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Variation of meat-type chickens in relation to genotypes and age of slaughter on carcass indices.

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Abstract - The experiment was conducted to compare the various carcass characteristics between two broiler strains. A total bird of 150 day-old chick of two commercial broiler strains (Marshall and Cobb, 75 each) were raised and at the end of 4, 6 and 8 weeks, 20 birds/strain; 40 birds/week, making a total of 120 birds were randomly selected from both strains for carcass analysis. The birds were starved of feed overnight and individually weighed to obtain starved live body weight. The birds were stunned and bled by severing the blood vessels and the nerve trunks at the roof of the mouth with a sticking knife. Thereafter, the birds were scalded, deplumed manually and eviscerated through a slit made between the end of the keel bone and rectum. Data were obtained on live weight (gram), eviscerated weight (gram), carcass weight (gram), dressing weight (gram), breast weight (gram), shank weight, thigh weight (gram), drumstick weight (gram) and back weight (gram). The visceral organs observed were liver, lungs, heart, kidney, spleen, gizzard, proventriculus and abdominal fats. At 4th week of age, there were significantly differences in eviscerated weight (Cobb birds; 666,25g and Marshall birds; 578,90g), breast weight (Cobb birds; 176,75g and Marshall birds; 138,40g), gizzard weight (Cobb birds; 32,85g and Marshall birds; 29,25g) and abdominal fats (Cobb birds; 9,45g and Marshall birds; 7,80g) while Cobb birds were favoured. At the 6th week of age; Cobb birds had higher values of live weight, eviscerated weight, carcass weight, dressing weight, breast weight, back weight, lungs, heart, abdominal fats and spleen than its Marshall counterpart. However, at the 8th week of age; live weight for Cobb birds had higher values of 3005,60g, eviscerated weight (2264,00g), carcass weight (2088.80g), dressing weight (2634.55g), breast weight (727.05g), back weight (337.95g), lungs (17.10g) and heart (11.70g) than its counterpart Marshall birds. It can be concluded that the Cobb birds had a better carcass characteristics than the Marshall birds.

Keywords: Meat type chicken / genotype / age / carcass indices

1. Introduction

Poultry keeping is an important means of rapidly increasing the availability of animal protein in the developing countries where malnutrition is a great problem (Anyanwu and Okoro, 2006). Poultry product is considered to be one of the most popular options in Nigeria in reducing the incidence of malnutrition particularly protein deficiency in the diets of populace (Obasoyo *et al.*, 2005). The necessity of protein in man and animal diet cannot be over emphasized; the reason is that, protein plays a vital role in tissue synthesis and building of body structure. Statistics have however shown that the demand for poultry products is on a geometric increase. According to FAO (2005) report, about 47 billion meat chickens were produced globally in 2004 (US produced 19%, China 13%, Brazil 11%). Since chicken

meat costs less than other meats, its market share is on the increase. At this rate of increase, the European Union is expected to produce more to meet the demand for poultry meat both locally and internationally. On the Nigerian scene, demand for poultry products is equally high and the current rate of production is extremely low and inadequate to meet with the demand.

Broiler meat production is raised primarily for human consumption within shortest period of time profitability. Until recently most birds were sold whole, but there has been a dramatic increase in the production of birds being grown for portioning and further processing (Ewart, 1993). The greatest scientific and technological development of poultry industry in the last years demanded the evaluation of different commercial broiler strains, as well as different handling technique, in order to improve production efficiency and help in decision making.

The marketing of poultry has been greatly diversified with a significant increase in cut-up (parts) and processed products (Le Bihan Duval *et al*., 2001). Demand for high quality cut-up (parts) and further processed convenience foods have driven the poultry industry to change its marketing practices (Watts and Kennett, 1995). Breeders of meat-type chickens have become interested in adult body weight and other growth traits, aimed at big-bodied weight at early age in order to attract better price at marketing (Malik *et al.*, 1997) since the age at which broiler chicken are sold is greatly influenced by consumer preferences (Omage *et al.*, 2006).

The main goal of broiler rearing is production of quality broiler carcasses that will be acceptable from the consumers. Acceptability depends on the quality and quantity of edible parts of carcasses, and the amount of muscle mass in carcass. Broilers carcasses are evaluated mainly through yield edible parts of which are expressed by dressing percentage (slaughter yields) and the quality of edible parts of carcass. All quality characteristics of carcass are inherent in the hybrids (genotype) and are therefore conditionally hereditary characteristics with precisely defined heritability proposed values (Chen *et al*., 1987).

