PATTERN OF GROWTH OF ROSS 308 STRAIN OF BROILERS IN OWERRI, IMO STATE

[1*]S. I. Ahamba, [2]C.U. Ekugba, [3]O.E. Kadurumba [4]U. E. Ogundu, and [5]J.C. Ekeh
[1]Department of Animal Science and Technology, School of Agriculture and Agricultural Technology, Federal University of Technology PMB 1526 Owerri, Nigeria.
[2]Department of Animal Science, Faculty of Agriculture, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.
Corresponding author: ahambaifeanyi@futo.edu.ng/ahambaifeanyi@gmail.com
Telephone number: (+234)7037261316

ABSTRACT
Ross 308strain of broiler is one of the most prevalent strain of broilers raised by farmers in Nigeria. Therefore, growth curved modelling of this animal becomes necessary to optimize its management and efficient of its production. This study is aimed at determining the growth rate of Ross 308 strain of broiler chicken. A total of 100 chicks were raised from day-old to 8weeks. Data collected were subjected to Analysis of Variance (ANOVA) and simple linear regression of each of the measured parameters on age was performed. The findings of this study revealed that there was a proportional increase in body weight with linear body measurements, hence the linear traits of ROSS 308 can be predicted if the animal's age is known. The allometric growth equation relating body weight and drum stick was highest (92.8%), whereas body weight and body length was least (76.9%). This study concluded that there is a concordance increase in body parameters of ROSS 308 chicken with age and that the Drum stick and Shank Length of Ross308 grow faster than other linear body parts. Hence, the study recommends Drum stick length as the best tool for selection of Ross 308 strain of broiler chicken.
Key words: Ross 308, broilers, allometric, strain

INTRODUCTION
Animal growth is as a result of an increase in size and change in functional capabilities of various tissues and organs of the animal that occurs from conception to maturity (Peters *et al.*, 2005). Growth of fowl is however, similar to the growth of other animals and it consists of 3 or 4 cycles, with 2 occurring after hatching (Grossman, 1988). Different body parts may not show a similar growth pattern in living organisms. Hence, Alkan *et al.* (2009) opined that the growth curves should be presented based on species, genotypes, environmental factors and the growth characteristics.
Growth curve modellings of animals is necessary for optimizing the management and efficiency of animal production (Kohn *et al.*, 2007). Many researchers (Sengul and Kiraz (2005); Nahashon *et al.*, 2006; Ogundu *et al.*, 2009), have tried to model the growth characteristics of poultry, but little or no work has been done in modelling the growth pattern of ROSS 308, especially in Imo state.
The existence of functional relationships of live body weights, body conformation and yield to production traits reported by Ogundu *et al.* (2009) are important in broiler production, since this information would reflect on the feed efficiency and performance of broilers. In support of this report, Medes (2008) concluded that defining growth with respect to each feature of the animal will not give sufficient information on its growth performances. Hence, supporting the earlier report of Alkan *et al.* (2011), that it is necessary to determine the growth performances of each features with respect to the whole body, relative to each other as well as the growth of left side organ relative to right side organs.
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 parameter could serve as a vital tool. Hence, the study tends to determine the pattern of growth of Ross 308 strain of broilers in Owerri, Imo state. Specifically, the work tries to

1. determine the growth characteristics of Ross308 strains of broiler chicken
2. determine the growth rate of Ross 308 strain of broiler chicken and
3. Establish the allometric growth pattern of ROSS 308 strain of broilers

MATERIALS AND METHODS

Study Site

The experiment was carried out in poultry unit of the Teaching and Research Farm of the Department of Animal Science and Technology, School of Agriculture and Agricultural Technology, Federal University of Technology Owerri. Owerri is located at the rainforest agro-ecological zone of Nigeria (5^{o}29N latitude and 7^{o}02E longitude), elevation of 90.91m, annual rainfall of 2641mm, temperature of 27.4^{o}C and relative humidity of 86%. The experiment was conducted between the months of July and August.

Experimental Birds and management

Total of one hundred (100) day-old broiler chicks of Ross 308 were purchased from a reputable hatchery and were randomly allocated to five treatments of 20 chicks each, with each treatment having four replicates of five birds each, in a deep litter housing system. The chicks were brooded using coal pot for heat supply within the first 3 weeks of life. Antibiotics and vitamins were administered as when due and vaccines were also administered as recommended for the strain by the producer. Bedding material used is wood shavings, which was always kept dried to prevent coccidiosis outbreak and strict biosecurity measures were adhered to with other management system during the experimental period to ensure a healthy environment for growth and reduce mortality.

