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Comparative study of body weight and some performance traits of improved Nigerian indigenous chickens raised in the south-south region of Nigeria

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Abstract

The study was carried out to assess the variation in body weight and some performance traits among improved Nigerian indigenous chickens in the South-South region of Nigeria to make recommendations needed for further improvement of the Nigerian local chickens in this region. One hundred and fifty birds of mixed sexes comprised of 50 Naked neck, 50 Normal feathered and 50 Frizzled feathered were kept for 16 weeks. During this period, daily data on feed intake and feed conversion ratio as well as weekly data on body weight, wing length, shank length, drum stick, body length, height at withers and breast girth were collected. Data were subjected to Analysis of Variance and significant means were separated. The results obtained showed that Feed intake, feed conversion ratio and body weight were significantly ($p<0.05$) affected by breed. The highest feed intake was observed among Normal feathered chicken breeds (3630.00±12.69g). The highest value of feed conversion ratio was observed among Frizzle feathered chickens (4.53±0.14) and the least (3.84±0.12) was observed among Naked Neck chickens. Body weight was highest among Naked neck chickens (1996.00±38.26g) and least among Frizzle feathered chickens (1467.00±44.18g). The results also showed significant ($p<0.05$) variations associated with age in all traits (wing length, shank length, drumstick, body length, height at withers, breast girth and body weight) studied from 4 to 16 weeks of age. However, breed did not influence ($p>0.05$) wing length and drumstick while shank length, body length, height at withers, breast girth and body weights were significantly ($p<0.05$) affected by breeds. The results further revealed a non-significant ($p>0.05$) variation in interactive effect of age and breed in growth performance among the Nigerian local chicken breeds studied. The information derived from this study if properly harnessed can be used to further genetically improve the Nigeria local chicken in the South South region of Nigeria.

Keywords: Body weight, performance traits, indigenous chickens, Nigerian

Une Étude comparative du poids corporel et de certains traits de performance des poulets indigènes nigérians améliorés élevés dans la région sud-sud du Nigéria

Résumé

L'étude a été réalisée pour évaluer la variation du poids corporel et certains traits de performance chez les poulets indigènes nigérians améliorés dans la région sud-sud du Nigéria afin de formuler les recommandations nécessaires à l'amélioration des poulets locaux nigérians dans cette région. Cent cinquante oiseaux de sexes mixtes composés de 50 cou nu, 50 plumes normales et 50 plumes frizzled ont été gardés pendant 16 semaines. Au cours de cette période, des données quotidiennes sur la consommation d'aliments pour animaux et le ratio de conversion des aliments ainsi que des données hebdomadaires sur le poids corporel, la longueur des ailes, la longueur de la tige, le bâton de tambour, la longueur du corps, la taille au 30e et la circonférence des seins ont été recueillies. Les données ont été

soumises à l'analyse de la variance et des moyens importants ont été séparés. Les résultats obtenus ont montré que l'apport alimentaire, le taux de conversion alimentaire et le poids corporel étaient significativement (p <0,05) affectés par la race. La consommation alimentaire la plus élevée a été observée chez les races de poulet à plumes normales (3 630,00 ± 12,69 g). La valeur la plus élevée du rapport de conversion alimentaire a été observée chez les poulets à plumes Frizzle (4,53 ± 0,14) et la plus faible (3,84 ± 0,12) chez les poulets Naked Neck. Le poids corporel était le plus élevé chez les poulets à cou nu (1996,00 ± 38,26 g) et le moins élevé chez les poulets à plumes Frizzle (1467,00 ± 44,18 g). Les résultats ont également montré des variations significatives (p <0,05) associées à l'âge dans tous les caractères (longueur des ailes, longueur de la tige, pilon, longueur du corps, hauteur au garrot, circonférence de la poitrine et poids corporel) étudiés de 4 à 16 semaines d'âge. Cependant, la race n'a pas influencé (p> 0,05) la longueur des ailes et le pilon, tandis que la longueur de la tige, la longueur du corps, la hauteur au garrot, la circonférence de la poitrine et le poids corporel étaient significativement (p <0,05) affectés par les races. Les résultats ont révélé une variation non significative (p> 0,05) de l'effet interactif de l'âge et de la race dans les performances de croissance parmi les races de poulets locales nigérianes étudiées. Les informations tirées de cette étude si elles sont correctement exploitées peuvent être utilisées pour améliorer génétiquement le poulet local du Nigeria dans la région sud-sud du Nigeria.

