PREDICTION OF THE LIVE WEIGHT OF THREE STRAINS OF BROILER CHICKEN USING CARCASS PARTS

[1]Kadurumba, O.E., [1]Aligwekwe, I.S. [1]Anyanwu, V.C., [1]Ikpamezie, L.C., [1]Okere, P.C. [1]Egenuka, F.C., [2]Okafor, L.O.

[1]Department of Animal Science and Technology, Federal University of Technology Owerri, Imo State
[2]Department of Animal Science, University of Agriculture and Environmental Sciences Umuagwo, Imo State
Corresponding author:kadurumbaoe@gmail.com

Abstract
The objective of the study is to predict the live weight of three strains of broiler chicken using body part and a total of 150-day-old chicks 50 Abor Acre, 50 Cobb 500, and 50 Ross 308 were used for this experiment. At 8 weeks of age a total of 30 birds comprising of 15 birds from each strain were randomly selected, weighed, slaughter and carcass parts cut and weighed. Values of body weight (BW) were higher in Arbor acre, while Ross 308 showed superiority for most carcass traits ($p>0.05$). The coefficient of determination (R^2) values ranged from 80 - 100 among strains with dressed weight recording the highest value (100) at week 8 showing that dressed weight is the best predictor in assessing body weight in broiler chickens.

Keywords: Live weight, Broiler, Carcass, Prediction, Strain

Introduction

Chicken meat consumption has been on the increase in recent times (Godfray *et al.,* 2018) and chicken production has proven to be the most prevalent alternative towards reducing the incidence of animal protein deficiency in human diets (Obasoyo *et al.,* 2005) in Nigeria. 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 based on its body weight and general development. At present, there is an improvement in the potential of broiler strains to provide high-quality meat at a lower cost (Kemp and Kenny, 2003). Information on correlations among the pre and post-slaughter traits is quite important in poultry breeding. This is because knowing which of the pre-slaughter traits affects which of the post-slaughter traits enables breeders to predict what kind of products will be obtained (Mendes, 2009). Also, analyzing data from body measurements and carcass weight data is difficult in terms of interpreting the influence of body measurements as well as determining the carcass part which is most useful for predicting carcass weight (Keskin *et al.,* 2007). In this context, small and medium farmers have performed crosses between birds of special breeds and strains looking for traits such as rusticity, precocity, and mostly correct yield indices of carcass and noble cuts for rearing broilers.

Broiler carcasses are evaluated majorly by estimating dressing percentage and quality of edible parts (Holeman *et al.,* 2003). Others measure carcass composition using laboratory techniques (Faridi *et al.,* 2011) or by prediction (Lorentz *et al.,* 2011). The sizes of major carcass parts such as breast, drumsticks and thigh are vital parameters in evaluating broiler carcass quality when it comes to marketing and purchasing decisions for producers and consumers, thus the aim of broiler producers is to be able to predict carcass traits that can be used to evaluate carcass quality (Shafey *et al*., 2013). Therefore, this study was aimed at predicting body weight of broiler birds using carcass parts.

Materials and methods

The study was carried out at the Poultry unit of the Teaching and Research Farm, School of Agriculture and Agricultural Technology, Federal University of Technology, Owerri, Nigeria. Imo State lying between latitude 4^o 45'N and 7^o 15'N and longitude 6^o 50'E and 7^o 25'E with an annual rainfall range of 1990mm to 2200mm, mean annual temperature of above 20^o C and average annual relative humidity of 75%.

A total of 30 eight weeks old birds comprising of 10 birds each of Abor acre, Cobb 500 and Ross 308 strains randomly selected from a pool of 90birds were weighed and fasted for 24 hours prior to slaughter. The parameters measured included the live weights, dressed weight, shank, breast, drumstick, spleen, heart, kidney, liver, intestine, abdominal fat, proventiculus.

Data was subjected to analysis of variance in a completely randomized design using statistical software for social sciences (SPSS) version 7.0 (2006) and the differences between means were separated by Duncan's New Multiple Range test (DMRT). Multiple stepwise regression model was used;

$Y=a + bx +e$.....(i)

Where Y is an independent variable, a represents constant, b is regression coefficient associated with dependent variables, x are the dependent variables. Prediction equation was determined using the model, the relationship between the body weight and carcass traits of each bird were also assessed and the coefficient of determination (R^2) was used to compare the accuracy of prediction.