Feed and feeding

Commercial starter mash purchased from a reputable feed vendor in Owerri, Imo state was used during the starter phase of the birds, and commercial finisher mash was used at the finisher phase. Water and feed were provided ad lib. throughout the experimental period.

Data Collection

Prior to the commencement of the experiment the birds were weighed to obtain their initial body weight and thereafter on weekly basis. Subsequently, Data were collected on weekly basis on the body weight, body length, shank length, keel length, wing length, breast width, drumstick length and circumference of drumstick. The body weight was measured using a 5.0kg sensitive digital scale (Escali Mercado series), whereas other measurements of length, width and circumferences were done using a rope and 30cm rule. Measurements of the weighing scales and the meter rule were expressed in grams and centimeters, respectively.

Statistical analysis

Data collected were subjected to Analysis of Variance (ANOVA) using the general linear model procedure of statistical package for social sciences (SPSS, 2006). Means were separated using the Least Significance Difference (LSD). 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;

$Y_i = a + b_iX_i$ where;

Y_i = response (dependent) variable e.g. Body weight…

a = Y-intercept

b_i = slope

X_i = ith independent variable i.e. age

RESULTS AND DISCUSSION

Table1 shows the mean body weight and linear body measurements from week 2 to week 8 of age for Ross 308 strain of broilers. There was a proportionate increase in body weight with the linear body measurements. The significant ($P<0.05$) increase in mean body weight with linear body measurements is directly proportional with the age from week 2 to 8, although there was a slight deviation in the means of weeks 3 and 4of the body length. The highest values (2511.10±10.81, 34.08±0.1,13.82±0.0, 25.66±0.1,23.77±0.1, 17.00±0.0, 27.81±0.0 and 20.06±0.0) for body weight, body length, shank length, keel length, wing length, drumstick, breast width and circumference of drumstick respectively, were recorded in week 8. While the least value (296.05±6.64, 19.39±0.12, 3.17±0.04, 8.28±0.02, 7.00±0.00, 5.57±0.09, 10.63±0.10 and 6.42±0.06) for body weight, body length, shank length, keel length, wing length, drumstick, breast width and circumference of drumstick respectively, were recorded in week 2.

The progressive increase in mean body weight with linear body parameters is an indication that as the chicken increase in age, body weight and linear body parameters increase as well. The value for the final body weight obtained from the result falls within the range the range of value (1.5 – 2.0kg) report by Alann *et al.* (2007), as market weight of broilers attained at 8-10 weeks of age. the increase in body weight and linear body parameters with advancement in age as observed in this study is an indication that the Ross 308 strain of broiler is an efficient strain, since the rapid increase in body weight of the broilers from week 6 to week 8 is in line with the observation of Oluyemi and Roberts (1999), who stated that efficient broiler strains gain more live weight at maturity because they are genetically designed to be meat producers.

The attainment of market weight at above 2kg in 8 weeks, gives the impression that Ross 308 strain has a relatively greater potential for growth in Owerri, Imo State, Nigeria.

Table 1 weekly mean body weight and linear body parameters of Ross 308 strain of Broiler

Traits	Mean ± SE (N)						
	WK2 (100)	WK3 (100)	WK4 (100)	WK5 (100)	WK6 (100)	WK7 (100)	WK8 (100)
BW	296.05±6.64	600±8.45^{a}	993.65±3.97^{b}	1370.5±15.89^{c}	1651.66±31.31^{d}	2328.80±21.47^{e}	2511±10.81^{f}
BL	19.39±0.12	24.55±0.12^{a}	19.57±0.05^{b}	23.24±0.08^{b}	27.59±0.07^{c}	29.06±0.08^{d}	34.08±0.08^{e}
SL	3.17±0.04	4.40±0.08^{a}	8.00±0.00^{b}	11.04±0.05^{c}	11.57±0.05^{d}	13.23±0.04^{e}	13.82±0.02^{f}
KL	8.28±0.02	9.27±0.21^{a}	10.49±0.08^{b}	14.64±0.05^{c}	20.00±0.00^{d}	22.40±0.05^{e}	25.66±0.05^{f}
WL	7.00±0.00	9.91±0.27^{a}	12.45±0.04^{b}	15.00±0.0^{c}	17.81±0.04^{d}	19.92±0.04^{e}	23.77±0.08^{f}
DS	5.57±0.09	7.92±0.11^{a}	9.00±0.00^{b}	11.00±0.00^{c}	13.00±0.00^{d}	15.00±0.00^{e}	17.00±0.00^{f}
BR	10.63±0.10	12.21±0.03^{a}	12.55±0.05^{b}	14.72±0.03^{c}	19.75±0.05^{d}	23.35±0.05^{e}	27.81±0.04^{f}
CD	6.42±0.06	8.00±0.00^{a}	9.00±0.00^{b}	12.47±0.06^{c}	14.00±0.00^{d}	17.38±0.05^{e}	10.06±0.02^{f}

