PHENOTYPIC CORRELATION AND BREED EFFECT ON MORPHOMETRIC TRAITS IN PULLET CHICKS

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ABSTRACT

This study was carried out at the Teaching and Research Farm and Animal Production and Health Laboratory of Olusegun Agagu University of Science and Technology, Okitipupa between 12th November to 10th December, 2022. Data collected on body weight and morphometric traits from one hundred and thirty-nine pullets comprise 48 FUNAAB Alpha, 45 Isa Brown and 46 Noiler were subjected to analysis of variance and Pearson correlation to determine effect of breed on growth traits and phenotype correlations among the traits. There was progressive increase in all the traits as age increased, however, FUNAAB Alpha and Noiler had higher values and significantly different (p<0.05) from Isa Brown. The relationships between body weight and other traits were high, positive and very highly significant (p<0.001) in Noiler and Isa Brown. In FUNAAB Alpha the correlations between body weight and shank length, wing length and breast girth were 0.276, 0.926 and 0.938, respectively. Breed had effect on the morphometric traits and increase in any of the traits leads to increase in body weight.

Keywords: Phenotypic Correlation, Breed, Morphometric Traits, Pullets

INTRODUCTION

Morphometric traits are the quantitative measurements of the structure, shape and size of an organism (Fayeye *et al.,* 2006). The body weight can be derived from the measurement of different parts of the body of the animals. This is an easy way to measure the differences in different types of breeds available in a particular location especially among rural poultry breeders (Semakula *et al.,* 2011). Morphometric traits such as shank length and diameter were indicators of leg development, while body girth was an indicator of breast development (Fayeye *et al.,* 2014). Morphometric traits can be used to predict the weight gain and as well to plan breeding strategies to use to improve on the production and performance of the poultry birds. Genetic diversity is also evaluated using morphological, biochemical and molecular characterization methods (Costa *et al.,* 2006).

Morphological characterization is influenced by environmental factors, hereditary factors and evolutionary origin of the breeds. Morphometric traits are correlated with body weight. Thus, such morphometric traits could be used as markers in body weight improvement programmes and as body weight predictors especially in pullets (Chineke *et al.*, 2002). A breed is a specific group of farm animals having homogeneous appearance, and/or other characteristics that distinguish it from other organisms of the same species. Breed specific characteristics, also known as breed traits, are

inherited, and purebred animals pass such traits from generation to generation (Costa *et al.,* 2006).

Pullets are young adolescent hens preparing to lay their first eggs. Pullets are between 16 to 52 weeks of age, while pullet chicks aged between 0 to 8 weeks. Pullets have been brooded, now have adult feathers and are in their first year of lay. Pullets have unique characteristics because of their main purpose of egg laying. One other characteristic of a pullet chicken is its pelvic bones. They are closer together than those of the hens, and in weight, pullets are noticeably lighter than the hens.

Noiler is a new type of dual-purpose chicken breed that has been created through selective breeding. Noiler is believed to be a product of genetic selection between the broiler and the native chicken. This unique fowl is bred to serve the dual purpose of producing meat and eggs (Akinbobola, 2023). FUNAAB Alpha is an ideal bird for changing climatic conditions, both in the cage and non-cage systems. It is also a dual purpose for meat and egg production (Adebambo, 2018). The Isa Brown pullet has proven more than 40 years of excellent performance as the best brown laying hen in the world. Extensive field testing with the Isa Brown shows that the Isa Brown has exceptional feed conversion and is capable of laying up to 500 first-quality eggs (ISA, 2023). This study compares the morphometric traits of Noiler, FUNAAB Alpha and Isa Brown chicks.

MATERIALS AND METHODS

Site of the Experiment: The study was carried out between 12th November to 10th December 2022 at the Teaching and Research Farm and Agriculture Laboratory of Olusegun Agagu University of Science and Technology, Okitipupa, Ondo State, Nigeria. Okitipupa lies between the coordinates $6^0$25 and $6^0$46 N and $4^0$35 and $4^0$50 E within the tropical rainforest zone of Nigeria. Okitipupa covers a total landmass of 636 square km and has an estimated population of 233.565 people (Toponavi, 2023).

Experimental Animals: One hundred and thirty nine pullets were raised from day old to 25th week of age. The pullets comprise of 48 FUNNAB Alpha, 45 Isa Brown and 46 Noiler. The pullets were raised in a deep litter system up to 17th week and later transferred to battery cage system. They were fed with commercial feed (Top Feed, Ibadan, Nigeria) and watered *ad libitum* throughout the period of the study. The proximate analysis of the commercial feed is shown in Table 1. Other management activities such as vaccination, deworming etc. were done when necessary.

