 8, 10 and 12

Table 2 shows the least squares means for body weight as affected by genotype and sex of the two chicken genotypes at weeks 8, 10 and 12. It was observed that there was no significantly (p>0.05) difference in the body weight of the two chicken genotypes at weeks 8 and 10 but Noiler had significantly (p<0.05) higher body weights than FUNAAB Alpha chickens at week 12 with an average mean difference of 72 g. The males of these genotypes were significantly (p<0.05) superior to the female counterparts with respect to body weight at weeks 8, 10 and 12 by a difference of 123.38 g, 193.72 g and 243.77 g, respectively.

Table 2. Effect of genotype and sex on the body weight and linear body measurements of chickens at weeks 8, 10 and 12 (LSM±SE)

AGE (Week)	Genotype / Sex	BW (g)	BC (cm)	BG (cm)	SL (cm)	TL (cm)	WL (cm)
8	FUNAAB Alpha	840.39±12.71	28.83±0.19	$11.75±0.22^b$	$8.50±0.08^b$	$15.18±0.16^b$	$18.61±0.14^b$
	Noiler	871.46±13.60	29.32±0.21	$14.06±0.24^a$	$8.88±0.08^a$	$15.99±0.17^a$	$19.11±0.15^a$
	Sex						
	Female	$796.73±13.34^b$	$28.35±0.20^b$	12.66±0.26	$8.41±0.07^b$	$15.26±0.12^b$	$18.40±0.11^b$
	Male	$920.11±14.13^a$	$29.86±0.21^a$	13.01±0.27	$8.98±0.07^a$	$15.89±0.12^a$	$19.34±0.12^a$
10	FUNAAB Alpha	1156.08±17.41	$32.84±0.19^a$	$12.67±0.17^b$	$9.49±0.08^a$	$16.94±0.12^b$	$20.35±0.13^a$
	Noiler	1179.78±18.64	$31.43±0.21^b$	$15.07±0.18^a$	$8.29±0.09^b$	$18.13±0.12^a$	$18.89±0.14^b$
	Sex						
	Female	$1075.85±18.39^b$	$31.35±0.21^b$	$13.45±0.20^b$	$8.54±0.10^b$	$17.17±0.13^b$	$19.13±0.16^b$
	Male	$1269.56±19.48^a$	$33.12±0.22^a$	$14.17±0.22^a$	$9.36±0.10^a$	$17.86±0.14^a$	$20.27±0.17^a$
12	FUNAAB Alpha	$1317.94±20.25^b$	35.24±0.25	$13.29±0.13^b$	$10.10±0.08^b$	$18.49±0.14^b$	21.34±0.20
	Noiler	$1389.33±21.68^a$	34.80±0.26	$14.48±0.14^a$	$10.89±0.08^a$	$19.48±0.15^a$	21.58±0.21
	Sex						
	Female	$1236.34±21.12^b$	$34.11±0.27^b$	$13.59±0.14^b$	$9.91±0.08^b$	$18.34±0.15^b$	$20.28±0.21^b$
	Male	$1480.11±22.37^a$	$36.07±0.28^a$	$14.13±0.14^a$	$11.09±0.08^a$	$19.64±0.16^a$	$22.77±0.22^a$

[a, b,] Means on the same column for each parameter with different superscripts are significantly different (p<0.05)
BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

The results of the linear body measurements considered showed significant (p<0.05) difference(s) in mean values based on genotype and sex effects. Noiler chicken genotype attained least squares means values that were significantly (p<0.05) superior to FUNAAB Alpha at week 8 for all the traits considered.

FUNAAB Alpha had a better (p<0.05) BC, SL and WL at weeks 10 and 12 than Noiler chickens. For BG and TL, Noiler chickens performed better at weeks 10 and 12 with significantly (p<0.05) greater values than FUNAAB Alpha chickens. The males were significantly (p<0.05) superior to their female counterparts in all the linear body measurements considered at weeks 8, 10 and 12 just as it was observed for the earlier weeks.

Effect of Genotype and Sex on Body Weight and Linear Body Measurements of Chickens at Weeks 14, 16 and 18

The results obtained at weeks 14, 16 and 18 for the two chicken genotypes are presented in Table 3. Noiler chicken genotype performed better (p<0.05) than the FUNAAB

Alpha chicken genotype in all the parameters considered. There were significant ($p<0.05$) differences in least squares means between the genotypes and sex. For BW, both chicken genotype had mean values which increased progressively but with a difference of 39 g, 135 g and 184 g at weeks 14, 16 and 18 respectively in favour of Noiler genotype. Similar progressive pattern of superiority was observed for sex effect during these weeks with males being significantly ($p<0.05$) better than their female counterparts with a difference of 235 g, 322 g and 412 g at 14th, 16th and 18th week of age.

