Nigerian J. Anim. Sci. 2020 Vol 22 (2):7-12 (ISSN:1119-4308)

Variations in the carcass traits of three strains of broiler chickens

***Fadare A.O., Dawodu T.S. and Ilufoye J.K.**

Department of Animal and Environmental Biology, Adekunle Ajasin University, Akungba-Akoko Nigeria

****Corresponding Author***: *delodunfadare@gmail.com, adelodun.fadare.aaua.edu.ng* ***Phone Number:*** *+234803478235*

Target Audience: *Animal scientist, Broiler farmers and Consumers.*

Abstract

The variation in carcass traits of Arbo acre, Cobb and Marshall strains were evaluated at the poultry unit of the Department of Animal and Environmental Biology, Adekunle Ajasin University, Akungba-Akoko, Nigeria. Three hundred day-old broiler chicks were raised under the same management conditions for eight weeks and slaughtered. Data collected include slaughter weight, plucked carcass weight, edible carcass, dressing yield, primal cut outs and internal organ weights. Results of the study showed that Marshall strain had the highest slaughter, plucked and edible carcass weights while the least values were measured for Arbo acre strain. The least inedible carcass was found in Cobb strain with a mean value of 465.32 ± 8.96 g. Cobb and Marshall strain had similar dressing yield of 77.19 ± 3.79% and 76.51 ± 2.26% respectively while the least dressing yield of 70.63 ± 1.74% was recorded for Arbo acre strain.The highest feather weight and percentage was recorded for Arbo acre. Cobb strain had higher percentage of breast muscle (16.60 ± 0.45%) than Marshall strain (14.70 ± 0.31%). Marshall strain had the highest weight of lung, full and empty gizzard. In conclusion variations exist in carcass traits of broilers in favour of Marshall and Cobb strain.

Key words: *Strain; Broiler; Slaughter weight; Dressing yield*

Description of Problem

Poultry meat are among the most valuable sources of protein available for human consumption. The contribution of poultry to animal protein supply cannot be over emphasized (1). White meat such as chicken meat is superior to red meat because of its comparatively low fat content and low cholesterol level (2). Broiler birds among other species of poultry have the potential of providing quality protein to the populace owing to its short generational interval (3). To meet the global increasing demand for poultry products, new strains of broiler are developed for faster growth rate and carcass quality (4).

The carcass yield of broiler chicken is of primary concern to the producer and consumers (5). According to (4), most carcass traits are strain and sex dependent. Factors affecting carcass composition include diet, age, sex, genotype and management (6). As stated by (7), the Nigeria poultry has over the years witnessed the introduction of different broiler strains. In the study conducted by (8), similar dressing yield was recorded for Marshall and Cobb. (9) also reported no significant difference in carcass traits of Arbo acre and other strain studied. (10) found no significant difference in dressing percentage between Cobb and Arbo acre.

There are contradictory reports on the superiority of the most common strains of broilers (Cobb, Arbo acre an Marshall) with regards to their carcass traits. (11) reported higher dressing yield of Cobb strain over Arbo acre and Hubbard strain of broiler. (12), however reported that Arbo acre strains had the highest live-weight, dressing percentage and breast meat percentage compared to Marshall, Ross and Hubbard. The research of

(6) showed that marshall had higher live weight and dressing percentage than Arbo acre. This study was therefore carried out to determine the variation in the dressing yield and other carcass traits of marshall, cobb and arbo acre strains of broiler chicken.

Materials and Methods

Experimental site

The experiment was carried out at the Poultry unit of the Department of Animal and Environmental Biology, Adekunle Ajasin University Akungba-Akoko, Ondo State. Akungba–Akoko is located in Akoko South West Local Government Area of Ondo state, Nigeria. The area lies in the south western region of Nigeria (7º28ˈand 5º43ˈ) according to Geographical Positioning System (GPS) and has the following environmental condition: average ambient temperature of 27^0C and relative humidity of 46 mm Hg.

Table 1. Carcass composition of Marshall, Arbo acre and Cobb broilers

Parameters	Marshall	Cobb	Arbo acre
Pre- slaughter weight (g)	2215.00±18.50^a	2048.88 ± 10.30^b	1937.50 ± 12.40^c
Slaughter weight (g)	2130.00 ± 15.25^a	1959.37 ± 27.81^b	1862.50 ± 23.72 ^{c}
Plucked weight (g)	2035.00 ± 13.50^a	1878.33 ± 22.87^b	1784.37 ±25.05^c
Edible carcass (g)	1694.80 ± 12.70^a	1581.56 ± 10.14^b	1368.44 ± 11.65^c
Inedible carcass(g)	520.20 ± 16.75^b	465.32 ± 8.96^c	569.06 ± 11.67^a
Dressing yield (%)	76.51 ± 2.26^a	77.19 ± 3.79^a	70.63 ± 1.74^b

^{abc}Means on the same row with different superscripts are significantly ($p< 0.05$) different.