In Nigeria today, poultry keeping is one of the most popular enterprises adopted by both small and medium scale farmer in the rural and urban setting (Idowu *et al.*, 2005). At present, there is an improvement in potential of broiler strains to provide high quality meat at lower cost (Kemp and Kenny, 2003). Reports from Mallo *et al.*, (1997); Ojedapo *et al.*, (2008) and Amao *et al*., (2009) stressed their findings on the different strains of commercial broilers in term of growth traits and breeding management but not in relation to the age at slaughtered. Therefore, the production of fast maturing birds such as broilers which have the ability to grow fast with respect to age at slaughter and genotypes had to be adopted in this environment.

2. Materials and methods

2.1. Experimental Site

The experiment was carried out at the Poultry unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso lies on the longitude 4º15¹ East of the Greenwich Meridian and Latitude 8º15¹ North of the equator. It is about 145km Northeast of Ibadan, the capital of Oyo State. The mean temperature is about 27ºC while the annual mean rainfall is 1247mm (Ojedapo and Amao, 2014).

2.2. Experimental Animals and Management

A total bird of 150 day-old chick of two commercial broiler strains (Marshall and Cobb, 75 each) was used. Marshall was purchased at Obasanjo's Farm in Ibadan and Cobb was purchased at Zartech Farm in Ibadan with all necessary vaccination administered. Each strain was identified by given a separate pen in an environmentally controlled brooder house with a floor covered with wood shavings which was kept dry throughout the experimental period by replacing spoiled litter when required.

The experimental house was constructed with planks, well netted and covered with nylons to reduce cold and its effect during brooding stage. The experimental house was thoroughly cleaned with detergent and water, disinfected with morigad and then left to dry for seven days. The pen's floor spacing of 1.5sq feet per bird was spread and covered with fresh saw dust to a thickness of 7 cm. All the equipment such as drinkers, feeders and wire separators were thoroughly cleaned and disinfected. The pens were later heated before the arrival of the birds with charcoal pot as source of heat with electric bulbs.

2.3. Experimental diets

Birds were fed *ad libitum* on a broiler starter diet(containing 24%CP and 2900kcal/Kg/ME) from hatching to 5th week of age followed by a finisher diet (21%CP and 2800kcal/Kg/ME) to 8th week of age while water and feed were available *ad libitum* to the birds.

2.4. Data Collection

At the end of 4, 6 and 8 weeks, 20 birds/strain; 40 birds/week, making a total of 120 birds were randomly selected from both strains. The birds were starved of feed overnight and individually weighed to obtain starved live body weight. The birds were stunned and bled by severing the blood vessels and the nerve trunks at the roof of the mouth with a sticking knife. Thereafter the birds were scalded, deplumed manually and eviscerated through a slit made between the end of the keel bone and rectum. The live weight, eviscerated weight, carcass weight, dressing weight, breast weight, shank weight, thigh weight, drumstick weight and back weight were recorded. The visceral organs recorded were liver, lungs, heart, kidney, spleen, gizzard, proventriculus and abdominal fats. The parameters were measured as described by Kleczek *et al.,* (2007).

2.5. Statistical Analysis

The data collected were subjected to one-way analysis of variance using the general linear model of (SAS, 2003) and t- test were used to separate the means. The below model was adopted;

$Y_{ijk} = \mu + S_i + A_j + (SA)_{ij} + E_{ijk}$

Where

Y_{ijk} = The individual measurement on each bird
μ = The overall mean
S_i = Effect of the i^{th} strain (1, 2)
A_j = Effect of the j^{th} age (4, 6, 8)
$(SA)_{ij}$ = Interaction effect of strain i^{th} and age j^{th}
E_{ijk} = The random errors

