CARCASS TRAITS VARIATION IN NIGERIAN LOCAL AND IMPROVED CHICKENS AS INFLUENCED BY BREED AND SEX

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ABSTRACT

This study was conducted to assess carcass traits variation in Nigerian local and improved chickens as influenced by breed and sex. Forty local and improved chickens (5 males and 5 females each of Naked neck, Normal feathered, Frizzle feathered and Noiler) were randomly selected at 13 weeks old for this study. Data generated from the carcass parameters were subjected to Analysis of Variance (ANOVA) using SAS 9.2 version 2008. The results showed that breed and sex were significantly different (p<0.05) in all the carcass parameters measured except in some organ weights. Breed significantly affected (p<0.05) all carcass parameters except for wing weight, head weight and neck weight that were not significantly affected (p>0.05). The highest live weight was observed in Noiler (1451.10 ± 88.00 g). Males had higher least squares means on all the carcass parameter; live weight (1379.05 ± 94.20 g), dress weight (1245.05 ± 90.83 g), eviscerated weight (1027 ± 76.57 g), breast weight (206.70 ± 17.21 g), proventriculus weight (6.10 ± 0.28 g), gizzard weight (34.45 ± 2.17 g) and liver weight (22.05 ± 1.03 g). It therefore be concluded in this study by stating that breed significantly affected (p<0.05) all carcass parameters except for wing weight, head weight and neck weight that were not significantly affected (p>0.05) and that males had higher least squares means in all the carcass parameters. This information can be harnessed for improvement of the Nigeria local chicken breeds.

Keywords: Carcass traits, Nigeria local chicken breeds, Noiler, Naked neck, Frizzle feathered, Normal feathered

INTRODUCTION

Indigenous poultry constitute a major asset to poor farmers who cannot afford to maintain exotic chicken on intensive management system. However, not much is known on these flocks about their management and general breeding performances despite the inherent advantages it confers on rural farmers (Ajayi, 2010). There is need therefore to assess the performances of these chicken breeds to improve the productivity of the Nigerian local chickens that are up till now, characterized by small body weight, small egg size and few number of eggs (Nwagu and Nwosu, 1994; Adebambo *et al*., 1999). Olawoyin (2006) concluded that genetic improvement of Nigerian indigenous chicken could help to alleviate the problems of animal protein shortage especially in the rural areas. Understanding the production, management and breeding systems and the associated factors affecting indigenous chicken production is essential to develop holistic improvement strategies (Gueye and

Branckaert, 2002). The value of increasing our knowledge of indigenous chicken production and the end products such as carcass parameters and meat quality should be strengthened for the purpose of evaluation and marketing in the formal poultry industry. Ascertaining the differences and predicting changes in carcass composition of indigenous chicken are required now more than ever since the change in consumer preference from buying a whole chicken to cut parts of chicken. Despite the various reports on carcass performances of the Nigerian local chickens, not much information exist is comparing them with Noiler which is an improved local breed. Thus, the research was embarked upon to evaluate the effects of sex and breed on carcass traits in Nigerian local and improved chicken breeds.

METHODS AND MATERIALS

Ethical Approval: The ethical approval for this study was given by the Animal Ethics Committee of the Department of Animal Science, Faculty of Agriculture, University of Port Harcourt, Port Harcourt, Nigeria.

Birds Management: The study was conducted at the Teaching and Research Farm of the Faculty of Agriculture, University of Port Harcourt, Port Harcourt, Nigeria. The site is located at longitude and latitude of 4.77N and 6.45E with an average temperature of 26.00 ± 2.00 ^{o}C (Uko *et al.*, 2016).Two hundred and thirty (230) indigenous day-old chicks comprising Frizzle feathered, Naked neck and Normal feathered chickens bought from FUNAAB Hatchery, Abeokuta, Ogun State, Nigeria and Noiler that was purchased from Amo Farm in Oyo State, Nigeria and were raised under an intensive management system for 13 weeks. The birds were the same type of feed - Hybrid chicks mash containing crude protein content of 21% from day old to 8 weeks and Hybrid growers mash containing 18% crude protein from 9 weeks to 13 weeks. Both feed and fresh water was provided *ad libitum*. Birds were given Gumboro vaccine on the first week, Lasota on the second week, Gumboro on the third week, fowl typhoid on the sixth week and they were dewormed on the tenth week. At the end of 13 weeks, fifty birds were selected at random consisting of 10 males and females each from the 4 breeds of chickens used in the experiment. The selected birds were fasted overnight, weighed, sacrificed and manually de-feathered. The weights of heart, lungs, liver, bile, pancreas, proventriculus, gizzard and the spleen of each chicken were determined using Camry Electronic Balance, Model EK5350 (600 g capacity). The dressed weight of each chicken was taken after the removal of the intestine and the visceral organs. The main-cut parts such as the thigh, drumstick, breast, tail back and rib back were weighed, recorded and expressed in grammes of dressed weight, other part of the chicken weighed were the head, neck, shank, drumstick, wings.

