STRENGTH AND NATURE OF RELATIONSHIP BETWEEN BODY WEIGHT AND LINEAR BODY MEASUREMENTS IN ANAK WHITE BROILER CHICKEN IN ABEOKUTA, NIGERIA

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Abstract
This study was carried out to determine the strength and nature of relationship between body weight (BW) and five body size traits in Anak White broiler chicken. Total of sixty (n = 60) day old unsexed Anak White chicks were procured from 'FUNAAB LEVENTIS', Abeokuta, Nigeria and used as experimental animal for ten weeks. The birds were brooded together for the first two weeks under standard management practices and were thereafter subjected to same treatment with commercial feed and water provided ad libitum. Measurable body traits such as body length (BL), keel length (KL), shank length (SL), thigh length (TL) and wing length (WL) were taken weekly. For BW, BL, KL, SL, TL and WL, the mean values were 1.85 ± 0.02 kg, 22.85 ± 0.15 cm, 11.92 ± 0.10 cm, 12.62 ± 0.07 cm, 16.47 ± 0.11 cm and 17.45 ± 0.10 cm, respectively at 10 weeks of age. Correlation and regression coefficients (that is r and β_1) between these quantitative traits were obtained to determine the intensity and nature of their associations. In this study 'r' ranged from 0.93 to 0.99 and 'β_1' ranged from 0.14 to 2.20, respectively. The study confirmed that there was a strong relationship between body weight and linear body measurements in Anak White broiler chicken.

Keywords: Body dimensions, body weight, chicken, correlation-regression, unsexed chicks

Introduction

Poultry is the commonest among the main livestock species or the 'big five' and is found wherever there is human settlement (Ojedapo *et al.*, 2012). Poultry products particularly meat and eggs are among the most valuable sources of animal protein available for human consumption according to Akanni *et al.* (2008) and Sanda *et al.* (2014). These products offer means of meeting the animal protein deficiencies in many developing nations including Nigeria. In most of these countries, demand for eggs and poultry meat far outstrip supply as evidenced by steep rises in prices in the last couple of years (Akanni *et al.*, 2008). Genetic improvement of chickens is therefore important in order to increase their contribution to the much needed animal protein in Nigeria. One of the prerequisites for genetic improvement is the knowledge of genetic parameters for traits of economic importance (Akanno and Ibe, 2006). Poultry Scientists and farmers have tried to establish the strength and nature of relationship that exist between body weight and physical characteristics such as shank length, breast width, breast angle, keel length, neck length, back length and thigh length as this reflect on efficiency as well as performance of the broilers. Khalil *et al.* (1987) also opined that breeders need to establish the relationship that exist between these parameters and organize the breeding programmes so as to achieve an optimum combination of body weight and conformation for maximum economic returns. According to Olowofeso (2009), determination of the interrelationship between body weight and body size parameters in animal may help livestock farmers when deciding whether to cull animals voluntarily. When several quantitative traits are measured in any species population, it is better to find out whether the characters measured correlates positively or negatively, as knowledge about its magnitude and signs help in judging how the improvement of one character will cause simultaneous change in the other character (Olowofeso, 2009). The poultry marketing system is generally informal and haphazardous (Emuron *et al.*, 2010). Birds are sold on face value and not by actual weight which reduces the farmers' bargaining power for premium price (Semakula *et al.*, 2011). The objective of this study therefore was to determine the strength and nature of relationship between body weight and five linear body measurements in Anak White broiler chicken reared in Abeokuta, Nigeria for ten weeks.

Materials and Methods

Experimental site, experimental birds and management

This study was carried out at a Commercial Poultry Farm, Emere Area, Camp, Abeokuta, Ogun State, Nigeria. This site is located on latitude 7°10'N and longitude 3°2'E and lies in the South-West geo-political zone of Nigeria. Mean annual rainfall is about 1037 mm and mean

monthly ambient temperature ranged from 28°C in December to 36°C in February with a yearly average relative humidity of about 82%. The vegetation represents an interphase between the tropical rainforest and the derived savannah (Ilori *et al.*, 2010). Total of sixty day old unsexed Anak White broiler chicks procured from FUNAAB LEVENTIS, Abeokuta, Ogun State, Nigeria were used for this study. Before the arrival of the chicks, floor of the pens and surroundings were kept clean of debris and cobwebs. The birds were brooded together for the first two weeks under standard management practices. Thereafter, birds were assigned to same treatment; feed and water were provided *ad libitum* throughout the experimental period. Routine vaccination and other management practices were carefully carried out.

Data collection and statistical analysis

The sixty birds starting from the third week of age were tagged and weighed individually to determine the body weight (BW) using a sensitive weighing balance. Five body measurements were also taken with the use of a measuring tape calibrated in centimetre. Data on body weight as well as other parameters from the birds were tested for statistical significance using the one way analysis of variance (ANOVA) of SPSS (2007). Simple linear correlation and regression procedure of SPSS 16.0 package was used to establish the strength of relationship between the different linear body measurements and body weight using the relation:

$$r = \frac{SS_{XY}}{\sqrt{SS_X SS_Y}}$$

where r = Pearson's product moment correlation coefficient, SS_{XY} = corrected cross product, SS_X = corrected sum of squares of independent variables, SS_Y = corrected sum of squares of dependent variable. Percentage growth rate (%GR) of the broiler's body weight and linear body measurements considered were estimated using the formula suggested by Kuzniacka and Adamski (2010) and expressed as:

$$\%GR = \frac{200(F_W - I_W)}{(F_W + I_W)}$$

where GR represents growth rate of a particular trait at a time, F_w and I_w are the final and initial values of a particular trait at a time.