3. Results

Table 1 shows the mean values of carcass indices of two commercial broilers at different ages. There were significant ($P<0.05$) differences between the carcass indices and the commercial broilers. At 4^{th} week of age, eviscerated weight was higher for Cobb birds (666.25g) than the Marshall birds (578.90g) and Breast weight value were higher for Cobb birds (176.75g) than the Marshall birds (138.40g). At 6^{th} week of age, live weight value were higher for Cobb birds (1923.95g) than the Marshall birds (1705.70g), eviscerated weight value were higher for Cobb birds (1515.25g) than the Marshall birds (1226.10g). Carcass weight were higher for Cobb birds (1343.55g) than the Marshall birds (1905.75g), dressing weight value were higher for Cobb birds (1704.45g) than the Marshall birds (1535.70g), breast weight were higher for Cobb birds (415.00g) than the Marshall birds (307.95g), thigh weight were higher for Cobb birds (228.00g) than the Marshall birds (190.80g) and back weight were also higher for Cobb bird(218.20g) than the Marshall bird (190.10g). At 8^{th} week of age, the live weight for Cobb birds (3005.60g) were superior than the Marshall birds (2537.50g), Cobb birds had higher eviscerated weight values (2264.00g) than the Marshall birds (1854.15g). Carcass weight, dressing weight, breast weight and back weight values for Cobb birds (2088.80g, 2634.55g, 727.05g and 337.95g) were all superior than Marshall birds of 1734.00g, 2244.05g, 502.30g and 290.05g respectively.

Table 1. Means and standard errors of carcass indices of 2 commercial broilers genotypes at different ages.

Parameters(g)	Genotypes	4 weeks	6 weeks	8 weeks
Live weight	Cobb	859.50±29.60	1923.95±45.37[a]	3005.60±64.99[a]
	Marshall	810.60±34.97	1705.70±50.17[b]	2537.50±90.00[b]
Eviscerated weight	Cobb	666.25±22.84[a]	1515.25±52.47[a]	2264.00±57.57[a]
	Marshall	578.90±30.25[b]	1226.10±37.12[b]	1854.15±68.48[b]
Carcass weight	Cobb	579.75±22.56	1343.55±30.96[a]	2088.80±54.60[a]
	Marshall	511.65±27.29	1095.75±33.07[b]	1734.00±60.95[b]
Dressing weight	Cobb	819.95±32.68	1704.45±41.52[a]	2634.55±63.75[a]
	Marshall	729.45±36.23	1535.70±44.63[b]	2244.05±70.36[b]
Breast weight	Cobb	176.75±9.55[a]	415.00±8.06[a]	727.05±24.19[a]
	Marshall	138.40±7.26[b]	307.95±9.75[b]	502.30±19.60[b]
Shank weight	Cobb	40.35±1.72	78.25±3.14	108.30±4.07
	Marshall	40.25±2.25	75.10±2.66	101.95±5.61
Thigh weight	Cobb	96.05±4.01	228.00±6.87[a]	319.50±6.68
	Marshall	84.85±4.81	190.80±6.26[b]	295.25±11.30
Back weight	Cobb	95.20±3.59	218.20±6.74[a]	237.95±7.93[a]
	Marshall	89.60±4.54	190.10±6.50[b]	290.05±9.77[b]

[ab]Mean along the same column with different superscripts are significantly (P<0.05) different.

Table 2 reveals the mean values of visceral organs of Cobb and Marshall broilers at different ages. There were significant (P<0.05) difference between the visceral organs and the commercial broilers. At 4th week of age, gizzard weight was higher for Cobb birds (32.85g) than the Marshall birds (29.25g) and abdominal fats were higher for Cobb birds (9.45g) than the Marshall birds (7.80g).At 6thweek of age, lung weight was higher for Cobb birds (11.85g) than the Marshall birds (10.05g). Heart weight (11.65g), abdominal fats (29.60g) and spleen (2.60g) of Cobb bird were higher than Marshall birds having 9.00g, 21.40g and 1.75g respectively.At 8th week of age, lung weight was superior for Cobb birds (17.10g) than the Marshall birds (14.75g) and heart weight for Cobb birds (11.70g) was higher than Marshall birds (10.25g)

Table 2. Means and standard errors of visceral organs of two commercial broilers genotypes at different ages