Mots-clés: Poids corporel, traits de performance, poulets indigènes, Nigérian

Introduction

There is an urgent need for improved poultry products in Nigeria following the recent ban by the Federal government on the importation of poultry and poultry products into the country. Furthermore, the advent of the covid19 pandemic has made many to lose their jobs and many individuals are now going into the poultry business using mostly exotic chickens. The importance of the Nigerian local chicken cannot be overemphasized. Although they are term "slow producers" because of their poor growth rate and low egg production rate producing 40-80 eggs/bird/year even under extensive management system (Tule, 2005), they possess good meat quality and flavour and are acceptable generally by the rural populace, peri-urban and some urban centers which make them an essential commodity (Oluyemi and Roberts, 1978). According to Ajayi (2010) local chickens are known to be hardy this contributed partially to their disease resistance. The local chicken based on their low body weight have been reported to require less food and scavenge for food however, possessed good dressing and meant quality (Nwosu *et al.,* 1985). Abbaya *et al.* (2017) reported that poor growth rate in local chicken is attributed to an unimproved breed and poor management system. Many developing and underdeveloped countries raised local chicken in rural poultry farming. Local chicken can fully manifest their potentials through improved management system (Tule, 2005). More also, the genetic potential of Nigerian local chicken is yet to fully manifest, this exclude them from commercial production (Oleforuh-Okoleh, 2013). Although several works have been carried out on the performance of the Nigerian local chickens (Agaviezor *et al*., 2018; Oleforuh-Okoleh, 2013; Peters *et al.,* 2005; Adebambo *et al*., 2009) this work focused on the comparative study of body weight and some performance traits of Nigerian indigenous chickens raised in the South-South region of Nigeria to enable us compare our results with those reported in the past and in other parts of the country.

Materials and methods

This study was conducted at the Teaching and Research Farm of the Faculty of Agriculture, University of Port Harcourt, Choba campus, Port Harcourt is suited at Obio-Akpor Local Government Area of River State. The site is located at longitude and latitude of 4.77N and 6.45E in the Niger Delta region of Nigeria. The annual average temperature is between 25.01 to 27.79°C and annual average rainfall of 203.03mm (Uko *et al*., 2016). A total of 150 day old chicks of mixed sexes comprising 50 Naked neck, 50 Normal feathered and 50 Frizzled feathered were obtained from the Federal University of Agriculture, Abeokuta, Nigeria. The birds were kept for 16 weeks. During the period of this experiment, the birds were fed with commercial diets according to their age. A starter diet (from 0-4 weeks of age) which contained 20% crude protein and 2800 kcal of metabolizable energy (ME) and growers' diet (from 4-16weeks) containing 18.5% crude protein and 2920 kcal of ME. The birds had access to water and feed *ad libitum*. Each bird was tagged for proper identification. Routine medication and vaccination were also carried out when required. Data on growth parameters were collected on a weekly basis while feed intake was done daily. Body weight was done using electronic scale and measuring tape for the body measurements - breast girth, body length, wing length, height at withers, drumstick and shank length.

Data analysis

Data collected were analysed by using the general Linear Model (GLM) procedures of Statistical Analysis System (SAS, 2008). The Statistical Model used.

$Yijk = \mu + Bi + Wj + BWij + \Sigma ijk$

Yijk = Overall observation
μ = Population means
Bi = Effect of breed
Wj = Effect of week (age)
BWij = Interactive effect of breed and week
Σijk = Residual effect

Duncan test for multiple comparisons was used to test significant differences between means at 5% probability level ($p<0.05$).