Significant ($p<0.05$) differences were also observed in the results of the linear body measurements considered for genotype and sex. Noiler chicken genotype attained least squares means that were significantly ($p<0.05$) superior to FUNAAB Alpha for all the traits considered at week 14. At weeks 16 and 18 Noiler chicken was also significantly ($p<0.05$) superior to FUNAAB Alpha for all the growth traits except for BC at week 16 and BG at week 18 where there were no significant ($p>0.05$) differences in the values obtained for the two genotypes. The males were significantly ($p<0.05$) superior to their female counterparts in all the linear body measurements considered at the aforementioned weeks.

Table 3. Effect of genotype and sex on the body weight and linear body measurement of chickens at weeks 14, 16 and 18 (LSM±SE)

AGE (Week)	Genotype / Sex	BW (g)	BC (cm)	BG (cm)	SL (cm)	TL (cm)	WL (cm)
14	FUNAAB Alpha	1572.16±22.37	37.83±0.26^b	13.26±0.08^b	10.74±0.09^b	19.10±0.15^b	21.67±0.18^b
	Noiler	1611.24±23.95	42.40±0.28^a	13.61±0.09^a	11.20±0.09^a	20.19±0.16^a	23.16±0.19^a
	Sex						
	Female	1479.70±24.04^b	38.75±0.35^b	13.18±0.10^b	10.23±0.07^b	18.65±0.14^b	21.36±0.20^b
	Male	1714.56±25.47^a	41.32±0.37^a	13.70±0.10^a	11.77±0.08^a	20.67±0.14^a	23.49±0.21^a
16	FUNAAB Alpha	1729.71±25.65^b	39.37±0.23	14.05±0.09^b	10.86±0.10^b	19.92±0.15^b	22.49±0.17^b
	Noiler	1864.61±27.46^a	39.02±0.24	14.99±0.09^a	11.67±0.11^a	20.91±0.16^a	24.07±0.19^a
	Sex						
	Female	1640.89±27.04^b	37.79±0.21^b	14.26±0.10^b	10.35±0.08^b	18.94±0.12^b	21.64±0.14^b
	Male	1962.78±28.64^a	40.80±0.22^a	14.75±0.11^a	12.24±0.09^a	22.00±0.12^a	25.00±0.15^a
18	FUNAAB Alpha	1895.25±27.68^b	41.75±0.31^b	14.93±0.09	10.94±0.09^b	19.93±0.15^b	22.68±0.18^b
	Noiler	2079.55±29.64^a	43.74±0.34^a	15.16±0.10	11.73±0.10^a	20.46±0.16^a	24.02±0.19^a
	Sex						
	Female	1787.03±28.01^b	41.25±0.36^b	14.55±0.09^b	10.44±0.08^b	18.86±0.10^b	21.72±0.15^b
	Male	2199.00±29.67^a	44.28±0.38^a	15.59±0.10^a	12.28±0.08^a	21.66±0.11^a	25.08±0.15^a

$^{a, b,}$ Means on the same column for each parameter with different superscripts are significantly different ($p<0.05$)

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

Effect of Interaction between Genotype and Sex on Body Weight and Linear Body Measurements of Chickens at Weeks 2, 4, 6, 8 and 10

The result of genotype and sex interactive effect showed significant (p<0.05) differences in all the economic traits of interest (BW, BC, BG, SL, TL and WL) at different weeks (Table 4). The pattern of superiority was shared between Noiler male and FUNAAB Alpha male chickens for all the traits considered from week 2 to 10. Noiler male chickens recorded the best body weight of 165.53±3.13 g (p=0.03), 941.79±18.93 g (p=0.03) and 1301.03±25.20 g (p=0.05) at weeks 2, 8 and 10, respectively. These values were significantly superior to that of FUNAAB Alpha male and female and Noiler female while FUNAAB Alpha male performed best at weeks 4 and 6 with least squares mean values of 407.16±24.16 g (p=0.04) and 575.29±11.21 g (p=0.03) which were significantly superior to the other three categories.