Parameters(g)	Genotypes	4 weeks	6 weeks	8 weeks
Lungs	Cobb	5.05±0.43	11.85±0.25[a]	17.10±0.64[a]
	Marshall	4.75±0.11	10.05±0.45[b]	14.75±0.66[b]
Heart	Cobb	5.25±0.26	11.65±0.44[a]	11.70±0.47[a]
	Marshall	5.10±0.34	9.00±0.50[b]	10.25±0.46[b]
Kidney	Cobb	6.30±0.25	13.10±0.58	15.50±0.57
	Marshall	5.75±0.49	11.80±0.66	15.05±0.51
Liver	Cobb	27.65±1.50	43.55±1.95	54.25±1.40
	Marshall	25.95±1.18	41.60±1.43	51.75±1.40
Proventriculus	Cobb	5.00±0.25	8.35±0.35	10.20±0.29
	Marshall	4.55±0.21	7.45±0.36	9.25±0.58
Gizzard	Cobb	32.85±1.24[a]	52.90±1.60	65.20±2.21
	Marshall	29.25±1.00[b]	50.65±1.51	60.50±3.18
Abdominal fats	Cobb	9.45±0.67[a]	29.60±2.16[a]	53.55±3.74
	Marshall	7.80±0.27[b]	21.40±2.20[b]	43.70±3.32
Spleen	Cobb	0.02±0.00	2.60±0.16[a]	3.95±0.28
	Marshall	0.02±0.01	1.75±0.11[b]	3.80±0.67

[ab]Mean along the same column with different superscripts are significantly (P<0.05) different.

4. Discussion

The values obtained earlier for Cobb and Marshall carcass evaluation in this present finding at 4th week of age, indicating significant difference for eviscerated and breast weight were not in line with the findings of Uwalaka *et al.*, (2013) who reported lower values for these variables in their earlier documentation. At the 6th week of carcass assessment, live weight, carcass weight, thigh weight and back weight values obtained were not agreed with the work of Makram *et al*., (2010) and Olawumi *et al*., (2010). These authors reported lower values for live weight, carcass weight and thigh weight for four and three different strains of broilers respectively. However, dressing, breast and back weight values in this study were consistent with the range of values reported by Makram *et al*., (2010) for four commercial broiler strain chickens under summer season in Egypt. The live weight, eviscerated weight, carcass weight, dressing weight, breast weight and back weight were influenced in the Cobb strain; having highest values than the Marshall strains at 8 week of age. These patterns exhibited by Cobbs in respect of the above carcass indices, were similar to the findings of Olawumi *et al*., (2010). These authors revealed a result that followed the same trend for Marshall and Hubbard birds. The live weight value for Cobb obtained in this study disagreed with the findings of Olawumi *et al*., (2012) but agreed with the live weight value of their Marshall birds that exhibited the same ranged of values of live weight for Marshall birds. However, eviscerated weight value observed for Cobb and Marshall in this present study were not in line with the works of Olawumi *et al*., (2012) who noted lower values of eviscerated weight for Marshall, Hubbard and Arbor Acre respectively. Meanwhile, the superior carcass and dressing weight values noted were disagreed with the reports of Olawumi and Fagbenro, (2010); Ekeocha and Afolabi (2012). These authors documented lower values for Marshall, Hubbard and Arbor Acre respectively. The breast weight and back weight values obtained in this present study were not compatible with the results of Olawumi *et al*., (2012) who noted lower values for these variables for Marshall, Hubbard and Arbor Acre birds.

The indication from the visceral organs evaluation at earlier stage of the evaluation reveals only a significant different for gizzard weight and abdominal fats were disagreed with the works of Uwalaka *et al*., (2013). These authors noted a lower ranged of values for gizzard weight for their broiler birds.Meanwhile, at the 6th week of visceral organs assessment, the values obtained for heart, lung and spleen weight were not in line with the findings of Stahl *et al*., (2003) who reported lower values for these parameters and Makram *et al*., (2010) who documented higher values for these variables in their four genotypes of meat-chickens.However, at the last visceral organs evaluation exercise; the variables obtained that differs were lungs and heart weight values which were similar to the values noticed earlier by Ojedapo *et al*., (2008); Ojedapo *et al*., (2009). These authors reported values that were in the ranged with this present study for commercial broilers raised both in deep litter and cage systems.

5. Conclusion

These present results that give an insight to the effect of strain of broilers (Cobb and Marshall) on carcass characteristics shows that Cobb birds depicted well in term of cut-up parts and visceral organs than the Marshall strains. From the results obtained in this present study, it can be suggested to the livestock keepers or farmers around this area to raise Cobb birds due to their better displays of carcass characteristics.

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