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# COMPARATIVE STUDY ON GROWTH TRAITS AND THEIR INTERRELATIONSHIPS IN TWO STRAINS OF BROILERS

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## ABSTRACT

*This study was conducted to determine the relationship between body weight and linear body parameters in Arbor acre and Ross308 strains of broilers at 0-4weeks of age using sixty birds of each strain. Data were collected on body weight, body length, shank length, wing length, drumstick length and breast width. Data collected were analyzed using SPSS version 17.0 and later subjected to multiple linear regression analysis. The body weight of Ross308 was significantly (P<0.01) higher than Arbor acre as age advanced. The values of coefficients of determination ($R^2$) were all high and positive, while the shank length was significantly higher (P<0.01) in Arbor acre. This study therefore, recommends Ross 308 for higher performance. Selection of Arbor acre broilers could be based on shank length, body length and wing length while Ross 308 could be based on the wing length, breast width and drumstick length. Hence a comprehensive selection program could be planned for improvement of arbor acre and Ross 308 based on the regressions coefficients obtained from this study.*

**Keywords**: broilers, Ross308, morphometric indices, strains.

## INTRODUCTION

The live body weight of an animal is an important variable that determines the market value of that animal. The exact time at which the animal is ready for slaughter can be assessed on the basis of its body weight and general development. Morphometric traits also called Linear Body Measurements or Conformation traits are important parameters for estimating body weight especially by commercial breeders and producers. Breeders therefore breed desirable production traits particularly body weight ***(Ojedapo et al, 2009).*** Chick weight and morphometric traits like body length and shank length have great influences on growth performance of broilers as these parameters positively affect slaughter yield at market age (***Patbandha, et al, 2017).*** Several studies have been conducted to determine the relationship between morphometric traits and body weight in various broiler strains, but little or no consideration has been given to birds at their early life stage, as this will help the farmer to predict the future performance of the bird. This study is therefore carried out to compare body weights weight and morphometric traits of two broiler strains and determine the relationship between them

## MATERIALS AND METHODS

The study was carried out at the poultry unit of the research farm of, Federal University of Technology Owerri, Imo State. Imo state is located in the south eastern agro-ecological zone of Nigeria. It lies between latitude 5'4 and 6'3 North, longitude 6'15 and 7'34 East. Mean annual rainfall is about 25,000mm, while the temperature range between 27.5-28.5$^0$ C and relative humidity 70-80%. A total of one hundred and twenty day old chicks comprising of 60 Abor acer and 60 Ross 308 chicks were used in the study. Birds were fed with the same ration and under the same management system**. Proper identification was done using tags of different colors for each strain. Using 10kg digital scale and a measuring tape, data on body weight and body**

**measurements were collected individually from all the chicks, starting from their day of delivery to the 4th week. The chicks were weighed and measured weekly.** The body measurements taken include Body weight (BW), Body length (BL), Shank length (SL), Wing length (WL), Drumstick length (DL), Breast width (BR). The data was analyzed using the SPSS Statistical Package (SPSS 2003).