Table 4. Effect of interaction between genotype and sex on body weight and linear body measurements of chickens at weeks 2, 4, 6, 8 and 10 (LSM±SE)

Genotype	Sex	Dependent variable	Age (Week)				
			2	4	6	8	10
FUNAAB Alpha	Female	BW (g)	151.37 ± 3.01^{b}	322.55 ± 24.16^{bc}	514.90 ± 11.21^{b}	777.25 ± 16.56^{b}	1066.67 ± 22.03^{b}
FUNAAB Alpha	Male		158.73 ± 3.01^{ab}	407.16 ± 24.16^{a}	575.29 ± 11.21^{a}	903.53 ± 16.56^{a}	1245.49 ± 22.03^{a}
Noiler	Female		157.27 ± 2.90^{ab}	339.27 ± 23.26^{b}	498.20 ± 11.33^{b}	816.60 ± 16.72^{b}	1085.20 ± 22.25^{b}
Noiler	Male		165.53 ± 3.13^{a}	373.83 ± 25.16^{ab}	565.13 ± 12.82^{a}	941.79 ± 18.93^{a}	1301.03 ± 25.20^{a}
FUNAAB Alpha	Female	BC (cm)	15.74 ± 0.16^{b}	21.49 ± 0.45^{b}	23.96±1.91	27.96 ± 0.26^{c}	31.85 ± 0.26^{b}
FUNAAB Alpha	Male		15.88 ± 0.16^{b}	22.95 ± 0.45^{a}	25.06±1.91	29.71 ± 0.26^{a}	33.83 ± 0.26^{a}
Noiler	Female		16.76 ± 0.15^{a}	21.08 ± 0.43^{b}	24.80±1.93	28.74 ± 0.26^{b}	30.84 ± 0.26^{c}
Noiler	Male		17.05 ± 0.16^{a}	21.83 ± 0.47^{ab}	25.19±2.18	30.06 ± 0.30^{a}	32.19 ± 0.29^{b}
FUNAAB Alpha	Female	BG (cm)	9.24 ± 0.10^{a}	10.32 ± 0.17^{ab}	11.26 ± 0.24^{b}	11.49 ± 0.32^{c}	12.11 ± 0.24^{c}
FUNAAB Alpha	Male		9.25 ± 0.10^{a}	10.29 ± 0.17^{ab}	11.68 ± 0.24^{b}	12.00 ± 0.32^{bc}	13.24 ± 0.24^{b}
Noiler	Female		8.05 ± 0.09^{b}	10.61 ± 0.17^{ab}	12.61 ± 0.24^{a}	13.85 ± 0.32^{a}	14.82 ± 0.24^{a}
Noiler	Male		8.30 ± 0.10^{b}	10.67 ± 0.18^{a}	12.36 ± 0.27^{a}	14.33 ± 0.36^{a}	15.38 ± 0.27^{a}
FUNAAB Alpha	Female	SL (cm)	4.71 ± 0.05^{a}	5.68 ± 0.06^{c}	7.06 ± 0.10^{d}	8.19 ± 0.10^{d}	8.96 ± 0.10^{b}
FUNAAB Alpha	Male		4.77 ± 0.05^{a}	6.08 ± 0.06^{b}	7.51 ± 0.10^{b}	8.81 ± 0.10^{b}	10.01 ± 0.10^{a}
Noiler	Female		4.54 ± 0.05^{b}	6.20 ± 0.06^{b}	7.16 ± 0.10^{c}	8.63 ± 0.10^{c}	8.12 ± 0.10^{d}
Noiler	Male		4.57 ± 0.05^{b}	6.44 ± 0.06^{a}	7.82 ± 0.12^{a}	9.21 ± 0.12^{a}	8.50 ± 0.12^{c}
FUNAAB Alpha	Female	TL (cm)	7.77±0.09	10.58 ± 0.13^{b}	12.59 ± 0.14^{d}	14.77 ± 0.22^{c}	16.74 ± 0.16^{c}
FUNAAB Alpha	Male		7.91±0.09	10.61 ± 0.13^{b}	13.00 ± 0.14^{c}	15.58 ± 0.22^{b}	17.15 ± 0.16^{c}
Noiler	Female		7.87±0.08	10.95 ± 0.13^{b}	13.61 ± 0.15^{b}	15.75 ± 0.22^{ab}	17.62 ± 0.16^{b}
Noiler	Male		8.02±0.09	11.61 ± 0.14^{a}	13.81 ± 0.16^{ab}	16.31 ± 0.25^{a}	18.78 ± 0.18^{a}
FUNAAB Alpha	Female	WL (cm)	9.73±0.09	13.01 ± 0.26^{b}	15.43 ± 0.13^{c}	18.12 ± 0.19^{c}	19.89 ± 0.18^{b}
FUNAAB Alpha	Male		9.64±0.09	13.51 ± 0.26^{b}	16.00 ± 0.13^{b}	19.10 ± 0.19^{b}	20.80 ± 0.18^{a}
Noiler	Female		9.70±0.08	13.23 ± 0.25^{b}	15.72 ± 0.13^{b}	18.69 ± 0.20^{b}	18.36 ± 0.18^{c}
Noiler	Male		9.85±0.09	14.57 ± 0.27^{a}	16.40 ± 0.15^{a}	19.65 ± 0.22^{a}	19.58 ± 0.20^{b}

