DESCRIPTIVE STATISTICS AND REGRESSION COEFFICIENT OF THE GROWTH TRAITS IN THE NIGERIAN HEAVY LOCAL CHICKEN ECOTYPE

Udeh, F.U., Udeh, V.C., Ozor, D.C. and Chukwudi, P.
Department of Animal Science, University of Nigeria, Nsukka
Correspondence email: fredrickudeh11@mail.com**; Tel: +2348062457193**

ABSTRACT
Body weight is a very important characteristic in animal husbandry due to selection criteria and economic profit, and linear body measurements are used as an indirect method of estimating body weight. The aim of the study was to predict body weight from the linear body measurements and establish regression equations for the prediction and determine the growth trait that most predicts body weight for selection and improvement purposes. A total of 180 grower chicks were used for the study. The birds were generated from the existing 7th Generation of the Nigeria heavy local chicken ecotype (NHLCE) parent stock in the Department of Animal Science farm. At the end of the brooding period, the grower-chicks were randomly chosen for the study. Data on body weight and linear body measurement was taken bi-weekly. The results showed that at 20 weeks of age, the birds had an average body weight of 1627.78g and, an average body length, shank length, chest circumference, thigh circumference and thigh length of 24.14cm, 8.32cm, 37.19cm, 11.01cm and 14.50cm, respectively. The regression result showed that chest circumference is the best predictor of body with highest value of R^2 (0.72) and lowest standard error (1.49). It was therefore concluded that linear body measurements can be used to predict body weight and the best predictor of body weight is the chest circumference.
Keywords: Growth traits, regression, body weight, linear measurement and NHLCE

INTRODUCTION
The Nigerian heavy local chicken ecotype (NHLCE) is a fast growing strain of local chickens developed in the Department of Animal Science, Teaching and Research farm, University of Nigeria, Nsukka. The birds were bred as dual purpose chickens to produce meat and eggs (Udeh *et al*., 2018).
Growth is fundamental to all living things and it can be defined as an increase in number of body cells and elongation in size per unit of time (Schulze *et al*., 2001). Body weight is a very important characteristic in animal husbandry due to selection criteria and economic profit. Due to the fact that it forms the basis for assessing growth, feed efficiency and also in making economic and market decisions in farm animals, it is an important attribute (Momoh and Keshima, 2008). Maciejowski and Zeiba (1982), in agreement, stated that there is positive correlation between body weight and a number of linear body measurements. Linear body measurements are kind of growth indicators in animal life, and are also helpful in predicting body weight and carcass trait (Atta and El –Khidir, 2004). The relationship between body weight and these linear measurements is important in developing predictive equations and employed in genetic improvement strategies (Chineke *et al*., 2002). Thus, this study was designed to predict body weight through linear body measurements and also determine the growth trait that most predicts body weight for selection and improvement purposes.

MATERIALS AND METHODS
Study Location
The study was carried out at the Local Chicken Breeding section of the Poultry Unit, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka is in Enugu state, Nigeria.
Experimental Animals and Management
A total of 180 grower chicks were used for the study. The birds were generated from the existing 7th Generation of the Nigeria heavy local chicken ecotype parent stock in the Departmental farm. The birds were given feed and water *ad libitum* throughout the experimental period. Vaccinations and medications were provided as at when due and other routine management practices were provided accordingly. Body weight and other linear body measurements were taken bi-weekly throughout the experimental period.

Data analysis

Data generated were subjected to descriptive statistics to obtain the means and standard errors of the mean and the linear regression coefficient was obtained using SPSS (2017) version 19.

RESULTS AND DISCUSSIONS

Descriptive statistics

The result of the descriptive statistics of the body weight and linear body measurements of the Nigerian heavy local chicken ecotype are presented in table 1. The shank length, chest circumference, body length and wing length increased with age.

Table 1: Descriptive statistics of the body weight and linear body measurements of the Nigerian heavy local chicken ecotype

Age	Parameters	Mean	Std. Dev.	Std. error of mean	Variance	Coefficient of variation	No of Animal
	BWT (g)	400.21	149.91	15.59	22472.36	37.48	
	BL (cm)	17.08	3.23	0.32	10.40	18.89	
8 Weeks	SL (cm)	5.54	0.97	0.10	0.95	17.55	180
	CC (cm)	21.82	3.29	0.35	10.80	15.06	
	TC (cm)	5.81	0.99	0.10	0.98	17.02	
	TL (cm)	8.48	1.22	0.13	1.49	14.39	
	BWT (g)	786.14	193.01	20.58	37253.87	24.55	
	BL (cm)	21.86	1.77	0.19	3.14	8.10	
14 Weeks	SL (cm)	6.22	0.61	0.06	0.37	9.74	175
	CC (cm)	30.29	3.24	0.35	10.52	10.71	
	TC (cm)	9.53	1.23	0.13	1.50	14.37	
	TL (cm)	11.93	1.36	0.14	1.84	11.37	
	BWT (g)	1627.78	354.88	39.43	125937.50	24.85	
	BL (cm)	24.14	1.84	0.21	3.41	8.34	
20 Weeks	SL (cm)	8.32	0.83	0.09	0.68	11.28	
	CC (cm)	37.19	4.01	0.45	16.11	11.41	173
	TC (cm)	11.01	2.14	0.24	4.56	12.33	
	TL (cm)	14.50	1.37	0.15	1.88	9.47	

BWT = Body weight, B.L = Body length, S.L = Shank length, C.C = Chest circumference, T.C = Thigh circumference, T.L = Thigh length.