Statistical Analysis: Data collected were subjected to Analysis of Variance (ANOVA) using SAS 9.2 version 2008 to determine the effects of sex and breed on the carcass characteristics. $P<0.05$ was accepted as significant. The results were presented as means ± standard error of means in tables.

RESULTS

The effects of breed and sex on carcass traits of chickens studied were presented in Table 1. Breed significantly affected ($p<0.05$) all carcass parameters except for wing weight, head weight and neck weight that were not significantly affected ($p>0.05$). The highest live weight was observed in Noiler (1451.10 ± 88.00 g), while the least live weight was observed in Frizzle feathered chickens. A similar trend was observed in dressed weight with Noiler having the highest dressed weight of 1330.60 ± 83.74 g with the least (852.33 ± 84.90 g) also observed in Frizzle feathered chickens. There was no significant difference ($p>0.05$) in the eviscerated weight of naked neck and Noiler chickens but both were significantly higher ($p<0.05$) than the values of Normal feathered chicken and Frizzle feathered chickens. Breast weight recorded the highest value 228.20 ± 26.34 g and was followed by Noiler (212.30 ± 13.13 g).

Table 1: Effects of breed on carcass parameters of four Nigerian local chicken breeds raised for 13 weeks

Breed	N	L.WT (g)	DRS.WT (g)	EV.WT (g)	BRS.WT (g)	WG.WT (g)	SH.WT (g)
Frizzle feather	10	979.67 ± 110.27^{a}	852.33 ± 84.90^{a}	700.89 ± 81.25^{a}	145.11 ± 18.53^{a}	96.88 ± 8.95	40.77 ± 5.30^{a}
Naked neck	10	1371.60 ± 129.03^{b}	1250.10 ± 122.17^{ab}	1045.70 ± 105.27^{b}	228.20 ± 26.34^{b}	131.80 ± 13.08	67.20 ± 7.10^{ab}
Noiler	10	1451.10 ± 88.00^{c}	1330.60 ± 83.74^{c}	1074.50 ± 67.32^{b}	212.30 ± 13.13^{ab}	141.80 ± 9.28	82.60 ± 5.79^{b}
Normal feather	10	1177.50 ± 80.81^{ab}	1092.00 ± 79.43^{ab}	885.60 ± 87.08^{a}	171.90 ± 12.82^{a}	110.80 ± 8.48	55.40 ± 5.90^{a}
		DS.WT (g)	**T.WT (g)**	**HD.WT (g)**	**NECK.WT (g)**	**BACK.WT (g)**	
Frizzle feather	10	98.89 ± 14.79^{a}	99.11 ± 13.63^{a}	47.55 ± 4.04	52.11 ± 7.75	125.78 ± 13.01^{a}	
Naked neck	10	146.60 ± 17.58^{c}	137.40 ± 15.82^{ab}	53.00 ± 4.37	58.40 ± 5.74	184.20 ± 17.09^{ab}	
Noiler	10	144.80 ± 9.57^{ab}	152.20 ± 11.04^{c}	57.80 ± 4.85	73.70 ± 4.72	206.90 ± 13.97^{b}	
Normal feather	10	122.00 ± 9.60^{b}	115.40 ± 9.11^{b}	42.20 ± 2.87	66.40 ± 5.77	157.30 ± 9.68^{ab}	

a, b, c: Means with different letters on same column are significantly different (p<0.05). N = number of observations (birds used), L.WT = Live weight, DRS.WT = Dressed weight, EV.WT = Eviscerated weight, BRS.WT = Breast weight, WG.WT = wing weight, SH.WT = shank weight, DS.WT = Drumstick weight, T.WT = Thigh weight, HD.WT = Head weight, NECK.WT = Neck weight, BACK.WT = Back weight