Table 1: Proximate composition of the commercial layer feed

Nutrients	Estimate
Moisture (%)	7.68
Ash (%)	1.28
Protein (%)	16.62
Fat (%)	7.81
Fibre (%)	2.40
Carbohydrate (%)	56.90
Metabolizable energy (kcal/kg)	2619.60

Source: *Agriculture Laboratory (2023)*

Parameters Measured: The pullets were weighed individually and morphological measurements were taken as suggested by Gueye *et al.* (1998). The weights of the birds were obtained using a 20 kg weighing scale, while a measuring tape was used for body measurements in centimeter. Wing Length (WL) was taken from the shoulder joint to the extremity of terminal phalanx, while Shank Length (SL) was measured from the knee joint to the spur. Breast girth (BG) was taken under the wing at the edge of the sternum. 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.

Data Collection and Analysis: The data collected were subjected to analysis of variance (ANOVA) using SAS (2007). Pearson correlation was used to determine the correlation coefficients among the traits.

RESULTS

The statistics of the body biometrics of the three breeds of pullets studied indicated that the coefficient of variation ranged between 28.68 and 70.63% for FUNAAB Alpha, 20.24 and 58.79 % for Isa Brown and 23.75 and 63.26% for Noiler (Table 2). The breed effects on morphometric traits on age basis showed that there was no significant effect among the three breeds in the following traits at age 0: body weight (BW); shank length (SL); and breast girth (BG) (Table 3). Isa Brown differed significantly in wing length (WL) at age 0. At week 1, there was no significant difference between FUNAAB Alpha and Noiler in all the four morphometric traits. Only Isa Brown differed significantly ($p<0.05$) in BW, SL and BG. There was no significant variation ($p>0.05$) in WL for all the three breeds at age 1. At week 2, SL and WL did not show any significant variation ($p>0.05$) in all the three breeds. FUNAAB Alpha differed significantly ($p<0.05$) in BW at this age. Noiler had the least size in BG which differed significantly ($p<0.05$). At week 3, there was no significant different ($p>0.05$) in WL among the breeds, while other traits differed significantly ($p<0.05$). Isa Brown had the lowest value of BW (16525), WL (11.13) and BG (11.75) at week 4, however there was no significant different ($p>0.05$) in SL among the breeds.

The phenotypic correlation among morphometric traits in FUNAAB Alpha breed indicated that there was low correlation between SL and BW (0.276). Strong correlation existed between WL and BW and BG and BW. Weak correlation also existed between BG and SL. High correlation also existed between BG and WL (Table 4).

The phenotypic correlation among morphometric traits in Isa Brown showed strong correlation among all the morphometric traits: between SL and BW, the correlation coefficient was 0.769; between WL and BW the coefficient of correlation was 0.923; between WL and SL, the coefficient of correlation was 0.867; and between BG and WL, the coefficient was 0.923 (Table 5).

The phenotypic correlation among the morphometric traits in Noiler breed showed strong correlations among all the morphometric traits. Between SL and BW, the correlation coefficient was 0.779; between WL and BW the coefficient of correlation was 0.929; between WL and SL, the coefficient of correlation was 0.836 and between BG and WL, the coefficient was 0.927 (Table 6).

DISCUSSION

The significant effect of breed was felt especially on the body weight across the ages except week 0. Noiler had the heaviest weight, followed by FUNAAB Alpha and Isa Brown in that order. This was in agreement with the observation of Costa *et al.* (2006) in Portuguese autochthonous chicken breeds. The high body weight values observed in Noiler and FUNAAB Alpha compared to Isa Brown could be attributed to the fact that the two breeds were bred for both egg and meat production. The non-significant effect of breed observed in WL in ages 1 to 3 was in conformity with the results of Olowofeso (2009). Similarly, the non significant effect of breed observed in BG and SL were in line with the findings of Gueye *et al.* (1998).

In FUNAAB Alpha pullets, there were strong connectivity among the BW, WL and BG. The SL was not strongly correlated with other morphometric traits. It showed that the evolutionary origin of the breed differs (Lawrence *et al.*, 2012). In Isa Brown pullets, all the morphometric traits were strongly correlated and interconnected. This means that they have the same evolutionary origin and differentiated from the same type of cells. The same findings were reported by Dransfield and Sosnicki (1999). Similar trend was also observed in Noiler pullets, all morphometric traits were strong related, indicating that they have the same cell morphogenesis.

