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DETERMINATION OF THE GROWTH PATTERN OF ROSS 308 BROILER STRAIN REARED IN A HUMID TROPICAL ENVIRONMENT

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Abstract: The current study was aimed to investigate the growth pattern of Ross 308 broilers reared in a humid tropical environment Data on body weight and other linear body traits (shank length, body length, wing length, breast width and drumstick were obtained weekly from 60 day old birds for a period of 8weeks. Data collected were subjected to Analysis of Variance (ANOVA), using the general linear model procedure. Means were separated for significance, using Least Significant Difference (LSD). The regression model, $Y_I = B_IX_I$, was used for the regression analysis and the allometric growth equation used was $Y = aW^{ß}$. A marked difference ($P<0.05$) for the body weight of broiler across the various weeks was observed, with the lowest value (139.40±5.48) 0bserved in week 1 and the highest value (2.440.33±51.66) in week 8. The linear regression of age on body parameters showed a highly significant difference ($P<0.01$) for the morphometric traits studied. The percentage of the regression coefficient for all the traits under consideration were high (above 50%), except for DL that has a low value of 19.2% and the various coefficient of allometry with coefficient of isometric (0.33) indicates that DS and SL grew faster than other components of the Ross 308 broiler body. With the high R^2-value obtained for the regression analysis, the study therefore recommends age at 8weeks and all other morphometric traits except DL are the best for the selection of Ross 308 strain of broilers for market weight. Hence, all the studied morphometric traits nice predictors of body weight of broilers, except the drumstick length.

Keywords: Broilers, Ross308, Growth pattern, Allometric

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1. Introduction

The broiler industry in order to meet up with the world poultry meat consumption rate need to produce birds with fast growth rate and high carcass yield in a short time (Prince, 2002). The high demand for fast growing broilers has been an issue that most farmers are yet to overcome due to the choice of strain which the farmer uses. According to Essien and Adiyimi (2009), the Nigerian poultry industry has over the years witnessed the introduction of Abor Acres, Ross 308, Hubbard and other strains of broilers. The realization of the full potentials of these strains is largely expected to depend on the nutritional and climatic variables subject to the genotypic traits which in turn set a ceiling on the productive capacity of the strains. However, the implication of this is that the broiler producers select stocks which have the genetic potential for fast growth and attainment of market weight early enough under the Nigerian climatic conditions.

Therefore, with the influx of different strains of broilers in Imo state and other states in Nigeria, it has become necessary for the farmers to know the pattern of growth of the various strains they encounter. This could assist them in choice of the feeding regime to attain optimum market weight at a short interval of time

The Ross 308 is a robust, fast growing feed efficient broiler with good meat yield. It is designed to satisfy the demands of customers who require consistency of performance and the versatility to meet a broad range of end product requirements. It is one of the most common strains available in commercial farms found in Owerri, Imo State. According to Alkano et al. (2007), defining growth with respect to each feature of the animal is not sufficient, since it gives limited information on the animal's growth performance in general. Therefore, to ascertain data for growth performance of different body parts of an animal with respect to each other and the whole body, prediction of allometric growth parameters becomes an essential tool. It therefore becomes necessary to ascertain the growth pattern of this strain, as this information could be exploited and used in breeding programme to develop fast growing indigenous strain adaptable to the humid tropic environment as well

as get the farmers well informed for easy prediction. The study tries to ascertain the allometric growth pattern of Ross308 strain of broiler in Owerri, Imo state, determine the growth characteristics of Ross 308 strain of broiler chicken and determine growth rates of the body and other linear body parameters.

2. Materials and Methods

2.1 Experimental Site and Animals

This experiment was conducted at the Teaching and Research Farms of the Department of Animal Science and Technology, Federal University of Technology Owerri. Federal University of Technology Owerri is located within South-East agro-ecological zone of Nigeria. It is located in the rainforest belt of Nigeria, with altitude of 90m and the mean annual rainfall, temperature and humidity of 2500mm, 26.5 27.50 ˚C and 70-80% respectively. It is located 25 kilometers south of Owerri, latitude and longitude of 5˚29N and 7˚02E respectively. 60 Day old Ross 308 strain of broiler chicks were purchased from a reputable hatchery. The brooding and rearing of the birds were done on a deep litter system. On arrival, the Day Old Chicks, permanent marker was used to mark each of them for identification. Feeders and drinkers were provided for the supply of feeds and water respectively. The birds were fed formulated starter and finisher diet ad libitum for the starter and finisher phases respectively. Water was also served *ad-libitum*, throughout the experimental period. Poultry routine management and vaccinations were maintained throughout the experiment, and the experiment lasted for 56days (March – May). Brooding was carried out for a period of 2 weeks and the birds were separated into five (5) different pens of 15 birds per pen. At this point, permanent tags were placed on the shanks of each bird for identification. The body weights of the individual birds and other body linear traits (Shank length, body length, keel length, wing length, breast width, and drumstick length and chest circumference) were measured to obtain their initial body weight, prior to the commencement of the experiment and thereafter recorded on weekly basis before the birds are fed.