The least breast weight was observed in Frizzle feathered chickens. Wing weight was not significantly different (p>0.05) across the breeds studied. However, Noiler had higher numerical values (141.80 ± 9.28 g). Shank weight was significantly (p<0.05) higher in Noiler and the least was recorded in Normal and Frizzle feathered chickens. Thigh weight was also highest in Noiler (152.20 ± 11.04 g) and the least in Frizzle feathered chickens (99.11 ± 13.63 g). Head weight was not significantly difference (p>0.05) across the breeds under consideration. More so, Noiler had the highest back weight (206.90 ± 13.97 g) and the least back weight occurred in Frizzle feathered chickens (125.78 ± 13.01 g).

The effect of sex on live weight (L.WT), dress weight (DRS.WT), eviscerated weight (EV.WT), wing weight (WG.WT), shank weight (SH.WT), drumstick weight (DS.WT), head weight (HD.WT), and neck weight (NECK.WT) were all significantly affected (p<0.05), while breast weight (BRS.WT), thigh weight (T.WT) and back weight (BACK.WT) were not significantly affected (p<0.05) by sex (Table 2). Males had higher least squares means on all the carcass parameters; live weight (1379.05 ± 94.20 g), dress weight (1245.05 ± 90.83 g), eviscerated weight (1027 ± 76.57 g), breast weight (206.70 ± 17.21 g), wing weight (133.60 ± 9.20 g), shank weight (90.16 ± 6.12 g), drumstick weight (144.40 ± 11.04 g), thigh weight (135.80 ± 12.00 g), head weight (55.75 ± 3.33 g), neck weight (69.15 ± 5.01 g) and back weight (183.50 ± 13.91 g) (Table 2).

The effects of breed and sex on organ traits of chickens studied were presented on Table 3. Breed significantly affected (p<0.05) proventriculus weight with Naked neck having the highest weight of 6.60 ± 0.40 g and the least proventriculus weight was observed in Frizzle feathered chickens (5.22 ± 0.21 g). However, there was no statistical difference (p>0.05) between the weight of proventriculus in Frizzle feathered and Normal feathered. Gizzard weight was significantly different (p<0.05) across the breeds with Noiler having the highest gizzard weight (41.80 ± 2.18 g) and the least gizzard weight recorded in Frizzle feathered chickens (24.88 ± 1.69 g). Liver weight was not significantly different (p>0.05) across the breeds.

Table 2: Effects of sex on carcass parameters of four Nigerian local chicken breeds raised for 13 weeks

Sex	N	L.WT (g)	DRS.WT (g)	EV.WT (g)	BRS.WT (g)	WG.WT (g)	SH.WT (g)
Female	20	1144.60 ± 54.56^{a}	1045.15 ± 46.91^{a}	851.00 ± 41.37^{a}	179.40 ± 11.28^{ns}	109.30 ± 5.10^{a}	53.95 ± 3.61^{a}
Male	20	1379.05 ± 94.20^{c}	1245.05 ± 90.83^{b}	1027 ± 6.57^{b}	206.70 ± 17.21^{ns}	133.60 ± 9.20^{c}	90.16 ± 6.12^{b}
Combined sex	40	1261.83 ± 56.91^{b}	1145.10 ± 52.93^{a}	939.25 ± 45.23^{a}	193.05 ± 10.39^{ns}	121.45 ± 5.50^{b}	62.03 ± 3.73^{a}
		DS.WT (g)	**T.WT (g)**	**HD.WT (g)**	**NECK.WT (g)**	**BACK.WT (g)**	
Female	20	115.60 ± 6.30^{a}	119.80 ± 6.20^{ns}	45.45 ± 2.11^{a}	56.35 ± 3.12^{a}	158.15 ± 7.51^{ns}	
Male	20	144.40 ± 11.04^{c}	135.80 ± 12.00^{ns}	55.75 ± 3.33^{b}	69.15 ± 5.01^{c}	183.50 ± 13.91^{ns}	
Combined sex	40	130.00 ± 6.70^{b}	127.80 ± 6.79^{ns}	50.60 ± 2.11^{a}	56.35 ± 3.09^{b}	170.83 ± 8.07^{ns}	

a, b, c: Means with different letters on same column are significantly different ($p<0.05$). N = number of observations (birds used), L.WT= Live weight, DRS.WT= Dressed weight, EV.WT= Eviscerated weight, BRS.WT= Breast weight, WG.WT = wing weight, SH.WT =shank weight, DS.WT=Drumstick weight, T.WT = Thigh weight, HD.WT= Head weight, NECK.WT= Neck weight, BACK.WT= Back weight, Ns = not significant