Results and discussion

Descriptive Statistics of broiler chicken

The least squares means (±SE) of live weight and body linear measurement for 8 weeks of age for Arbor acre, Cobb and Ross strains are presented in Table 4.1. Values of body weight (BW) were significantly ($P<0.05$) higher in Ross 308 than Arbor acre and Cobb 500. There was no definite order in superiority for the linear body measurements between the three studied strains. At every stage of growth, a particular parameter had a higher value in a particular strain and changed in another strain. However, the result of body weight and body linear measurements in the three strains increases as age advances in this study. This is not in agreement with the reports of Adeyinka *et al.* (2006), Udeh *et al.* (2011) who reported that age is a major determinant of growth and physiological development. Arbor Acre was significantly ($p<0.05$) superior to Cobb 500 and Ross 308 broilers for body weights. A similar result was obtained by Udeh *et al.* (2011) and Amao *et al.* (2011). who reported that Arbor Acre was superior to Ross in body weight at 8 weeks of age. The report of that Abor acre was superior to Ross at 8 weeks of age also agrees with the result obtained in this study. Strain effect on body weights of chickens and different age in this study agrees with the findings of Razuki *et al.* (2011) and Ojedapo *et al*. (2012) who observed significant strain effects on live body weights of broiler chicken slaughtered for carcass evaluation at 8-12 weeks.

Table 1: Mean Effect of Strain on Carcass traits

Traits	Arbor Acre	Cobb 500	Ross 308	S.E.M
Live weight	2.30 ± 0.122	2.08 ± 0.123	2.21 ± 0.0089	0.065
Dressed weight	1.85 ± 0.089	1.99 ± 0.124	2.12 ± 0.085	0.060
Shank weight	90.60 ± 4.94	91.80 ± 8.38	87.57 ± 11.45	4.84
Thigh weight	236.00 ± 16.03	247.00 ± 18.49	273.80 ± 15.75	9.81
Drum stick	210.00 ± 14.80^{b}	236.40 ± 13.60^{ab}	257.60 ± 13.87^{b}	8.65
Wing weight	188.00 ± 10.73	191.80 ± 9.72	209.40 ± 17.04	7.40
Breast weight	332.20 ± 18.75$^{\mathbf{b}}$	382.60 ± 29.00^{ab}	430.00 ± 23.52^{a}	15.35
Neck weight	80.20 ± 6.04	77.60 ± 5.60	82.40 ± 4.05	2.97
Head weight	60.40 ± 2.85^{b}	64.20 ± 4.05^{b}	76.60 ± 3.142^{a}	2.28
Liver weight	37.60 ± 2.56	35.60 ± 2.56	40.00 ± 1.93	1.36
Gizzard full	63.60 ± 2.80	62.20 ± 3.50	64.60 ± 3.30	1.80
Empty gizzard	40.80 ± 2.15	42.20 ± 2.16	45.80 ± 2.26	1.282
Proventriculus	9.00 ± 0.333^{b}	9.60 ± 0.653^{ab}	11.00 ± 0.447^{a}	0.317
Small Intestine	16.00 ± 0.516^{b}	20.00 ± 2.211^{ab}	25.20 ± 2.687^{a}	1.330
Heart Weight	9.40 ± 0.600	10.80 ± 0.952	11.60 ± 0.718	0.461
Gun boot	60.40 ± 3.70	72.00 ± 6.310	67.40 ± 4.872	2.962
Back weight	261.40 ± 16.78	263.80 ± 18.90	282.40 ± 15.81	9.746
Spleen weight	2.00 ± 0.000	2.00 ± 0.000	2.00 ± 0.000	0.00
Jeoveum	20.80 ± 1.769^{b}	25.60 ± 1.360^{ab}	27.80 ± 2.280^{a}	1.161

Regression Equation of Broiler Strains using carcass parts

Prediction equation relating the body weight and carcass traits among the three broiler strains are shown in Table 2. The coefficient of determination (R^2) values in Arbor Acre, Cobb 500, and Ross308 Strains ranged from 80 – 97, 99, and 99 – 100 respectively, with dressed weight recording the highest value (100). This result shows that dressed weight could give the best of prediction in assessing body

weight in broiler chickens. This result did not agreed with the findings of Ojo *et al.* (2010) and Ogah (2011) who reported the highest R^2 value in wing length in different strains at 7 – 8 weeks of age. Nosike (2015) reported R^2 value of 96% with wing length in the black turkey strain.