C**onclusion:** Breed of chicken can have effect on the size of the pullets and how the morphometric traits were developed. This study demonstrated a positive relationship between body weight and body measurements in all the

Table 2: Summary statistics of the morphometric traits in pullet chick breeds

Breed	Number of observations	Variables	Mean ± SD	Minimum value	Maximum value	CV (%)
FUN	48	BW	127.60 ± 90.13	29.00	372	70.63
		SL	2.73 ± 0.81	1.20	4.20	29.80
		WL	7.68 ± 2.53	4.00	12.00	32.97
		BG	10.36 ± 2.97	6.50	18.00	28.68
ISA	45	BW	88.11 ± 51.80	29.00	250.00	58.79
		SL	2.16 ± 0.59	1.10	3.00	27.51
		WL	7.70 ± 2.22	4.50	12.00	28.87
		BG	9.15 ± 1.85	6.50	3.00	20.24
N	46	BW	105.61 ± 66.80	30.00	26.5	63.26
		SL	2.29 ± 0.71	1.00	4.00	31.16
		WL	7.67 ± 2.82	3.00	14.00	36.8
		BG	9.84 ± 2.34	5.50	4.00	23.75

FUN = FUNAAB Alpha; ISA = Isa Brown; N = Noiler; BW = Body weight; SL = shank length; WL = Wing length; BG = breast girth; SD = Standard deviation; CV = Coefficient of variation

Table 3: Breed effect on morphometric traits of pullets

Week	Breed	BW (g)	SL (cm)	WL (cm)	BG (cm)
0	FUN	33.9 ± 0.62	1.17 ± 0.06	4.37 ± 0.10^{b}	6.60 ± 0.07
	N	33.80 ± 0.76	1.21 ± 0.05	4.35 ± 0.21^{b}	6.55 ± 0.17
	ISA	33.10 ± 0.86	1.36 ± 0.09	5.05 ± 0.14^{a}	6.75 ± 0.13
1	FUN	61.40 ± 2.87^{a}	2.30 ± 0.08^{a}	5.97 ± 0.29	8.76 ± 0.19^{a}
	N	59.00 ± 0.32^{a}	2.35 ± 0.11^{a}	5.50 ± 0.19	8.93 ± 0.11^{a}
	ISA	50.20 ± 1.44^{b}	2.0 ± 0.00^{b}	6.02 ± 0.13	8.24 ± 0.09^{b}
2	FUN	108.20 ± 8.90^{a}	2.33 ± 0.07	8.17 ± 0.17	10.39 ± 0.31^{a}
	N	99.40 ± 4.35^{b}	2.38 ± 0.09	8.43 ± 0.17	10.00 ± 0.17^{a}
	ISA	80.38 ± 3.64^{b}	2.23 ± 0.09	8.10 ± 0.17	8.87 ± 0.16^{b}
3	FUN	199.20 ± 13.55^{a}	2.70 ± 0.06^{a}	9.29 ± 0.38	12.45 ± 0.70^{a}
	N	166.10 ± 9.71^{ab}	2.60 ± 0.06^{a}	9.45 ± 0.23	11.80 ± 0.21^{ab}
	ISA	133.50 ± 13.36^{b}	2.33 ± 0.07^{b}	8.97 ± 0.23	10.60 ± 0.19^{b}
4	FUN	262.25 ± 21.39^{a}	3.38 ± 0.18	11.31 ± 0.28^{b}	14.44 ± 0.51^{a}
	N	212.50 ± 19.67^{a}	3.33 ± 0.21	12.58 ± 0.39^{a}	13.33 ± 0.51^{a}
	ISA	155.25 ± 5.85^{b}	3.06 ± 0.11	11.13 ± 0.23^{b}	11.75 ± 0.31^{b}

FUN = FUNAAB Alpha; ISA = Isa Brown; N = Noiler; BW = Bodyweight; SL = shank length; WL = Wing length; BG = breast girth; SD = Standard Deviation. Means on the same column per week with the different superscripts are significantly different (p<0.05)

Table 4: Correlation among morphometric traits in FUNAAB Alpha

Morphometric traits	BW	SL	WL	BG
BW		0.276	0.926***	0.938***
SL			0.95	0.177
WL				0.932***
BG				

*BW = Body weight; SL = shank length; WL = Wing length; BG = breast girth; *** = p<0.001*

Table 5: Correlation among morphometric traits in Isa Brown

Morphometric traits	BW	SL	WL	BG
BW		0.769***	0.923***	0.929***
SL			0.867***	0.860***
WL				0.932***
BG				0.00

*BW = Body weight; SL = shank length; WL = Wing length; BG = breast girth; *** = p<0.001*

Table 6: Correlation among morphometric traits in Noiler

Morphometric traits	BW	SL	WL	BG
BW		0.779***	0.929***	0.938***
SL			0.836***	0.888***
WL				0.927***
BG				

*BW = Body weight; SL = shank length; WL = Wing length; BG = breast girth; *** = p<0.001*

three breeds of pullets under investigation. The increase in any of the traits will lead to increase in live weight. Body weight of pullets can be determined accurately using body measurements such as wing length wing spine, breast girth etc. Selecting and improving these traits will impact positively on the body weight of pullets.

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