$^{a, b, c, d}$ Means on the same column with different superscripts are significantly different (p<0.05)

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

For the linear body measurements of interest, there were different patterns of superiority displayed among the four categories, for instance, Noiler male and female chickens were significantly ($p<0.05$) superior to FUNAAB Alpha male and female at week 2 for body circumference, while at week 4, 8 and 10 FUNAAB Alpha male and Noiler male were significantly ($p<0.05$) superior to the other two categories. Results obtained for BG showed that FUNAAB Alpha male and female had 9.25±0.10 cm(p=0.03) and 9.24±0.10 cm(p=0.03), respectively which were significantly superior to the other two categories at week 2 while at week 6, Noiler female (12.61±0.24 cm p=0.02) and Noiler male (12.36±0.27 cm p=0.03) were significantly superior to the other two categories. Noiler male and female performed best at weeks 8 and 10.

The result of the SL showed significant ($p<0.05$) differences at weeks 4, 6, 8 and 10 with Noiler male chickens having the best performance when compared with the other three categories at weeks 4 (6.44±0.06 cm p=0.02), 6 (7.82±0.12 cm p=0.03) and 8 (9.21±0.12 cm p=0.02) while at week 10, FUNAAB Alpha male chicken's SL was significantly ($p<0.05$) superior to that of the other three categories with a value of 10.01±0.10 cm (p=0.01). Interaction between genotype and sex favoured Noiler males at weeks 4, 8 and 10 when considering TL. Noiler male chickens also had the highest values for wing length at weeks 4, 6 and 8, which were significantly ($p<0.05$) superior to values obtained in FUNAAB Alpha male and female, and Noiler female, while at week 10, FUNAAB Alpha male performed best.

Effect of Interaction between Genotype and Sex on Body Weight and Linear Body Measurements of Chickens at Weeks 12, 14, 16 and 18

Genotype and sex interactive effect significantly ($p<0.05$) affected all the economic traits of interest from week 12 to 18 (Table 5). Noiler male chickens had the best performance for body weight at weeks 12, 14, 16 and 18. These values are significantly superior to the values obtained in FUNAAB Alpha male and female and Noiler female.

A similar trend of superiority was observed in all the linear body measurements considered at the aforementioned weeks with Noiler male chickens having Significantly ($p<0.05$) higher values. Body circumference is the only trait where FUNAAB Alpha male recorded highest ($p<0.05$) value above the other counterparts at week 12.

Genetic and Phenotypic Correlations of Growth Traits of FUNAAB Alpha and Noiler Chicken Genotypes at week 4

The results of the genetic (Upper diagonal) and phenotypic (Lower diagonal) correlations of growth traits of FUNAAB Alpha and Noiler chickens at week 4 are presented in Table 6. These correlations were based on sire plus dam components of variance and covariance. FUNAAB Alpha and Noiler chicken genotypes both had positive correlation coefficients for body weight with all linear body measurements considered. Correlation coefficients among the linear body measurements were also high and positive. Generally, higher correlation coefficients were observed in genetic than phenotypic for all the trait considered except for the correlation between body weight and body circumference were higher phenotypic correlation coefficient surpassed that of genetic. The genetic correlation coefficients were between 0.485 and 0.981

while phenotypic correlation coefficients ranged between 0.078 and 0.940 in all the productive traits considered.

In Noiler chickens, body weight was positively correlated with all the linear body measurements with the highest coefficient of 0.880 observed between BW and BG in genetic correlation. The genetic correlation coefficients were between 0.374 and 0.956 with the highest coefficient of 0.956 observed between BG and SL while for the phenotypic correlation coefficients, it was between 0.101 and 0.920. The lowest correlation coefficient (0.101) was observed between BW and BC while the highest (0.920) was observed between TL and WL for the phenotypic correlation at week 4.

Table 5. Effect of interaction between genotype and sex on body weight and linear body measurements of chickens at weeks 12, 14, 16 and 18 (LSM±SE)