**RESULTS AND DISCUSSIONS**

The least squares means (±SE) of body weight and body linear measurements from 1 to 4 weeks of age for Arbor acre and Ross strains are presented in Table 1. The mmeas and standard error for BW at 4 weeks for Arbor acre birds was 776.22±21.85g while those of Ross broilers were 820.68±25.88g. Ross 308 strains were heavier (P<0.01) from week 2 to week 4. This finding is similar to the report of Udeh *et al.* (2011) and Amao *et al.* (2011) who showed that Arbor Acre was superior to Ross in body weight at 8 weeks of age. Although, the wing length of Ross 308 appeared to be significantly (P<0.01) higher in weeks 2 and 3, week 4 showed Arbor acre having higher (P<0.01) value. SHL at 1 to 2 weeks were significantly higher (P<0.05), but at week 3 and 4, the trend changed, SL of Arbor acre became significantly (P<0.01) higher than Ross 308. The DL values were significantly (p<0.01) higher with Ross 308. From weeks 2 to 4, the values of BR were significantly higher (P<0.01) with Ross 308. The BL was significantly higher (P<0.01) with Ross 308 in week 2 and week 3. The trend changed in week 4 such that the values of the BL became significantly higher (P<0.01) in Arbor acre. The result of body weight and body linear measurements in the two strains increased as age advanced and this is in agreement with the reports of Adeyinka *et al.* (2004), Udeh *et al*. (2011) who reported that age is a major determinant of growth and physiological development. Strain effect on body weights of chickens at different ages in this study agrees with the finding of Ajayi and Ejiofor (2009), Enaiat *et al*. (2010), Razuki *et* al. (2011), Ojedapo *et al*. (2011) who observed significant strain effects on live body weights of broiler chicken slaughtered for carcass evaluation at 8-12 weeks.

Table 4.2 show the multiple regression analysis of body weight on the linear body traits of Arbor acre strain of broiler. A highly significant (P<0.01) $R^2$ value of 93.2%, with a highly significant (P<0.01), regression, R value of 96.5% was shown. Highly significant(P<0.01) $R^2$- value obtained for the multiple regression analysis shows that the linear model has account for 93.2% of the variability of the data, which gives the impression that the model fits the data. While, the 0.965 R value, indicates that both the body weight and other linear body traits vary together about 96.5% of the time. In the other words, if you change the linear body traits of the Arbor acre broilers, the body weight is 96.5% likely to change. However, positive correlation here denotes that the pairs of traits, body weight and linear body traits have direct relationship or at least they are controlled by the same genes in the same direction (Ibom 2009; Okon *et al*., 2009). Thus traits with strong positive correlation can be selected for improvement as selection for one trait can lead to improvement of another. The co-efficient were positive (P<0.01) for all the linear body traits with values ranging from 12.19 to 45.71 for DL and SL respectively. The observed positive regression coefficient values for WL, SL, DL, BR and BL means that, a unit increase in any of the traits, would amount to an expected increase of the BW by a constant amount of 23.61g, 45.1g, 12.19g, 14.94g and 32.48g respectively. furthermore, the intercept, a, had a negative value of -766.34, which indicates that if the value of WL, SL, DL, BW and BL is zero (0), the BW will decrease by 766.34g.

Multiple regression analysis of traits revealed a highly significant (P<0.01) $R^2$ value of 0.932, with a highly significant (P<0.01), regression, R value of 0.965.1 The very high $R^2$-value obtained, indicates that the linear model has explains about 93.2% of the variability in the body weight data. This gives the impression that the model fits the data. The co-efficient were positive (P<0.01) for WL, DL, BR and BL with values ranging between 12.12 to 32.50 for BL and WL respectively. This signifies that any unit increase in any of the traits, will bring about 32.50g, 25.38g, 29.54g, and 12.12g increase in BW respectively. The negative regression coefficients (-24.43) observed in SL shows that any unit increase in SL will bring about a corresponding decrease in BW by 24.43g. The intercept, a, with a negative value of -519.907 indicates that if all the linear body traits studied has a value of zero, the BW will decrease by 519.91g. Hence, the high correlation

coefficient between BW and other linear body measurements indicates that high correlations among traits will bring about predictability for the other body traits (Adeleke *et al.*, 2011). Also, high positive phenotypic correlation coefficients obtained in this study were consistent with the reports of Adebambo *et al.* (2006) and Adedeji *et al.* (2008). These results also indicating pleiotropic effects, suggest that these traits are controlled by the same set of genes or linked genes as opined by Adeleke *et al.*, 2011. The result of this study agrees with the findings of Udeh and Ogbu (2011); Udeh *et al*. (2011) who reported positive and high significant ($P<0.01$) correlations among traits within each strain.