Results and Discussion

Percentage growth rate and descriptive statistics calculated on the measured traits are presented in Table 1. Mean values relating to body weight (BW), body length (BL), keel length (KL), shank length (SL), thigh length (TL) and wing length (WL) estimated were 1.85±0.02 kg, 22.85±0.15 cm, 11.92±0.10 cm, 12.62±0.07 cm, 16.47±0.11 cm and 17.45±0.10 cm at the end of the study. For the linear body measurements, percentage growth rate ranged from 31.21 to 48.20, and percentage growth rate for bird's body weight was 101.36 (Table 1). Percentage growth rate for body weight in this study was however lower than the 147% reported for pheasants by Kuzniacka and Adamski (2010). This therefore means that percentage growth rate for measurable traits differ in birds.

Table 1: Percentage growth rate for body weight, body dimensions and descriptive statisti cs for body weight and body measurements in Anak White broiler chicken

Trait	%GR	$\bar{X}$. SEM	Minimum value	Maximum value	Range
BW (kg)	101.36	1.85±0.02	0.50	2.20	1.70
BL (cm)	37.74	22.85±0.15	17.00	28.90	11.90
KL (cm)	48.20	11.92±0.10	7.50	16.50	9.00
SL (cm)	31.21	12.62±0.07	9.80	15.40	5.60
TL (cm)	39.91	16.47±0.11	12.00	20.60	8.60
WL (cm)	37.10	17.45±0.10	12.80	20.90	8.10

In this study, correlation and regression were used to test for the strength and nature of relationship between body weight and linear body measurements. Correlation coefficients between bird's body weight and each of the linear measurements were very high and ranged from 0.93 to 0.99. These results indicate that there were strong relationship between body weight and each

of the body size parameter considered. Also, functional relationship between body weight and body dimensions (that is the regression) was positive and ranged from 0.14 to 2.20 (Table 2). These positive correlation and regression coefficients obtained between body weight and linear body measurements were similar to results reported by Olowofeso (2009), Ojedapo *et al.* (2012) and Sanda *et al.* (2014) in their studies with poultry species.

Table 2: Regression coefficient (below diagonal) and correlation co efficient (above diagonal) between body weight and five linear body measurements in Anak White chicken at 70-day old

Trait	BW	BL	KL	SL	TL	WL
BW	*	0.96	0.97	0.95	0.99	0.93
BL	0.14	*	0.97	0.97	0.96	0.94
KL	0.22	1.51	*	0.96	0.97	0.95
SL	0.32	2.20	1.42	*	0.95	0.94
TL	0.20	1.29	0.84	0.56	*	0.95
WL	0.20	1.37	0.90	0.60	1.03	*

Body weight changes and that of the linear body measurements considered in this study (that is after the first two weeks of brooding through the tenth weeks of age are depicted in Figure 1). This shows that as the birds advanced in age, there were increase in body weight and linear body dimensions considered. Similar results of this nature in birds have been reported by Akanni *et al.* (2008); Olowofeso (2009); Kuzniacka and Adamski (2010) and Ojedapo *et al.* (2012), respectively. This means that when good quality feeds and sound management techniques are employed in poultry production, there is the tendency that the body weight of the birds will increase and this will also cause increase in other body parts.

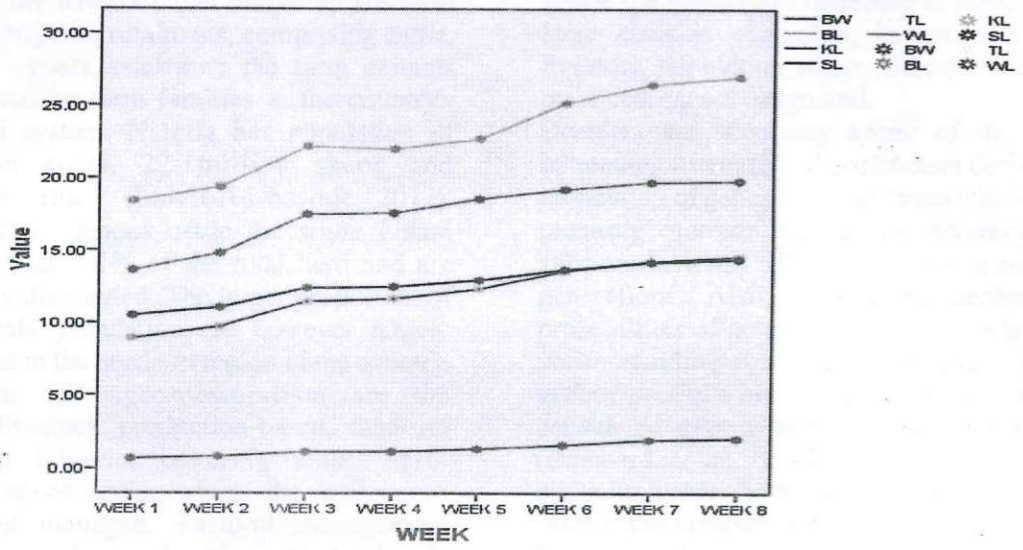


Figure 1: Body weight and linear body changes from third to tenth week of age of Anak White broiler chicken.

Conclusion

This study confirmed that there was a strong relationship between body weight and five linear body measurements considered in Anak White broiler chicken. There were increase in the percentage growth rate of the measurable traits considered in the broiler chicken and this might be as a result of better feed utilization which enhances normal body growth and tissue development in the broiler chicken. Measurement of body weight and some body size parameters provide a faster and ease means of determining the percentage growth rate of measurable traits in animals. Correlation and regression analysis of measurable traits in animals will also assist livestock breeders and farmers in knowing at a glance the strength of relationship between two or more traits considered in live animals.

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