2.1. Statistical Analysis

Data collected were analyzed using the general linear model procedure of statistical package for the social sciences (SPSS, 2011). Simple linear regression of each of the measured parameters on age was carried out to determine the rates of growth of the body and each of the component parts.

The regression model is given in the expression (equation 1);

$$Y_i = a + b_i x_i \quad (1)$$

Where; Y_i = intercept, a = Y-intercept, b_i = slope, x_i = ith independent variable, i.e., age.

Allometric growth equation that will be fitted to the data on body weight (BWT) and linear structural body parameter (Y) is of the form in expression (equation 2);

$$Y = aW_{\beta} \quad (2)$$

Where; Y = linear structure body parameter, i.e. body length (BLT), a = initial growth constant, β = coefficient of allometry

Least estimate of a and β was obtained by fitting the log-transformed linear equation in the expression (equation 3);

$$\log_{10}Y = \log_{10}a + {}_{\beta}\log_{10}W \quad (3)$$

3. Results and Discussions

The mean (±SE) of body weight and body linear measurements of Ross 308 from week 1 to 8 as shown in Table1, reviewed a significant progression ($P<0.01$) in the mean body weight and linear body parameters with age. The lowest values (139.40±5.48, 8.0±0.15, 3.76±0.08, 5.40±0.16, 7.73±1.89 and 10.37±0.20) for body weight, wing length, shank length, drumstick length, breast width and body length respectively, were in week one while the highest values (2440.33±51.66, 18.99±0.33, 8.39±o.14, 16.6±0.3, 18.48±0.32 and 29.49±0.47) for body weight, wing length, shank length, drumstick length, breast width and body length respectively, were in week eight. The increase with advancement in age as observed in this study is in tandem with the reports of Adeyinka et al. (2004) and Udeh et al. (2011) who reported that age is a major determinant of growth and physiological development. The mean final body weight (2562 ± 52.55) of ROSS 308 at 8weeks of age obtained is equivalent to the findings of Afolayan et al. (2012), who ascertained a market weight of 2310.0g for Ross308 at 8weeks of age. The attainment of market weight greater than 2kg gives the impression that Ross308 has a great potential for weight gain and growth rate in the humid tropics of South East, Nigeria.

Table 1. Weekly mean (Mean ± SE) of body weight and body linear measurements of ROSS 308

Traits	WK I(60)	WK 2(60)	WK 3(60)	WK 4(60)	WK 5(60)	WK 6(60)	WK 7(60)	WK 8(60)
BW (g)	134.45 ± 5.66	317.80 ± 15.80	513.32 ± 11.93	820.68 ± 25.88	984.83 ± 12.4	1184.88 ± 30.57	1816.12 ± 43.99	2562 ± 52.55
WL (cm)	8.13 ± 0.19	10.94 ± 0.22	13.90 ± 0.12	14.78 ± 0.23	16.10 ± 0.24	18.60 ± 0.14	21.10 ± 0.13	24.57 ± 0.29
SL (cm)	3.98 ± 0.05	5.18 ± 0.12	5.10 ± 0.06	5.46 ± 0.09	6.00 ± 0.05	6.57 ± 0.06	7.30 ± 0.07	7.08 ± 0.09
DS (cm)	5.15 ± 0.08	7.56 ± 0.17	7.65 ± 0.08	9.51 ± 0.19	10.14 ± 0.32	12.07 ± 1.59	12.00 ± 0.10	19.16 ± 0.24
BW (cm)	7.45 ± 0.17	9.90 ± 0.22	10.73 ± 0.14	13.90 ± 0.38	15.53 ± 0.11	16.50 ± 0.19	19.99 ± 0.17	16.74 ± 0.22
BL (cm)	10.47 ± 0.19	13.22 ± 0.28	15.74 ± 0.29	17.81 ± 0.28	19.04 ± 0.03	20.94 ± 0.23	24.17 ± 0.24	31.86 ± 0.32

Table 2 shows the regression of body parameters on age in Ross308 broiler. The result shows that all the regression equations were highly significant (P<0.01), considering the comparative goodness of fit of the considered model, judging from the criteria like R2-values, levels of significance error of estimate and signs and size of regression coefficient. High R^2-values ranging between 68.5% and 89.4% were obtained for BR and WL respectively. However, DL has a very low R^2-value of 19.2%. The co-efficient were generally positive ranging between 2.82 for drumstick length to 7.14 for body weight respectively. The linear regression of age on body parameters in Ross 308 strains of broilers showed a highly significant difference (P<0.01) for all traits across various ages. The high R^2-values (81.8%, 89.4%, 70.8%, 68.5% and 82.1%) for BW, WL, SL, BW and BL respectively, obtained in the relationships shows that the linear traits of Ross 308 can be predicted if the animal's age is known. Except for the DL, this has a very low R^2-value (19.2%). This saves the farmer additional cost of buying a weighing scale, thus predicting the body weight of the bird at every age stage using values of any morphometric trait, as described by Chineke et al., (2006). The highly significance (P<0.01) F-value shows that the data fits in very well in the model used.