Table 3: Effects of breed on organ weights of four Nigerian local chicken breeds raised for 13 weeks

Breed	N	PROV.WT (g)	GIZ.WT (g)	LIV.WT (g)	LG.WT (g)	SP.WT (g)	B.WT (g)	H.WT (g)	PAN.WT (g)
Frizzle feather	10	5.22 ± 0.21^{a}	24.88 ± 1.69^{a}	20.22 ± 1.25	8.77 ± 0.40	1.67 ± 0.17	1.56 ± 0.17	4.55 ± 0.38^{a}	1.66 ± 0.16^{a}
Naked neck	10	6.60 ± 0.40^{a}	31.00 ± 2.34^{b}	22.00 ± 1.89	10.50 ± 0.99	1.90 ± 0.27	2.60 ± 0.42	6.40 ± 0.56^{c}	1.90 ± 0.17^{ab}
Noiler	10	6.20 ± 0.41^{ab}	41.80 ± 2.18^{c}	20.90 ± 0.69	10.20 ± 0.71	1.60 ± 0.16	2.80 ± 0.32	5.70 ± 0.37^{b}	2.10 ± 0.35^{b}
Normal feather	10	5.40 ± 0.30^{a}	26.90 ± 1.34^{a}	20.30 ± 1.39	10.60 ± 0.80	1.70 ± 0.17	1.90 ± 0.27	5.10 ± 0.39^{b}	1.90 ± 0.17^{ab}

a, b, c: Means with different letters on same column are significantly different ($p<0.05$). N = number of observations (birds used), PROV.WT = Proventriculus weight, GIZ.WT = Gizzard weight, LIV.WT = Liver weight, LG.WT = Lung weight, SP.WT = Spleen weight, B.WT = Bile weight; H.WT = heart weight, PAN.WT = Pancreas weight

However, naked neck had numerical higher liver weight (22.00 ± 1.89 g). A similar trend was observed for lung and spleen weights. Bile weight was also not significantly ($p>0.05$) affected by breed. However, Noiler had the highest value of bile weight (2.80 ± 0.32 g) and was followed by naked neck (2.60 ± 0.42 g). The least bile weight was observed in Frizzle feathered chickens (1.56 ± 0.17 g). Naked chickens had the highest heart weight (6.40 ± 0.56 g). The hearty weights of Noiler and Normal feathered chickens were however not significantly different. The least was observed in Frizzle feathered chickens (4.55 ± 0.38 g).

Pancreas weight was significantly higher in Noiler (2.10 ± 0.35 g) with the least value observed in Frizzle feathered chickens (1.66 ± 0.16 g).

The effect of sex on organ weights was not significantly affected ($p>0.05$) except for gizzard and heart weights (Table 4). Males had numerical higher proventriculus weight (6.10 ± 0.28 g). Also, males had significantly ($p<0.05$) higher gizzard weight (34.45 ± 2.17 g). Furthermore, males had numerical liver weight, lung weight, spleen weight and bile with 22.05 ± 1.03 g, 10.60 ± 0.58 g, 1.75 ± 0.16 g and 2.50 ± 0.25 g respectively.

Table 4: Effects of sex on organ weights of four Nigerian local chicken breeds raised for 13 weeks

Sex	N	PROV.WT (g)	GIZ.WT (g)	LIV.WT (g)	LG.WT (g)	SP.WT (g)	B.WT (g)	H.WT (g)	PAN.WT (g)
Female	20	5.80 ± 0.29^{ns}	28.50 ± 1.47^{a}	19.95 ± 0.79^{ns}	9.50 ± 0.38^{ns}	1.70 ± 0.10^{ns}	2.00 ± 0.22^{ns}	4.90 ± 0.29^{a}	2.20 ± 0.22^{ns}
Male	20	6.10 ± 0.28^{ns}	34.45 ± 2.17^{b}	22.05 ± 1.03^{ns}	10.60 ± 0.58^{ns}	1.75 ± 0.16^{ns}	2.50 ± 0.25^{ns}	6.11 ± 0.32^{c}	2.00 ± 0.14^{ns}
Combined sex	40	5.95 ± 0.20^{ns}	31.43 ± 1.37^{a}	21.00 ± 0.67^{ns}	10.05 ± 0.36^{ns}	1.73 ± 0.09^{ns}	2.25 ± 0.17^{ns}	5.50 ± 0.23^{b}	2.10 ± 0.13^{ns}