Genotype	Sex	Dependent variable	Age (Week) 12	14
FUNAAB Alpha	Female	BW (g)	1204.51 ± 24.98^{c}	1472.35 ± 28.62^{c}
FUNAAB Alpha	Male		1431.37 ± 24.96^{b}	1671.96 ± 28.62^{b}
Noiler	Female		1268.80 ± 25.22^{c}	1487.20 ± 28.90^{c}
Noiler	Male		1543.85 ± 28.56^{a}	1770.26 ± 32.73^{a}
FUNAAB Alpha	Female	BC (cm)	34.23 ± 0.33^{b}	36.81 ± 0.33^{d}
FUNAAB Alpha	Male		36.25 ± 0.33^{a}	38.85 ± 0.33^{c}
Noiler	Female		34.00 ± 0.34^{b}	40.73 ± 0.33^{b}
Noiler	Male		35.83 ± 0.38^{a}	44.54 ± 0.37^{a}
FUNAAB Alpha	Female	BG (cm)	12.96 ± 0.18^{d}	13.07 ± 0.12^{c}
FUNAAB Alpha	Male		13.62 ± 0.18^{c}	13.45 ± 0.12^{b}
Noiler	Female		14.23 ± 0.18^{b}	13.29 ± 0.12^{bc}
Noiler	Male		14.81 ± 0.20^{a}	14.03 ± 0.14^{a}
FUNAAB Alpha	Female	SL (cm)	9.49 ± 0.08^{d}	9.97 ± 0.08^{d}
FUNAAB Alpha	Male		10.71 ± 0.08^{b}	11.51 ± 0.08^{b}
Noiler	Female		10.34 ± 0.08^{c}	10.49 ± 0.08^{c}
Noiler	Male		11.60 ± 0.10^{a}	12.12 ± 0.09^{a}
FUNAAB Alpha	Female	TL (cm)	17.83 ± 0.18^{c}	18.02 ± 0.18^{d}
FUNAAB Alpha	Male		19.15 ± 0.18^{b}	20.18 ± 0.18^{b}
Noiler	Female		18.85 ± 0.18^{b}	19.30 ± 0.18^{c}
Noiler	Male		20.28 ± 0.20^{a}	21.32 ± 0.20^{a}
FUNAAB Alpha	Female	WL (cm)	20.04 ± 0.24^{b}	20.32 ± 0.22^{d}
FUNAAB Alpha	Male		22.64 ± 0.24^{a}	23.02 ± 0.22^{b}
Noiler	Female		20.52 ± 0.25^{b}	22.41 ± 0.22^{c}
Noiler	Male		22.94 ± 0.28^{a}	24.12 ± 0.25^{a}

[a, b, c, d] Means on the same column with different superscripts are significantly different ($p<0.05$)

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

Table 6. Genetic (Upper diagonal) and phenotypic (Lower diagonal) correlations of growth traits of FUNAAB Alpha and Noiler chicken genotypes at week 4

Genotype	Trait	BW	BC	BG	SL	TL	WL
FUNAAB Alpha	BW	-	0.772	0.544	0.664	0.740	0.855
	BC	0.909	-	0.621	0.715	0.928	0.981
	BG	0.356	0.585	-	0.485	0.631	0.702
	SL	0.195	0.655	0.078	-	0.906	0.952
	TL	0.357	0.588	0.218	0.341	-	0.962
	WL	0.490	0.940	0.256	0.736	0.613	-
Noiler	BW	-	0.828	0.880	0.751	0.379	0.611
	BC	0.101	-	0.883	0.374	0.538	0.594
	BG	0.193	0.765	-	0.956	0.881	0.842
	SL	0.256	0.457	0.216	-	0.402	0.557
	TL	0.463	0.117	0.845	0.545	-	0.464
	WL	0.485	0.165	0.136	0.259	0.920	-

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length and WL = Wing Length

Genetic and Phenotypic Correlations of Growth Traits of FUNAAB Alpha and Noiler Chicken Genotypes at Week 8

At week 8, the result showed that both genotypes had a similar pattern of correlation coefficients (Table 7). Genetic correlation coefficients were consistently higher than the phenotypic correlation coefficients in most of the traits studied.

The genetic correlation coefficients between BW and linear body measurements were higher than phenotypic correlation coefficients for chicken genotypes except for BW's correlation with SL and TL in FUNAAB Alpha. BC correlated with other linear body measurements also showed better correlation coefficients in genetic than phenotypic correlation. The highest (0.974) correlation coefficient was observed between BG and TL while the lowest (0.334) was observed between BG and WL in FUNAAB Alpha chickens for genetic correlation. For the phenotypic correlation, the coefficients were between 0.107 (BC with BG) and 0.956 (SL with TL).

In Noiler chicken genotype, the genetic correlation coefficients were between -0.532 (BC and BG) and 0.992 (BW and TL) while the phenotypic correlation coefficients range from 0.100 (BW and SL) to 0.892 (BG and SL). Correlation coefficients observed between SL and TL, WL and between TL and WL showed higher and better correlation coefficients for genetic than phenotypic correlation. BC and BG correlated with other linear body measurements displayed different degree of superiority between the genetic and phenotypic correlation. Noiler chicken genotype had better genetic correlation coefficients when compared with the FUNAAB Alpha counterpart while the reverse is the case for the phenotypic correlation coefficients at week 8.