Mean body weight increased from 400.21g at week eight to 1.6kg at week twenty. Ojo *et al*. (2014) who agreed with this pattern of growth had reported that there is a gradual increase of body weight with age. The observed mean body weight in this study 1.627kg at week twenty was slightly higher than 1.45kg reported by Ukwu *et al.* (2014). Similarly, it is higher than the values (1.19kg) and (1.06kg) reported by Momoh and Karishma (2008). These differences could be attributed to the different breeds/strains of chicken used and different management practices employed.

The Coefficient of variation was higher at week 8 than weeks 14 and 20. This is in agreement with the findings of Semakula *et al.* (2011) who reported that all linear body measurements increased with increasing age and stagnated above eight weeks of age. He noted that linear measurements reflect structural growth, thus are not expected to change much after maturity is attained. At week eight, B.L had the highest coefficient of variation (18.89%) whereas TC was highest in week 14 and twenty, respectively. This agreed with the result obtained by Momoh and Keshima (2008) who reported that body length and chest circumference were the traits with highest variation. On the other hand, Gambo *et al.,* (2014) in their work observed the shank length to be the trait with the highest variability occurring highest in week 2 but gradually decreasing towards week six. Above all, Daikwo (2011) and Gambo *et al*. (2014) asserted that age has highly significant effect on all the linear body parameters.

Linear regression

The results of the linear regression of body on linear body measurement of the Nigerian heavy local chicken ecotype are presented in table 3.

Table 3: Linear regression of body weight (dependent variable) on body measurement (independent variables) of the Nigerian heavy local chicken ecotype using simple linear regression

Independent variable	Intercept (a)	Std error	Regression coefficient	R^2	Significance
Body length	-909.52	4.33	83.67	0.38	0.000**
Shank length	-1159.38	10.99	316.42	0.58	0.000**
Chest circumference	-904.80	1.49	59.68	0.72	0.000**
Thigh circumference	-317.43	6.26	143.38	0.46	0.000**
Thigh length	-620.55	3.17	125.38	0.71	0.000**

All the linear body measurements under study were statistically significant; and they also had high coefficients of determination (R^2) ranging from 0.38 to 0.72. This shows that they are all good predictors of body weight. This result is in agreement with the findings of Adeleke *et al*. (2004) who reported that body weight can be predicted from linear body measurements for cross bred egg-type chickens. The values of R^2 obtained in this study were lower than the R^2 values (73.91% to 97.91%) and (82% to 92%) reported by Adeleke *et al.* (2004) and Amao *et al.* (2011), respectively.

Regression Equation

The linear regression equation that could be used to predict body weight from the body linear measurement of the Nigerian local chicken ecotype is presented in table 4. The result showed that the best linear regression equation is the one of chest circumference (BWT = -904.804 + 5.680CC) because it has the lowest value of standard error and highest value of coefficient of determination.

Table 4: Linear regression equation of body weight on linear body measurement for local chickens

Regression equation	R	R^2	Std error	Probability
BWT = -909.52 + 83.67BL	0.615	0.37	4.33	0.00
BWT = -1159.37 + 316.42SL	0.758	0.58	10.99	0.00
BWT = -904.80 + 59.68CC	0.849	0.72	1.49	0.00
BWT = -317.43 + 143.38TC	0.679	0.46	6.26	0.00
BWT = -620.55 + 125.38TL	0.847	0.71	3.17	0.00

BWT=Body weight, R^2=coefficient of determination

The least predictive equation was the body length (BWT = -909.52+83.67BL) because it has the lowest coefficient of determination (37.9%). Vincent *et al*. (2015) reported that regressing chest circumference on the body weight had the highest coefficient of determination (R^2= 0.65 and 0.78 for females and males). The implication of the positive value for the regression coefficient is that body weight gain increases directly with linear body dimensions. This was also observed by Ajayi *et al.* (2008) for Ross and Anak titan broiler strains.

CONCLUSION

From the findings in this study, it could therefore, be concluded that chest circumference had the lowest standard error (1.49) and the highest value of coefficient of determination of 72.0% and hence, it is adjudged to be the best predictor of body weight.

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