Table1 Least square mean (±SE) of body weight and body linear measurements of Arbor acre and Ross308 strains of Broiler

| Traits | Strains | Age in weeks | | | |
|---|---|---|---|---|---|
| | | 1<br>Arbor acre (60)<br>Ross 308 (60) | 2<br>Arbor acre (60)<br>Ross 308 (60) | 3<br>Arbor acre (60)<br>Ross 308 (60) | 4<br>Arbor acre (60)<br>Ross 308 (60) |
| BW (g) | Arbor acre | 139.40 ± 5.48[a] | 139.40 ± 5.48[a] | 325.76 ± 13.33[a] | 776.22 ± 21.85[a] |
| | Ross 308 | 134.45 ± 5.66[a] | 317.80 ± 15.80[b] | 513.32 ± 11.93[b] | 820.68 ± 25.88[b] |
| WL (cm) | Arbor acre | 8.00 ± 0.15[a] | 8.00 ± 0.15[a] | 10.99 ± 0.16[a] | 15.20 ± 0.18[a] |
| | Ross 308 | 8.13 ± 0.19[a] | 10.94 ± 0.22[b] | 13.90 ± 0.12[b] | 14.78 ± 0.23[b] |
| SL (cm) | Arbor acre | 3.76 ± 0.08[a] | 3.76 ± 0.08[a] | 5.24 ± 0.09[a] | 5.87 ± 0.19[a] |
| | Ross 308 | 3.98 ± 0.05[b] | 5.18 ± 0.12[b] | 5.10 ± 0.06[a] | 5.46 ± 0.09[b] |
| DS (cm) | Arbor acre | 5.40 ± 0.16[a] | 5.40 ± 0.16[a] | 7.60 ± 0.14[a] | 9.01 ± 0.10[a] |
| | Ross 308 | 5.15 ± 0.08[a] | 7.56 ± 0.17[b] | 7.65 ± 0.08[a] | 9.51 ± 0.19[b] |
| BR (cm) | Arbor acre | 7.73 ± 1.89[a] | 7.73 ± 1.89[a] | 10.03 ± 0.21[a] | 13.22 ± 0.22[a] |
| | Ross 308 | 7.45 ± 0.17[a] | 9.90 ± 0.22[b] | 10.73 ± 0.14[b] | 13.90 ± 0.38[b] |
| BL (cm) | Arbor acre | 10.37 ± 0.20[a] | 10.37 ± 0.20[a] | 13.20 ± 0.28[a] | 18.50 ± 0.22[a] |
| | Ross 308 | 10.47 ± 0.19[a] | 13.22 ± 0.28[b] | 15.74 ± 0.29[b] | 17.81 ± 0.28[b] |

Table 4.2 multiple regression analysis of body weight on linear body traits of arbor acre

| Traits | B-values | T-values | SEM | Sig |
|---|---|---|---|---|
| BW = 766.34 | | | | |
| WL | +23.61 | 3.63 | 0.25 | 0.00 |
| SL | +45.71 | 6.11 | 0.19 | 0.00 |
| DL | +12.19 | 1.08 | 0.07 | 0.28 |
| BR | +14.94 | 3.06 | 0.13 | 0.03 |
| BL | +32.48 | 5.64 | 0.41 | 0.00 |
| $R^2$ (%) | 93.2 | | | |
| R (%) | 96.5 | | | |

Table 4.2 multiple regression analysis of body weight on linear body traits of Ross 308

| Traits | b-values | T-values | SEM | Sig |
|---|---|---|---|---|
| BW =519.907 | | | | |
| WL | +32.50 | 8.40 | 3.87 | 0.00 |
| SL | -24.43 | -1.64 | 14.87 | 0.10 |
| DL | +25.38 | 2.42 | 10.50 | 0.17 |
| BR | +29.54 | 5.81 | 5.08 | 0.00 |
| BL | +12.12 | 4.82 | 2.51 | 0.00 |
| $R^2$ (%) | 93.2 | | | |
| R (%) | 96.5 | | | |

## CONCLUSION

The higher values were obtained for body weight and linear body traits in Ross 308. Also, high relationship was found existing between body weight and linear body traits in the two strain studied, indicating that selection for one trait could lead improvement in others Thus selection of Arbor acre broilers could be based on SL, BL and WL at starter phase, while selection of Ross 308 could be based on the WL, BR and DL.