Table 7. Genetic (Upper diagonal) and phenotypic (Lower diagonal) correlations of growth traits of FUNAAB Alpha and Noiler chicken genotypes at week 8

Genotype	Trait	BW	BC	BG	SL	TL	WL
FUNAAB Alpha	BW	-	0.906	0.959	0.634	0.660	0.712
	BC	0.783	-	0.429	0.584	0.587	0.630
	BG	0.132	0.107	-	0.379	0.974	0.334
	SL	0.705	0.117	0.350	-	0.471	0.944
	TL	0.676	0.253	0.930	0.956	-	0.653
	WL	0.231	0.490	0.930	0.111	0.185	-
Noiler	BW	-	0.778	0.645	0.549	0.992	0.981
	BC	0.531	-	-0.532	0.109	0.532	0.592
	BG	0.160	0.203	-	0.547	0.389	0.465
	SL	0.100	0.326	0.892	-	0.578	0.969
	TL	0.208	0.216	0.852	0.111	-	0.786
	WL	0.221	0.453	0.104	0.153	0.029	-

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length, and WL = Wing Length

Genetic and Phenotypic Correlations of Growth Traits of FUNAAB Alpha and Noiler Chicken Genotypes at Week 12

The phenotypic correlation coefficients were higher than the genetic correlation coefficients for both chicken genotypes at week 12 (Table 8). In FUNAAB Alpha chickens, both the genetic and phenotypic correlation coefficients were high and positive. The genetic correlation coefficients were between 0.460 (BG and TL) and 0.753 (SL and WL) while the phenotypic correlation coefficients ranged between 0.114 (SL correlated with WL) and 0.971 (BG correlated with WL). BW and the linear body measurements had high and better phenotypic correlation coefficients than the genetic correlation coefficients in most of the traits while BC correlated with other linear body measurements showed higher genetic coefficients than the phenotypic correlation coefficients in all the traits correlated with BC.

Noiler chicken genotype had genetic correlation coefficients that ranged between -0.125 (BG correlated with WL) and 0.953 (BC correlated with BG) while the phenotypic correlation coefficients ranged between -0.458 (BC correlated with SL) and 0.992 (SL correlated with WL). BW correlated with linear body measurements showed that genetic coefficients were higher than the phenotypic correlation coefficients in most of the traits correlated with body weight while for other linear body measurement correlated together, phenotypic coefficients were higher for most of the traits considered at week 12.

Table 8. Genetic (Upper diagonal) and phenotypic (Lower diagonal) correlations of growth traits of FUNAAB Alpha and Noiler chicken genotypes at week 12

Genotype	Trait	BW	BC	BG	SL	TL	WL
FUNAAB Alpha	BW	-	0.487	0.557	0.710	0.522	0.576
	BC	0.911	-	0.647	0.708	0.487	0.540
	BG	0.730	0.587	-	0.489	0.460	0.534
	SL	0.639	0.162	0.472	-	0.682	0.753
	TL	0.677	0.172	0.478	0.650	-	0.666
	WL	0.313	0.270	0.971	0.114	0.158	-
Noiler	BW	-	0.878	0.129	0.715	0.701	0.630
	BC	0.826	-	0.953	0.338	0.215	0.611
	BG	0.437	0.741	-	0.179	0.115	-0.125
	SL	0.221	-0.458	0.211	-	0.573	0.701
	TL	0.314	0.345	0.211	0.980	-	0.627
	WL	0.415	0.379	-0.307	0.992	0.837	-

BW = Body Weight, BC = Body Circumference, BG = Breast Girth, SL = Shank Length, TL = Thigh Length, and WL = Wing Length

DISCUSSION

The two chicken genotypes studied (FUNAAB Alpha and Noiler) have been developed and improved through a progressive programme of breeding and selection (ADEBAMBO, 2015) for excellent performance and good processing yield to meet multiple market demand around the world (TADELLE, 2017). An on station performance evaluation by the African Chicken Genetic Gains Nigeria (ACGG-NG) carried out in Nigeria showed that the Nigerian indigenous chickens attained average body weights of 793 g at 16 weeks in Nigeria station (TADELLE, 2017). The improved indigenous chicken (FUNAAB Alpha) attained an average body weight of 1729 g at 16 weeks in this study. A difference of close to 1 kg (936 g) was observed, which means a high level of genetic improvement has been achieved over the years.

Body weight of an individual is used as a measure of growth in farm animals and often determined by its rate of growth (IBE, 1993). However, studies by IGE (2013) and YUNUSA and ADEOTI (2014) have shown that other growth traits relating to body morphometric measurements such as body length, shank length and chest girth can serve as good indicators of growth. The profitability of poultry enterprise depends on their production at a specific point in time (ILORI *et al.,* 2017). Hence, having a breed with high growth performance within the shortest possible time will increase profitability and bridge the persistent protein malnutrition especially in sub-Saharan Africa (ILORI *et al.,* 2017).