Table 2. Linear Regression of Age on Body Parameters in ROSS 308 broilers

Traits	Equation	R^2 (%)	S.E	Sig
BW	BW = -502.182 + .905Age	81.8	334.04	0.00
WL	WL = 6.69 + .946Age	89.4	1.52	0.00
SL	SL = 3.94 + .841Age	70.8	0.59	0.00
DL	DL = 2.82 + .441Age	19.2	7.21	0.00
BR	BW = 7.14 + .828Age	68.5	2.17	0.00
BL	BL = 7.01 + .906Age	82.1	2.64	0.00

Table 3 shows the log linear and allometric growth equations and distribution co efficient for linear growth parameters for 8-week period in Ross 308 strain of broilers. The degree of reliability of the allometric equation was measured by the R^2 values. Very high (91.5% and 92.8%) R^2 values were obtained for the allometric equation relating body weight and shank length and body weight and drumstick respectively. Whereas, a relatively high (80.6%, 80.8% and 76.9%) R2 values were obtained for body weight and breast width, body weight and wing length and body weight and body length respectively. The R^2 values obtained from the results showed that the model used fits the data. The former shows a very high reliable equation whereas, the later showed a relatively high reliability of allometric equation. Hence, this confirms the postulate of Palsson (1955), that different components of the body have a different growth rate, thus explaining the differential growth patterns observed between body weight and different body components. Different body parts develop at varying rates and these changes determine the shape, conformation and body proportion of the animal at a given time (Olutogun et al., 2003).

Table 3. Log Linear and Allometric Growth Equations and Distribution coefficient for Linear Growth for 8 weeks

Linear parameters	log linear	R^2 (%)	SEM	Allometric
Shank length (SL)	Y = 0.144 + 0.957BW	91.5	0.176	$BL = 0.31W^{0.975}$
Drum stick (DS)	Y = 0.49 + 0.96BW	92.8	0.115	$DS= 1.63W^{0.96}$
Breast width (BR)	Y=1.246 + 0.90	80.6	0.171	$BR= 3.48^{0.90}$
Wing length (WL)	Y=0.986 + 0.90BW	80.8	0.177	$WL= 2.68W^{0.90}$
Body length (BL)	Y=5.001+ 0.90BW	76.9	0.118	$BL=148.56W^{0.88}$

BL= body length, Sl= shank length, BR= breast width, DS= drumstick length, WL= Wing length, BW= body weight

4. Conclusion and Recommendations

The quest for broiler production in Nigeria cannot be possible without strategizing the possible breeding pattern for improvement of the various strains of broilers that are peculiar to the environment. To ensure the sustainability of the poultry enterprise, the productive capability of the animal (broilers) must be improved. This cannot be achieved without considering the pattern of growth of the various strains of broilers, measurement of correlations among body parameters (traits) and age of the birds for development of selection programs for effective planning. This results from this study therefore reviewed a marked difference (P<0.05) for the body weight of broiler across the various weeks, hence, as the chicken increase in age, there is a concordance increase in the body parameters. The linear regression of age on body parameters showed a highly significant difference (P<0.01) for the morphometric traits studied, the percentage of the regression coefficient for all the traits under consideration were high (above 50%), except for DL that has a low value of 19.2% and the various coefficient of allometry with coefficient of isometric

(0.33) indicates that DS and SL grow faster than other components of the Ross 308 broiler body.

With the high R^2-value obtained for the regression analysis, the study therefore recommends age at 8weeks and all other morphometric traits except DL are the best for the selection of Ross 308 strain of broilers for market weight and size. It is a nice predictor for the linear body parameters.

Author Contributions

O.K. (25%), I.A. (25%), C.U. (25%) and C.I. (25%) design of study. O.K. (25%), I.A. (25%), C.U. (25%) and C.I. (25%) data acquisition and analysis. O.K. (25%), I.A. (25%), C.U. (25%) and C.I. (25%) writing up. O.K. (25%), I.A. (25%), C.U. (25%) and C.I. (25%) submission and revision. All authors reviewed and approved final version of the manuscript.

Conflict of Interest

The authors declared that there is no conflict of interest.

Ethical Consideration

The authors confirm that the ethical policies of the journal, as noted on the journal's author guidelines page, have been adhered to. The experimental procedures approved by local Animal Care and Ethics Committee of Animal Science and Technology, Federal University of Technology Owerri, Imo state (Decision Number/Date: 2021/03-02, March 27, 2021).

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