Results

The effect of breed on feed intake, feed conversion and body weight of Nigerian local chicken breeds is shown in Table 1. Feed intake, feed conversion ratio and body weight were significantly ($p<0.05$) affected across breeds. The highest feed intake was observed among Normal chicken breeds (3630.00±12.69g). Although there was no significant difference between the feed intake of Frizzle and Naked Neck chicken breeds, Naked neck chickens recorded 3553.00±15.54g while Frizzle chickens recorded 3530.00±17.94g of feed. Furthermore, feed conversion ratio (FCR) varied significantly across breeds. The highest FCR value was observed in Frizzle feathered chickens (4.53±0.14) while the least was seen in Naked Neck chickens (3.84±0.12). Body weight was also significant across breeds. The highest body weight was observed in Naked neck chickens (1996.00±38.26g) while the least body weight was observed in Frizzle feathered chickens (1467.00±44.18g).

Table 1: Effect of breed on feed intake, feed conversation and body weight of Nigerian local chicken breeds

Breed	Feed Intake(g)	Feed Conversion Ratio	Body Weight (g)
Normal feathered	3630.00±12.69[a]	4.21±0.10[a]	1977.00±31.24[a]
Frizzle feathered	3530.00±17.94[b]	4.53±0.14[a]	1467.00±44.18[b]
Naked Neck	3553.00±15.54[b]	3.84±0.12[b]	1996.00±38.26[a]

a, b, c: Means within each column with different superscript differ significantly ($p<0.05$)

Weekly growth performance of Nigerian local chicken breeds studied is depicted in Table 2. The result showed significant ($p<0.05$) variations associated with age in all traits (wing length, shank length, drumstick, body length, height at withers, breast girth and body weight) studied from 4 to16 weeks of age. Generally, as expected, all growth parameters studied increased ($p<0.05$) with age from 4 to 16. As expected, all the parameters increased significantly as the age of the birds increased.

Table 2. Weekly variation of growth performance data of Nigerian local chicken breeds

Age (Weeks)	Wing length (cm)	Shank length (cm)	Drumstick (cm)	Body length (cm)	Height at withers (cm)	Breast girth (cm)	Body weight (g)
4	13.16^{d}	5.24^{b}	6.10^{d}	24.17^{d}	20.02^{d}	13.85^{d}	273.22^{d}
8	19.81^{c}	7.62^{b}	9.20^{c}	33.04^{c}	30.44^{c}	20.83^{c}	689.30^{c}
12	23.34^{b}	10.45^{ab}	13.96^{b}	39.22^{b}	38.26^{b}	25.22^{b}	1088.00^{b}
16	26.18^{a}	17.75^{a}	15.98^{a}	46.17^{a}	45.77^{a}	30.73^{a}	1634.00^{a}
SEM	0.35	2.59	0.28	0.53	0.74	0.44	46.67

a, b, c: Means within each column with different superscript differs significantly ($p<0.05$)

Breed effect on growth performance of Nigerian local chicken is shown in Table 3. Result showed that breed did not influence ($p>0.05$) wing length and drumstick while shank length, body length, height at withers, breast girth and body weights were significantly ($p<0.05$) affected by breeds. Naked neck chicken recorded the highest numerical value of 20.68cm for wing length while the least value of 20.58cm was observed in Frizzle feathered chicken. Also, Frizzle feathered chicken had the highest value of 13.02cm for shank length compared to the values of 9.08 and 8.70cm recorded for Naked neck and Normal feathered chicken respectively. In addition, Naked neck chicken had the longest drumstick (11.51cm) although not significantly ($p>0.05$) different from the values of Frizzle feathered (11.37cm) and Normal feathered (11.06cm) chickens. The highest significant body length (36.06cm) was observed in Frizzle feathered chicken and the lowest value of 34.93cm was observed in Normal feathered chicken. Height at withers also varied across breeds with Frizzle feathered chicken (34.87cm) having significant difference ($p<0.05$) higher value than Normal feathered chicken (32.60cm). Breast girth also recorded numerical difference ($p>0.05$) with the highest result (23.22cm) obtained in Naked neck, while Normal feathered chickens recorded the least value of 22.09cm. Although there was no significant ($p>0.05$) difference in body weight for Frizzle feathered and the other two breeds, body weight was significantly ($p<0.05$) different between naked neck and normal feathered chickens. The highest body weight was observed among naked neck chicken breeds (994.25g) while the least value of 841.00g was observed among normal feathered chicken.