## REFERENCES

Adebambo, A. O., O.I. Faybenvo, S.O. Fragite. Preliminary assessment of growth and reproductive data of three strains of chickens for broiler development in Nigeria. Proceeding 1st Nigeria international poultry summit. Ota Ogun State. Pp: 9-11.

Adedeji, T.A., Ojedapo, L.O., Ige, A.O., Ameen, S.A., AkinwuriA.O. and Amao S.R. (2008). Genetic evaluation of growth performance of pure and crossbred chicken progenies in a derivedsavannah environment. In: *proceeding of the 13th annual Conference of Animal Science Association of Nigeria. September 15-19, Ahmadu Bello University, Zaria, Kaduna state. Pp. 8-12.*

Adeleke, M., Peters S., Ozoje, M.O. and Adebambo, O.A. (2011). Genetic parameter estimates for body weight and linear body measurements in pure and crossbred progenies of Nigerian indigenous chickens. *Livestock research for rural development*, 23:19.

Adeyinka, I.A., Oni, O.O., Nwagu, B.I., and Adeyinka, F.D. (2006). Genetic parameter estimates of body weight of neck broiler chicken. *International Journal of Poultry Science*, 5(6): 509-592.

Ajayi F.O. and Ejiofor O. (2009). Effect of genotype x sex interaction on some developmental characteristics of Ross ans Anak Broiler strains in the high rain forest zone of Nigeria. *Asian Journal of Poultry Science* 3(2): 51-56.

Amao S.R., Ojedapo L.O. and Sosina O.A, Evaluation of growth Performance traits in three strains of broiler chickens reared in derived savanah environment of Nigeria. *World j. Young Researchers.*2011; 1(2): 28.

Enaiat M.M., Amina A.S. and Eman M.A (2010). A comprehensive study of productive and physiological pewrformance between two local strains of chicks. *Egypt Poult Sci*, 30(1), 297-316.

Ibom, L.A. (2009). Variations in Reproductive and Growth performance traits of White-skinned x Black-skinned African giant snail hatchlings in Obubra, Nigeria, Doctor of Philosophy thesis. Department of Animal Science, University of Calaber, Calaber, Nigeria.

Ojedapo L.O, Adedeji T.A, Amao S.R., Ameen S.A., Ige A.O., Olaniyi O.A., Sanyaolu V.F.. The influence of strain and sex on carcass characteristics of three commercial broiler strains. tropical journal of Animal science. 2009; 11:25-31

Okon, B., Ibom, L. A., Ekpo, I.A. and Ewa, E.C. (2009). Evaluation of Reproductive and some egg quality parameters of Albino Snails. J=*journal of Applied sciences.* 12(1): 8234-8241.

Patbandha, T.K., Garg, D., Marandi, S., Vaghamashi, D.G., Patil, S.S. and Savsani, H.H. (2017). Effect of chick weight and morphometric traits on growth performance of coloured broiler chicken. *Journal of etymology and zoology studies.* 5(6): 1278-1281.

Razuki, W.M., Mukhlis, S.A., Jasim F.H. and Hamad, R.F. (2011). Productive performance of four commercial broiler genotype reared under high ambient temperatures. *International journal of poultry science*, 10: 87-92.

SPSS (2004). Statistical package for Social Sciences- New York, Cary.

Udeh I and ogbu C.C. (2011). Principal Component Analysis of Body measurements in three Strains of Broiler Chicken. *Science World Journal.* 6(2).

Udeh I., Isikwenu, J. O. and Ukughere G. Performance Characteristics and prediction of body weight using lineare body measurements in four strains of broiler chicken.*International Journal of Animal and Veterinary Advances*. 2011. 3(1).