Table 2. Primal cut out parts of Marshall, Arbo acre and Cobb broilers

Parameters		Marshall	Cobb	Arbo acre
Wing	(g)	179.70 ± 5.20^a	164.82 ± 8.04^b	161.81 ± 7.53^c
	(%)	8.11 ± 0.18^b	8.51 ± 0.21^a	7.89 ± 0.11^c
Thorax	(g)	348.40 ± 9.15^a	336.43 ± 7.92^b	353.49 ± 9.18^a
	(%)	15.73 ± 0.65^b	17.36 ± 0.35^a	14.51 ± 0.28^c
Breast	(g)	325.60 ± 3.40^a	321.50 ± 5.34^a	297.38 ± 9.25^b
	(%)	14.70 ± 0.40^b	16.60 ± 0.45 ^{a}	14.51 ± 0.35^b
Leg	(g)	94.50 ± 1.54	86.95 ± 1.45	88.99 ± 1.19
	(%)	4.27 ± 0.11	4.49 ± 0.14	4. 34 ± 0.12
Thigh	(g)	420.00 ± 8.51	378.39 ± 9.14	399.01 ± 7.92
	(%)	18.96 ± 0.16^c	19.53 ± 0.11^a	19.41 ±0.15^b
Head	(g)	74.50 ± 3.10^a	63.34 ± 1.40^c	65.94 ± 1.94^b
	(%)	3.36 ± 0.04^a	3.27 ± 0.01^b	3.22 ± 0.03^c
Neck	(g)	67.90 ± 0.68^a	58.82 ± 1.19^b	52.15 ± 1.23^c
	(%)	3.26 ± 0.01^a	3.04 ± 0.02^b	2.54 ± 0.04^c

^{abc}Means on the same row with different superscripts are significantly ($p< 0.05$) different.

Experimental animals and management

Three hundred (300) day-old broiler chicks comprising one hundred each of Arbo acre, Cobb and Marshall strains were used for the study. Brooding lasted for four weeks using charcoal stove. They were fed twice daily with commercial broiler starter mash diet containing 2700 Kcal/kg metabolizable energy and 23% crude protein from day old to 4 weeks of age while they were fed with commercial broiler finisher diet containing 2950 Kcal/kg metabolizable energy and 20% crude protein from 5weeks to the end of the experiment at 8 weeks. The birds had free access to clean water throughout the period of the experiment. The vaccination schedule for gumboro and lasota vaccines were strictly adhered to and adequate medical attention was given to unhealthy birds.

Slaughtering, dissection and measurement procedures

At 8 weeks of age, eighty broilers from each of the strains were weighed and slaughtered. Each bird was bled and weighed to determine the blood weight. The feathers were plucked and the bird re-weighed to determine feather weight. The head and primal parts were separated and the internal organs were also removed. Primal cut out parts such as breast muscle, wings, thigh, neck, legs, thorax were weighed using a Metler® sensitive scale. The internal organs (heart, lung, liver and gizzard) and inedible parts (grit, gastro intestinal tract) were also measured with the sensitive scale. The relative percentages of all carcass parts to the live body weight (pre-slaughter weight) were estimated.

Data obtained from the measurements were subjected to analysis of variance (13). The model is as specified below:

$Y_{ijk} = \mu + A_i + e_{ijk}$

Y_{ijk}= the parameter or interval

μ = overall mean for the parameter of interest

A_i = Fixed effect of ith strain (i=1-3)

e_{ijk}= random error associated with each record (Normally=Independently and identically distributed with zero mean and variance ($\eth^2 e$)

Results and Discussion

Tables 1, 2, 3 and 4 show the results on carcass composition, primal cut out parts, the internal organs and inedible carcass of Marshall, Arbo acre and Cobb broilers.