Table 3: Effect of breed on growth performance data of Nigerian local chicken breeds

Breed	Wing length (cm)	Shank length (cm)	Drumstick (cm)	Body length (cm)	Height at withers (cm)	Breast girth (cm)	Body weight (g)
Frizzle feathered	20.58	13.02^{a}	11.37	36.06^{a}	34.87^{a}	22.66^{b}	927.87^{ab}
Naked neck	20.68	9.08^{b}	11.51	35.95^{b}	33.39^{ab}	23.22^{a}	994.25^{a}
Normal feathered	20.60	8.70^{b}	11.06	34.93^{b}	32.60^{b}	22.09^{b}	841.00^{b}
SEM	0.31	2.34	0.25	0.48	0.67	0.39	42.21

a, b, c: Means within each column with different superscript differs significantly ($p<0.05$)

The interactive effect of age and breed on growth performance of Nigerian local chicken breeds is presented in Table 4. The results revealed a non-significant ($p>0.05$) variation in interactive effect of age and breed in growth performance among the Nigerian local chicken breeds studied. The highest wing length (27.08cm) was observed in Naked neck at week 16 while the lowest wing length (12.91cm) was observed in Naked neck at week 4. More so, the highest shank length (28.75cm) was observed among Frizzle feathered chickens in week 16 while the least shank length (5.00cm) was recorded among Naked neck at week 4. The highest drumstick length (17.25cm) was observed among Naked necked chickens in week 16 while the least drumstick length (5.00cm) was recorded among Normal feathered chicken at week 4. The same trend was observed for body length, height at withers, breast girth and body weight. In all, Frizzle feathered chicken showed more numerical superior values in wing length, shank length, drumstick, height at withers, breast girth and body weight compared to Naked neck and Normal feathered counterpart at 4 weeks of age. A similar result was observed at 8 weeks of age except in shank length and body weights were Naked neck recorded a higher value compared to other breeds studied. Naked neck expressed more superiority than Frizzle and Normal feathered in wing length, shank length, drum stick and body weight at 12 weeks of age. At 16 weeks of age, Naked neck chicken recorded a numerically higher value in all the growth parameters studied compared to Frizzle and Naked neck counterpart except in shank length were Frizzle feather had the highest value of 28.75cm in shank length.

Table 4: Interactive effect of age and breed on growth performance data of Nigerian local chicken breeds

Age (Week)	Breed	Wing length (cm)	Shank length (cm)	Drumstick (cm)	Body length (cm)	Height at withers (cm)	Breast girth (cm)	Body weight (g)
4	Frizzle feathered	13.50	5.41	6.33	24.75	21.33	14.50	292.00
	Naked neck	12.91	5.00	6.05	24.33	18.66	13.50	261.66
	Normal feathered	13.06	5.31	5.93	23.43	20.06	13.56	266.00
8	Frizzle feathered	20.41	7.58	9.58	33.66	31.58	21.33	713.50
	Naked neck	19.16	7.66	8.66	32.58	30.50	21.16	714.66
	Normal feathered	19.86	7.62	9.37	32.87	29.25	20.00	639.75
12	Frizzle feathered	22.83	10.33	14.00	39.33	39.75	25.41	1114.00
	Naked neck	23.58	10.66	14.08	39.33	36.16	25.33	1123.00
	Normal feathered	23.62	10.37	13.81	39.00	38.87	24.93	1027.00
16	Frizzle feathered	25.58	28.75	15.58	46.50	46.83	29.41	1592.00
	Naked neck	27.08	13.00	17.25	47.58	48.25	32.91	1877.00
	Normal feathered	25.87	11.50	15.12	44.43	42.25	29.87	1432.00
	SEM	0.63	4.69	0.51	0.95	1.34	0.79	84.42

Discussion

Feed conversion ratio is the total quantity of feed consumed to weight gain. The highest feed conversion ratio was observed in Naked neck chickens. This result agrees with the report of Oleforuh-Okoleh *et al.*