Table 2: Prediction equation relating the body weight and carcass traits

Strain	Regression Equation	R^2	S.E	Significant
Abor Acre	BWT = .018 +1.24 DWT	80	.1828202	***
	BWT = 1.37 + 1.24DWT - .085	93	.1148558	***
	BWT = 1.25 + 1.74DWT - .090 - .003 DS	97	.0770788	***
Cobb 500	BWT = .111 + .991DWT	99	.0395223	***
	BWT = .196 + 1.03 DWT - .002	100	.0282588	***
Ross 308	BWT = .023 + 1.03DWT	99	.0309755	***

BWT = Body Weight; DWT = Dressed Weight

Conclusion

Dressed weight is the best predictor in assessing body weight in broiler chickens. Thus relationship existing between body weight and carcass traits in the three strains studied, indicates that selection could be combined with the prediction in the different strains.

References

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.

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

Faridi, A., Mottaghitalab, M., Darmani-kuhi, H., France, J. and Ahmadi, H. (2011). Predicting carcass energy content and composition in broilers using the group method of data handling-type neural networks. J. Agric. Sci. (Cambridge) 149(2):249-254.

Godfray, H.C.J., Aveyard, P., Garnett, T., Hall, J.W., Key, T.J., Lorimer, J., Pierrehumbert, R.T., Scaborough, P., Springmann, M. and Jebb, S.A. (2018). Meat consumption, health and the environment. *Science* 361. Eaam5324

Holeman, A., Vadnjal, R., Zlender, B. and Stibilj V. (2003). Chemical composition of chicken meat from free range and extensive indoor rearing. *Arch. Geflugelk*. 67(3): 120-124.

Kemp, C. and Kenny, M. (2003). Feeding the modern broiler for more meat. Int. Hatchery practice 17:11 – 13. `

Keskin, S., Daskiran A. and Kor. A. (2007)**.** Factor analysis scores in a multiple linear regression model for the prediction of carcass weight in Akkeci kids. *J Appl Anim Res* 31: 201-204.

Lorentz, L.H., Gaya, L.G., Lunedo, R. and Sterman, J.B. (2011). Production and body composition traits of broilers in relation to breast weight evaluated by path analysis. *Sci. Agric*. (Piracicaba, Braz.) 68(3): 320-325.

Mende, M. (2009). Multiple linear regression mode is based on the principal component score to predict the slaughter weight of the broiler. *Arch. Geflugeik*. 73(2): 139 -/144.

Nosike, R. J. (2015). Characterization and Discrimination of Nigerian Local Turkey based on quantitative traits and Biologic Markers. PhD. Thesis, Michael Okpara University of Agriculture Umudike, Abia State, Nigeria. P.63

Obasoyo, D.O., Bamgbose, A.M and Omoikhoje, S.O. (2005). Blood profile of broilers fed diets containing different animal protein feedstuff. *10th Annual Conf. Anim. Sci. Association of Nigeria*. Univ of Ado – Ekiti, Nigeria. Pp 176 – 178.

Ogah, D.M. (2011). Assessing Size and Conformation of the Body of Nigerian Indigenous Turkey. *Slovak Journal of Animal Science,* 44 (1): 21-27.

Ojedapo, L.O., Amao, S.R., Ameen, S.A., Adedeji, T.A., Ogundipe, R.I. and Ige, A.O. (2012). Prediction of body weight and other linear body measurements of two commercial layer chickens. *Asian Journal of Animal Sciences*, 6(1): 13-22.

Ojo, O.A., Akpa, G.N., Adeyinka, I. A., Makinde, F.M., Iyiola,-Tunji, A. O. and Ubani, E. O. A. (2010). Prediction equation for eight weeks body weight of Hubbard broiler breeder chickens by age using body measurements. In: *Proceedings of the 15th Annual Conference of the Animal Science Association of Nigeria*, ASAN, (17): 35-38.

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

Shafey, T.M., Alodan, M.A., Hussein, E.O.S. and Al-Batshan, H.A. (2013). The effect of sex on the accuracy of predicting carcass composition of Ross broiler chicken. *Journal of animal and plant sciences* 23(4): 975-980.

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