In carcass composition (Table 1), there were significant differences ($p<0.05$) in the pre- slaughter weight, slaughter weight, plucked weight, edible carcass, inedible carcass and dressing yield of Marshall, Cobb and Arbo acre broiler strains. Marshall strain had the highest pre-slaughter weight (2215.00±18.50g) followed by cobb (2048.88 ± 10.30 g) while the least pre-slaughter weight was recorded in Arbo acre strain (1937.50 ± 12.40 g). Marshall strain also had the highest slaughter, plucked and edible carcass weights of 2130.00±15.25g; 2035.00±13.50 and 1694.80±12.70g while the least values of (1937.50±12.40g, 1862.50± 23.72g, 1784.37± 25.05g) were recorded in arbo acre strain. The least inedible carcass was found in Cobb strain with a mean value of 465.32± 8.96 g while the highest value of 569.06 ±11.67g was recorded in arbo acre strain. Cobb strain gave the highest mean dressing yield of 77.19±3.79% though not significantly ($p>0.05$) different from76.51±2.26% recorded in marshall strain but with both being significantly ($p<0.05$) different from 70.63±1.74% recorded in arbo acre strain. The similarity in the dressing yield of cobb strain and marshall strain in this study corroborated the reports of (8) who reported similar dressing yield for marshall and cobb broiler strains. The superiority of marshall strain in carcass composition over arbo acre strain in this study was in line with the reports of (6) that marshall strain had higher live weight and dressing percentage than arbo acre strain. (11) also reported higher

dressing yield of Cobb strain over Arbo acre strain of broiler. (14) however, reported higher live weight, plucked weight and dressing percentage and breast weight in Arbo acre than Marshall strain of broilers. (12) also reported that Arbo acre strains had the highest live-weight, dressing percentage and breast meat % compared to other strains studied.

In primal cut out parts of marshall, arbo acre and cobb broilers (Table 2), the effect of strain was significant ($p<0.05$) on wing, thorax, breast, head and neck parts but not ($p>0.05$) leg and thigh parts. However, thigh parts were significantly ($p<0.05$) different among strains as percentage of dressing weights. Marshall strains had the highest wing weight (170.70 ± 5.20g) followed cobb and arbo acre strains. However, the relative percentage of wing weight to the live body weight (pre- slaughter weight) was highest in Cobb strain. Cobb strain also had the highest relative percentage of thorax weight to the pre-slaughter weight compared with Marshall and Cobb strain. Although the breast muscle weight was similar in Marshall and Cobb strain, Cobb strain had higher relative percentage of breast muscle (16.60 ± 0.45%) than Marshall strain (14.70 ± 0.31%). This was in line with the report of (7) that Cobb broiler had higher breast muscle than Marshall broilers. (15) observed that Cobb had higher breast yield compared to other strains studied. The effect of strain was not significant ($p>0.05$) on the leg weight and its relative percentage . Similar mean values were recorded for all the strains as shown on Table 2. The relative percentage of thigh weight to live weight was highest in Cobb broiler. (16) also reported the superiority of Cobb broiler strain over Ross strain in carcass weight, major cut portions and dressing percentage. (10) however, reported no significant difference in thigh, % breast, and other primal cuts of Cobb and Arbo acre broiler. In this study, Marshall strain had the highest head weight and relative percentage than other strains . In the same vein the highest mean value of neck weight and relative percentage was recorded for Marshall strain as shown in Table 2.

In the internal organs of marshall, arbo acre and cobb broilers (Table 3), there were significant ($p<0.05$) broiler strain effect on the weights of lung, liver, full gizzard, empty gizzard and GIT, but not ($p>0.05$) in heart weight presented on Table 3 showed that the effect of strain was not significant ($p>0.05$) on heart as an internal organ. The heart weight and the relative percentage of heart to the live weight were similar in all the strains. Nevertheless, the effect of strain was significant ($p<0.05$) on lung, gizzard, liver weight and gastro intestinal tract. The highest weight and relative percentage of lung was found in Marshall strain while Cobb and Arbo acre strain had similar lung weight and relative percentage. Marshall strain also had the highest weight of full and empty gizzard. The relative percentage of full gizzard was similar in Cobb and Arbo acre strain. (8) also reported that gizzard weight was higher in Marshall than Arbo acre. The three strains had similar relative percentage of liver despite that the highest weight (53.20 ±1.11g) was recorded for Marshall strain. (17) also reported similar liver percentage for Marshall and Arbo acre strain. (7) reported that Cobb and Marshall bred of broiler had similar, liver and gizzard weight. In the study conducted by (8), similar heart, liver, intestine, lung weight were found in Arbo acre and Marshall strain.

The least value of gastro-intestinal tract weight and percentage was found in Cobb strain followed by Arbo acre strain in this study as shown in Table 3. The three strains had similar blood weight and relative percentage, however the feather weight and relative percentage was significantly affected by strain as presented in Table 4. The highest feather weight and percentage was recorded for Arbo acre. The variation in grit was also

significantly affected by strain. The highest grit weight and relative percentage was found in marshall strain followed by arbo acre while the least grit weight and percentage was recorded for cobb strain.

Conclusion and Applications

1. From the results obtained in this study, it can be concluded that there was significant effect of strains on the carcass traits of broilers with the Marshal strain having the highest pre-slaughter weight, slaughter and plucked weight compared with Cobb and Arbo acre breed.
2. The least inedible carcass was found in Cobb strain.
3. Dressing yield was similar in Marshall and Cobb strain but higher than that of Arbo acre .