(2016) who documented that naked neck chicken had a better feed conversion ratio compared to the normal feather chickens. The authors documented feed conversion ratio of 0.25 and 2.59 for naked and normal feather Nigerian local chicken fed low crude protein diet. Nigerian local chicken has been term slow grower and reported to possess small body size. However, they have been reported to attain maturity faster than the exotic breeds (Nwosu *et al*., 1985). The mean body weight of normal feather, frizzle feather and naked neck breeds respectively at 16 weeks of age in this study is higher than the values of 1007.90g, 932.80g and 937.00g recorded for normal, frizzle and naked neck indigenous Kenyan chickens at the same 16 weeks of age (Magother *et al.,* 2010). The differences observed in these studies may be due some factors such as breed, management system, age, sex and different environment (Najib and Al-Aqil, 2015). Body weight in farm animals has always been used to determine growth**.** Adebambo (2009) proved that body measurements like the body length, chest girth, shank length can be used to measure growth. The present result showed a significant disparity ($p>0.05$) in body weight between the naked neck and normal feathered chicken. Naked neck chicken appeared to record the highest body weight compared to other breeds studied. This result affirmed the findings of Islam and Nishibori (2009) who documented that the naked neck chicken had a higher body weight compared the normal feather counterpart. This result is also in consonant with the report of Rajkumar *et al.* (2011) who reported higher growth performance in naked neck chicken compared to other breeds studied. However, the higher body weight obtained in naked neck chicken over the normal feathered chicken in this study was contrary to the observation of Adekoya *et al*. (2013) and Oleforuh-Okoleh *et al.* (2017) who reported that normal feathered chicken recorded higher body weight ($p>0.05$) than the naked neck counterpart. Superior body weight and growth traits observed in naked neck over the normal fathered chicken in this study also disagree with the reports of Norris *et al.,* 2007; De Almeida and Zuber, 2010; Magothe *et al.,* 2010 who documented that naked neck chicken possess inferior body weight compared to the normal feathered counterpart. The disparity observed in these studies may be due to breed, management system, age, sex and different environment (Magala *et al.,* 2012) which may have influenced the breed used. More also the present study showed a non-significant disparity ($p<0.05$) in body weight and growth traits between the naked neck and frizzled feathered chicken. It was observed in the present study that all the growth parameters vis *a vis* wing length, shank length, drumstick, body length, height at withers, breast girth and body weight among the three breeds (frizzle feathered, naked neck and normal fathered chickens) studied increased significantly ($p>0.05$) as the chickens aged from 4 to 16 weeks. The result is in tandem with the results of Peters *et al.* (2005), Adebambo *et al*. (2009) and Adedeji *et al*. (2008). It is worthy of note that growth in animal entails increase in size, development of organs and tissues from the point of fertilization to maturity. Gous (2007) reported that normal growth in animal is followed by sequence of changes in maturation with accumulation of protein with increase in other growth body parameters such as wing length, shank length, drumstick, body length, height at withers, breast girth and body weight. The mean values of body weight, breast girth and shank length respectively at 16 weeks of age in the present study is higher than the report of Adebambo *et al.* (2009) who documented the mean values of 1095.23g for body weight, 26.56cm for breast girth and 10.25cm for kneel length at the 16

weeks of age. Breast meat is one of the most essential economic traits in chickens; however, this trait is largely dependent on breast girth and shank length. Naked neck chicken recorded the highest breast girth (23.22cm) compared to the normal (22.09cm) and frizzle (22.66cm) feathered chicken in this study, although there were no significant ($p<0.05$) differences among the breeds. Cahaner *et al*. (1987) attributed the higher breast girth in naked neck to the high breast muscle compared the normal feathered counterpart. The values obtained for body weight, breast girth and shank length for the normal feathered, frizzle feathered and naked neck chicken at 16 weeks of age in the present study is related to 987g, 970.22g and 996.50g body weight; 26.06cm, 25.15cm and 26.05cm breast girth and 10.23cm, 10.55cm and 9.29cm shank length for normal feather, frizzle feather and naked neck breeds, respectively reported by Adeleke *et al.* (2011). Oleforuh-Okoleh *et al.* (2016) reported the values of 1635.08g and 1587.93g body weight for normal feathered and naked neck respectively at 16 weeks of age. The same authors documented the values of 30.99cm and 30.75cm breast girth, and 9.38cm and 9.18cm shank length for normal feathered and naked neck chickens respectively. The disparity observed in the study may be attributed to genetic and non-genetic factor which may not be explained.

Conclusion

This study revealed significant breed and age effects on performance data considered. Naked neck chickens performed best in this part of the country and are thus recommended for farmers for better productivity.

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