Abbreviations: BW- Body weight, **BL-** Body Length, **BR –** Breast Width, **CD-** Circumference of Drumstick, **DS-** Drum stick, **KL-** Keel Length, **SL-**Shank Length, **WL-** Wing Length, **S.E-** Standard Error of estimates, **N=** Total number of chicken per week, **WK2- WK8 =** Age in weeks. **NB: $^{a-f}$** means with different superscripts in each row are significantly different at P <0.05; SEM = Standard error of the mean.

Table 2 shows the regression of body parameters on age in ROSS308 strain of broilers. The result showed that all the regression equations were highly significant ($P < 0.01$). considering the comparative goodness of fit, judging from criteria like R^2 values, levels of significant, errors of estimate and signs and size of regression coefficient, the model used fits the equation. High R^2 value ranging between 81.9% and 99.3% were obtained for BL and WL respectively.

The linear regression of the age on body parameters in Ross 308 strains of broilers showed a highly significant difference ($P< 0.01$) for all the traits except the body length and the body weight that showed no significant difference ($P > 0.05$) across various ages. The high R^2 value obtained in the relationships shows that the linear traits of Ross 308 can be predicted if the animal's age is known. This will save the farmer additional cost of buying a scale. This is as opined by Chineke *et al.* (2006) that the difference in linear traits reveals useful measures that depict the size and shape of an animal. It also suggests that a high proportion of variation in body parameters at various weeks are explained by the variation in the weekly body parameters. This agrees with the discovery of Peters *et al.* (2005), that the linear regression functions best describe body measurements at early stages of growth probably because growth in some body part in chicken is linear until it reaches full maturity. Hence, the F-value obtained shows that the data fit in very well in the model.

The use of age to readily predict body weight and linear parameters in broiler chicken without slaughter is therefore highly desirable as it will ensure selection of animals that will reach market weight and size at relatively faster rate (Egena *et al.*, 2012).

Table 2 Linear Regression of Age on Body Parameters in Ross 308 Strain of Broiler

Traits	Equations	R^2 (%)	S.E	Significance
BW	BW = -557.22 + .610 Age	37.2	901.076	**
BL	BL = 11.871 + .905 Age	81.9	2.148	**
BR	BR = .864 + .960 Age	92.2	1.657	**
CD	CC = .109 + .985 Age	97.1	.752	**
DS	DS = 1.519 + .996 Age	99.3	.292	**
KL	BL = -1.175 + .976 Age	95.3	1.317	**
SL	SL = .845 + .953 Age	90.7	.994	**
WL	**WL = 1.497 + .990 Age**	**98.0**	**.689**	**

Abbreviations: BW- Body weight, **BL-** Body Length, **BR –** Breast Width, **CD-** Circumference of Drumstick, **DS-** Drum stick, **KL-** Keel Length, **SL-**Shank Length, **WL-** Wing Length, **S.E-** Standard Error of estimates, **** =** Highly significance ($P < 0.01$).

Table 3 shows the loglinear and allometric growth equations and distribution growth equations and distribution coefficient for linear growth parameters for 7- week period inRoss308 strain of broilers. The degree of reliability of the allometric equation was measured by R^2 values. Very high (92.8%, 92.5% and 91.5%) R^2 values were obtained for the allometric equations relating body weight and drum stick, body weight and circumference of drumstick, and body weight and shank length respectively. Whereas, a relatively high (80.8%, 80.0% and 76.9%) were obtained for body weight and wing length, body weight and breast width and body weight and body length respectively. The very high R^2 values reviewed that the equations are highly reliable whereas the relatively high R^2 values showed a relatively high reliability of the allometric equation. As reported by Koop and Grossman (1991), the different components of the body weight have a different growth rate which explains the differential growth patterns observed between body weight and different body components. Hence, different body parts develop at varying rates and these changes determine the shape, conformation and body proportion of the animal at a given time (Olutogu *et al.*, 2003).