References

1. Ahmed, I.A., Adeyinka, I.A., Kabir, M., Mohamed, A. B, Sani, I., Galadima, N.M. and Muhammad, J. Y. (2018). Evaluation of growth performance traits in three strains of broiler chickens reared in semi-Arid zone of Nigeria. *International Journal of Innovative Research and Advanced Studies* 5 (3): 276-280.
2. Jaturasitha, S, Srikanchai, T, Kreuzer, M. and Wicke, M. (2008) Differences in carcass and meat characteristics between chicken indigenous to Northern Thailand (Black boned and Thai native) and imported extensive strains (Bresse and Rhode Island Red). *Poultry Science*, 87:160-169.
3. Saadu A, Bashar, Y.A., Abubakar, A., Abbas, A.Y., Lawal, N., Mani, A.F. and Ribah M.I. (2018). Performance of some broiler strains fed varying energy levels in hot season of Sokoto, semi arid Nigeria. *Journal of Agriculture and Veterinary Science* 11(5): 1-7.
4. Olawumi, S.O., Fajemilehin,S.O. and Fagbuaro, S.S. (2012) Genotype X Sex interaction effects on carcass traits of three strains of commercial broiler chickens. *Journal of World Poultry Research*, 2 (1) : 21-24.
5. Sam, I.M. (2019) Influence of sex on relationship between morphometric trait measurement and carcass traits in broiler chicken raised in humid tropics. *Journal of Agriculture, Environmental Resource and Management* 4 (1):395-403.
6. Sogunle, O.M., Egbeyale, L.T., Alajo, O.A., Adeleye, O.O., Fafiolu, A.O., Onunkwor, O.B., Adegbite, J.A and Fanimo, A.O. (2010) Comparison of meat composition and sensory values of two different strains of broiler chickens. *Archivos de Zootecnia* 59: 311-314.
7. Ojedapo, L.O., Amao, S.R. and Ogunshola, O.J. (2015) Variation of meat type chickens in relation to genotypes and age of slaughter on carcass indices. *Journal of New Sciences* 14 (6): 473--478.
8. Akporhuarho, P.O. and Unukevwere, J. U (2015) Carcass and adipose tissue deposit characteristics of four strains of broiler chicken reared in a humid tropical environment. *Journal of Agriculture and Food Environment* 2: 115-121.
9. Rahimi, S.H., Esmaeilzadeh, L. and Karimi, T.M.A. (2006) Comparison of growth performance of six commercial broiler hybrids in Iran. *Iranian Journal of Veterinary Research* (University of Shiraz) 7(2):38-44
10. Abd- Elwahab, A.M. (2016) Comparison between four broiler strains in production performance and carcass characteristics under Sudan condition. MSc. Thesis submitted to Department of Animal Science, Sudan University of Science and Technology. pp 33-43.

11. Zaman, R., Jahan, S.S., Islam, A. and Ahmed, S. (2015) Production performance of three broiler strains in summer seasons in Bangladesh. *Global Journal of Animal Science, Livestock Production and Animal breeding* 3(2):138-144
12. Akinwunmi, A.O. and Odunsi, A.A. (2013) Meat quality of broiler chicken as affected by strain, age at slaughter and immobilization methods. *International Journal of Science and Research* 5(9): 1318-1324
13. SAS (2010). Statistical Analysis System. SAS Stat. Version 12. SAS Institute Inc. Gary NC 27513, U.S.A.
14. Safiyu, K. K., Sogunle, O. M., Egbeyale, L.T. and Shittu, T.A. (2016) Performance carcass characteristics and meat quality of two broiler strains reared outdoor in tropical climates. *Bulletin of Animal Health and Production in Africa* 64(3) : 345-354.
15. Nogueira, B.R.F., Neis, M.P., Carvalho, A.C., Mendoza, E.A.C., Oliveira, B.L., Silvia, V.A. and Bertechini, A.G. (2019) Performance growth curves and carcass yield of four strains of broiler chicken. *Brazilian Journal of Poultry Science* 21(4):1-8.
16. Rahman, M.S. (2014) Morphological analysis of breast and thigh muscle in different post natal ages of broiler chicken and its carcass characteristics. *Bangladesh Journal of Veterinary Medicine* 12(2) 115-120.
17. Makka, N. 2016. Comparative study of three strains of broiler chickens using growths, biochemical profile and mathematical model. A M.Sc. Dissertation submitted to Department of Animal Science, Ahmadu Bello University Zaria, Nigeria pp 32-37