a, b, c: Means with different letters on same column are significantly different (p<0.05). N = number of observations (birds used), PROV.WT = Proventriculus weight, GIZ.WT = Gizzard weight, LIV.WT = Liver weight, LG.WT = Lung weight, SP.WT = Spleen weight, B.WT = Bile weight; H.WT = heart weight, PAN.WT = Pancreas weight

Males had significantly (p<0.05) higher heart weight (6.11 ± 0.32 g) but contrary to this, females had the highest numerical pancreas weight (2.20 ± 0.22 g).

DISCUSSION

Breed significantly (p<0.05) affected all carcass parameters except for wing, head and neck weights. This variation could be attributed to the genetic makeup of these chicken breeds. Ojedapo *et al*. (2015) in their study on the relation of genotypes and age of slaughter chicken on carcass indices observed significant effect of breed but recorded higher live weight at 8 weeks than those reported in this study. Similar finding was reported by Kryeziu *et al*. (2018) on their study on effects of different stocking density and sex on carcass traits of broilers. Live weight of chicken varied from 2056 to 4763g as reported by Hussein *et al*. (2019) in their study on the effects of stock, sex and muscle type on carcass characteristics and meat quality. These values were higher than those reported in this study. Higher carcass weights were also reported by Fernandes *et al*. (2013) who reported values ranging from 3139.52 to 3242.54 g in different breeds of broiler chicken. The higher live weight recorded in this study was a reflection of the improvement done on the breeds considered as compared to the unimproved Nigerian local chickens.

Ojedapo *et al*. (2015) also reported significant variation of breed effect on dressing weight where they observed that Cobb chicken had higher dressing weight (2664.00 g) than their Marshall counterparts (1854.15 g). These values were however higher than those reported in this study. A similar trend was observed for eviscerated weight reported by Ojedapo *et al*. (2015). The breast weight values reported in this study were lower than those reported by Kryeziu *et al*. (2018) and Hussein *et al*. (2019). Significant breed effect on shank weight, thigh weight and back weight has been reported by Ojedapo *et al*. (2015), Kryeziu *et al*. (2018) and Hussein *et al*. (2019). Their values were however higher than those reported in this study.

Significant effect of sex on carcass traits has been reported by Bogosavljevic-Boskovic *et al.* (2006) and Kryeziu *et al*. (2018). Males had higher mean weights for all the carcass parameter. The values in this study were in agreement with those reported by Ojedapo *et al*. (2015), Kryeziu *et al*. (2018) and Hussein *et al*. (2019) who observed that carcass yield of male indigenous chickens were significantly higher than those of their female counterparts. However, these results were contrary to those reported by Ejiogu *et al.* (2013) who observed that yield of carcass was not significantly different (p>0.05) for all carcass traits measured. The carcass yield reported in this study was higher than what was reported in Korean local and silky fowl by Choo *et al.* (2014).

Significant effect (p<0.05) of breed on organ weight was observed in this study. Ojedapo *et al*. (2015) observed that Cobb broilers had significant higher (p<0.05) proventriculus weight (65.20 g) than Marshall chickens (60.50 g). These values are however

higher than those reported in this study. Kwiecień *et al*. (2018) also reported breed effect on gizzard, liver and bile weight in their work in the effect of breed and caponisation on the growth performance, carcass composition, and fatty acid profile in the muscles of Greenleg Partridge and Polbar breed of chickens.

Kwiecień *et al*. (2018) also reported sex effect on organ weight. They reported that males had higher values in gizzard weight. However, female chickens had higher liver weight and bile weight. Their values are higher than those reported in this study.

Conclusion: In this study, breed significantly affected ($p<0.05$) all carcass parameters except for wing, head and neck weights. Males had higher mean weights for all carcass parameters. Also, the effect of sex on organ weights was not significant ($p>0.05$) except for gizzard and heart weights.

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