When compared to the exotic breeds of chickens (Abor Acre and Marshal), the Nigerian indigenous chicken has small body size and grow slowly (NWOSU *et al.*, 1980). It is evident from the current study that indigenous chickens possess great potentials for genetic improvement through breeding programmes. This is in agreement with earlier observations by IKEOBI *et al.*

(1996); ADEBAMBO *et al.* (1999); PETERS (2000); ADEDEJI *et al.* (2008); ADEBAMBO *et al.* (2009). FUNAAB Alpha is the first improved genotype of chicken developed at the Federal University of Agriculture, Abeokuta which shows a great improvement over the unimproved Nigerian indigenous chickens in terms of body weight and linear body measurements. In line with the report of IGE (2013), ADENIJI and AYORINDE (1990) that the age of an animal influences its growth pattern, the result of this research showed that growth rate was high at the early (between 2 and 8 weeks) stage of production in both chicken genotypes. Though, the rate of increase was not as rapid as in the case of Cobb broiler strain reported by ADENIJI and AYORINDE (1990), considerable rate of increase was observed in their growth.

The differences and superiority observed in the studied genotypes over the unimproved Nigerian indigenous chickens corroborate the fact that they have been selected for better growth performance. BAMIDELE *et al.* (2019) reported matured body weights of Noiler chicken genotype at 20 weeks to be between 2 and 2.6 kg which are within the result of this study with 2.3 kg at 18 weeks. The observed body weight of FUNAAB Alpha is in agreement with the findings of ADEBAMBO (2015) who reported an average of 1200 - 1800 g at between 18 and 21 weeks of age for the FUNAAB Alpha pullet line. It is also in agreement with the report of BAMIDELE *et al.* (2019) who reported body weight that ranged between 1635 - 2097 g at 20 weeks of age.

The trend of superiority observed in the body weight of the two chicken genotypes (FUNAAB Alpha and Noiler) from week 12 to 18 in this study is similar to the report of SULEIMAN (2019) who reported an average body weight of 1904.57 g and 1511.83 g for males at 18 weeks of age in favour of Noiler. Male body weight of the genotypes between 70 and 126 days observed in this study showed a similar pattern of superiority to their female counterparts with Noiler being the heavier bird. This is in line with finding of ACGG-NG (2018) that carried out similar research on genetic conservation through effective utilization of the improved indigenous chicken breeds by rural households in Nigeria.

Growth traits are under the same gene actions. Positive genetic correlation coefficients observed in this study substantiate the fact that genetic correlations result from pleiotropic effects of genes on multiple traits or from chromosomal linkage of genes affecting different traits. These occur with various magnitudes of genetic and phenotypic correlations of growth traits in the local chickens (KHAN and SINGH, 2002). Furthermore, the result of this study is corroborated by the report of KHAN and SINGH (2002) who pointed out that genetic correlation explains how much genetic influence on two traits is common. If it is above zero, it implies the two traits involved are influenced by common genes. However, this can be the factor concept of the two traits; which seem different phenotypically but share common genetic basis.

The strength of the association obtained for both genetic and phenotypic correlations at week two in Noiler, week four in FUNAAB Alpha and at week twelve in Noiler for genetic correlation and FUNAAB Alpha chicken for phenotypic correlation are consistent with the findings of earlier researchers such as YAKUBU *et al.* (2009); GUNI *et al.* (2013) and FAYEYE *et al.* (2014). They submitted that strong and positive association between body weight and the growth traits measured is an indication of pleiotropism and provides basis for possible genetic manipulation and improvement of the Nigerian local chicken.

The high and positive genetic correlations between body weight and other linear body measurements observed in this study are corroborated by the work of GAYA *et al.* (2006) who reported high genetic correlation between body weight and carcass traits at different ages. It was suggested that direct selection for body weight at 38 and 42 days of age could produce indirect genetic gain for breast muscle, leg and eviscerated body weight. The result also conforms with the work of OLEFORUH-OKOLEH *et al.* (2017) who reported correlation coefficients that ranged from moderately positive to highly positive values. Similarly, OKPEKU *et al.* (2003) reported high and positive genetic correlations between body weight and chest girth, HAUNSHI *et al.* (2012) reported strong and positive correlations between body weight and shank length which are consistent with the findings of this research. This implies that body weight correlated with breast girth, shank length and body parts are controlled by a single gene or genes linked together on the same locus of a chromosome.