Table 3 Log Linear and Allometric Growth Equation and Distribution Coefficient for Linear Growth for 7 weeks.

Linear parameters	Log linear	R2 (%)	SEM	Allometric
Shank Length (SL)	Y = 0.144 + 0.957BW	91.5	0.176	$SL = 0.31W^{0.957}$
Drum stick (DS)	Y = 0.49 + 0.96BW	92.8	0.115	$DS = 1.63W^{0.96}$
Cir. of Drum stick (CD)	Y = 0.187 + 0.96BW	92.5	0.157	$CD = 121W^{0.96}$
Breast width (BR)	Y = 1.246 + 0.90BW	80.6	0.171	$BR = 3.48W^{0.90}$
Body length (BL)	Y = 5.001 + 0.88BW	76.9	0.118	$BL= 148.56W^{0.88}$
Wing length (WL)	Y = 0.986 + 0.90BW	80.8	0.177	$WL = 2.68W^{0.90}$

Abbreviation: BW- Body weight, **BL-** Body Length, **BR –** Breast Width, **CD-** Circumference of Drumstick, **DS-** Drum stick, **KL-** Keel Length, **SL-**Shank Length, **WL-** Wing Length, **SEM =** Standard Error Mean

CONCLUSION

The quest for efficient broiler production in Nigeria cannot be maximally achieved without strategizing the possible breeding pattern for improvement of the various strains of broilers that are peculiar to the environment.

However, to ensure sustainability of the poultry industry (especially the broilers), the productive capacity of the animal must be improved. This cannot be totally achieved without considering the pattern of growth of various strains of broilers, measurements of correlations among body parameters (traits) and age of the birds for development of selection programs for effective planning.

This study therefore tried to estimate the linear regression of age on body parameters in Ross308 strain of broilers and increase the base line knowledge of the relationship between some linear body parameters and age of Ross 308 strain of broilers. Hence, predict the linear body parameters using regression analysis.

A marked difference ($P<0.05$) was observed for the body weight of broilers across the various weeks. This reveals that as chicken increase in age, there is a concordance increase in its body parameters. Also, the linear regression of age on body parameters showed a highly significant difference ($P<0.05$) for all the traits, except for body weight that was not significant ($P>0.05$). Finally, the various coefficient of allometry when compare with coefficient of isometric growth (0.33), indicate that Drum stick and Shank Length grow faster than other component of the body.

Hence, the study recommends DL as the best tools for selection of Ross 308 strains of broilers, due to the high R^2 values obtained for the both predictors. They are nice predictors for the linear body parameters.

REFERENCES

Alkan, S., Mendes, M., Karabag, K., Balcioglu, M.S. (2009). Effects of short-term divergent selection for 5-week bodyweight on growth characteristics of Japanese quail. *Arch.Geflukgelk.*, 73(2). 124-131.

Grossman, M. (1988). Multiphasic analysis of growth curves in chicken. *Poultry science* 67: 33-42.

kohn, F., Sharifi A. R. and Simianer, H. (2007). Modelling the growth of the Goettingen minipig. *J. Anim. Sci.* 85: 84-92.

Mendes, M. (2008). Asymmetry measures and allometric growth parameter estimates for investigate effect of early feed restriction on deviation from bilateral symmetry in broiler chickens. *Arch. Tiez.* 51: 611 – 619.

Nahashon, S.N., Adefope N., Amenyenu, A. and Wright, D. (2006). Effect of varying metabolisable energy to crude protein concentrations in diets of pearl gray guinea fowl pullets I. growth performance. *Poult. Sci. J*. 63: 1237 – 1242.

Ogundu, U.E., Okpala, O.O. and Iloeje, M.U. (2009). Predictive ability of Broiler production models. *Ani. prod. Research advances*, 5(2); 79-82.

Peters, S.O. Ikeobi, C.O., Ozoje, M.O. and Adebambo, A.O. (2005). Modelling growth in seven chicken genotype. *Nig. Poultry sci. J., 4: 1-6.*

Sengul, T. and Kiraz S. (2005). Nonlinear models for growth curves in large white turkeys. *Turk. J. Vet.Anim. Sci.* 29: 331- 337.