Body weight correlated with thigh and wing lengths are a strong and positive correlation for the two chicken genotypes which is similar to ADELEKE *et al.* (2011) who noted that genetic correlation among growth traits in pure and crossbred progenies of Nigerian improved chicken is also a strong and positive one. Other reports by IGE (2013) and KABIR *et al.* (2006) have documented high and positive genetic and phenotypic correlations between body weight and shank length as obtained in this study from week 2 to 12 but it is in contrast with the report by SEMAKULA *et al.* (2011) who reported weak relationship between these two traits.

Positive phenotypic correlations were also recorded for most of the traits, though some traits showed negative phenotypic correlations at some weeks for both FUNAAB Alpha and Noiler chickens. FUNAAB Alpha chickens had highly positive phenotypic correlation in most of the economic traits of interest, which could imply that growth traits of FUNAAB Alpha chickens was greatly influence by the environment as against genetic in Noiler chickens. Phenotypic correlations observed in this study falls within the range reported in literature. The phenotypic correlations observed between body weight and wing length is a positive but low correlation for the two chicken genotypes which means that environment has minimal influence on the outcome of traits for most weeks. This negates the findings of OKPEKU *et al.* (2003); MOMOH and KERSHIMA (2008) and UKWU *et al.* (2014) who made use of Nigerian local chickens and reported strong and positive phenotypic correlations among body weight, chest girth, shank length and wing length. This means that the environment had considerably high effect on the traits (body weight and breast girth) as against minimal environmental influence on traits for this study.

CONCLUSIONS

Noiler chickens had better body weight and linear body measurements from week 10 to 18 than FUNAAB Alpha. Sexual dimorphism favoured male birds in terms of body weight and linear body measurements from week 1 to 18. With respect to genotype by sex interaction, Noiler male chickens were superior in all the traits considered from week 12 to 18. A strong and positive genetic correlation was observed among the economic traits of interest in both chicken genotypes with Noiler chickens having higher genetic correlation for most of the weeks while FUNAAB Alpha chickens had a strong and positive phenotypic correlation among the economic traits of interest.

The strong and positive association between body weight and the growth traits measured is an indication of pleiotropism, it estimates the degree to which the traits studied are affected by same genes or pairs of genes. This provides basis for further genetic manipulation and improvement of the chicken genotypes. Noiler chickens are recommended to commercial and small holder poultry farmers based on its superior performance in body weight and linear body measurements. Both chicken genotypes can be used in development of sire and dam lines in breed development due to presence of sexual dimorphism in them.

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GENETIČKI I FENOTIPSKI KOEFICIJENT KORELACIJE KVANTITATIVNIH OSOBINA KOD DVA GENOTIPA PILETA

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Izvod

Ovo istraživanje je sprovedeno radi procene genetičke i fenotipske korelacije morfometrijskih osobina novorazvijene nigerijske rase živine (FUNAAB Alpha) i pilića Noiler. Ukupno 300 jednodnevnih pilića bez pola, sa po 150 svaki od dva genotipa, uzgajano je osamnaest nedelja. Superiorne jedinke (4 petla i 20 kokošaka po genotipu) iz prve faze su odabrane na osnovu težine za roditelje za 100 jedinki po genotipu uzgajanih u drugoj fazi tokom 12 nedelja. Telesna težina, kao i linearna merenja tela (obim tela, obim grudi, dužina butina, dužina potkolenice i dužina krila) vršeni su nedeljno. Podaci o rastu su analizirani korišćenjem Generalizovanog linearnog modela SAS, a test najmanje značajne razlike (LSD) je korišćen za odvajanje značajnih srednjih vrednosti za genotipove. Izračunate varijanse i kovarijanse (PROC MIKSED DATA) su korišćene za procenu genetičkih i fenotipskih korelacija. Rezultati su pokazali da je piletina Noiler imala veću ($p<0,05$) telesnu težinu i linearne mere tela od 10 do 18 nedelja sa prosečnom težinom od 2079,55 g u poređenju sa 1895,29 g za FUNAAB Alpha. Pozitivne genetičke korelacije primećene su među osobinama od interesa i kod FUNAAB Alpha i kod Noilera, pri čemu je poslednji imao više koeficijente genetičke korelacije koji su se kretali između 0,573 (TL k SL) i 0,953 (BG k BC) u 12. nedelji. Seksualni dimorfizam je favorizovao mužjake u svim izmerenim osobinama. Implikacija ovih rezultata je da je važno znati i efekat osobine koja se zaista bira i njen uticaj na druge osobine. Genetičke korelacije su rezultat plejotropnih efekata gena na više osobina ili hromozomske veze gena koje utiču na različite osobine. On procenjuje stepen do kojEg na proučavane osobine utiču isti geni (pleiotropni) ili parovi gena.

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