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ASSESSMENT OF THE BODY WEIGHT AND GROWTH TRAITS OF THE NIGERIAN HEAVY LOCAL CHICKEN ECOTYPE SELECTED FOR GENERATIONS G7 AND G8 THROUGH INDEX SELECTION

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Abstract

Poultry products are among the best sources of animal protein for human consumption, and offers a solution to animal protein shortage, especially in Nigeria and other African countries. The aim of the study was to assess the body weight and growth traits of the Nigerian heavy local chicken ecotype selected for generations G7 and G8 through selection index. A total of 350 and 345 day-old chicks for generations (G) 7 and G8, respectively, were used for the study. Generation G7 chicks were produced from the existing generation G6 parent stock, while G8 chicks were generated from G7 parents, in the Teaching and Research Farm, Department of Animal Science, University of Nigeria, Nsukka. Thirty (30) mature cocks and 90 mature laying hens were randomly chosen from the G6 parent stock, and randomly divided into six mating/breeding groups at mating ratio of 1 male: 3 females, to produce the G7 chicks. Artificial insemination was used to inseminate the hens. Semen collected from the males were used to inseminate the females according to the mating ratio and breeding groups. The insemination was done on two days interval and lasted for two weeks. Fertile eggs were collected, incubated and hatched according to mating groups to produce the contemporaneous aged chicks for the study. Similar protocol was applied to generate the chicks for G8 study. Generation G7 chicks were produced from G6 parents, while, G8 chicks were produced from G7 parents. Feed and water were provided to the birds *ad libitum*. Data were collected on body weight at 4 weeks interval. Data on feed intake were collected on daily basis and finally used to calculate the feed conversion ratio (FCR). Data collection lasted for 24 weeks. The data were subjected to analysis of variance and significant means separated using Duncan New Multiple Range Test. The results of the growth traits showed that initial body across generations G7 and G8 were not ($p>0.05$) significant on sex, but, significantly ($p<0.05$) influenced by the breeding groups. Final body weight increased significantly

($p>0.05$) across sex and mating groups. The results indicated that male birds were better feed converters compared to their female counterparts across generations G7 and G8. The overall body weight of the birds at hatch were not ($p>0.05$) significant across generations G7 and G8, but, showed significant ($p<0.05$) differences across the mating groups. The overall body weight at week 24 of age were 1352.11±17.39 and 1605.67±18.13 for generations G7 and G8, respectively. Body weight of male chickens were progressively higher than those of the females from hatch to week 24 of age, similarly, generation G8 birds showed superiority over the G7 birds throughout the experimental period. It was therefore, concluded that continuous selection can lead to further genetic progress, so long as there are still reasonable variation among the populations of the Nigerian heavy local chicken ecotype.

Keywords: Body Weight, Growth Traits, Heavy Ecotype, Selection Index, Generations and Chickens.

INTRODUCTION

In Nigeria, over the past few decades, poultry production has increased dramatically, but it has primarily focused on raising exotic chickens (Anosike *et al*., 2018, Abioja and Abiona, 2021) despite the fact that local chickens play major roles in rural economies and as well, contribute substantially to the gross domestic product (Momoh *et al*., 2007; CBN, 2012; Valentin *et al*., 2022). About 98% of flock makeup is made up primarily of chickens (Ajayi 2010) of the total poultry numbers (chickens, ducks, guinea fowls, quails and turkeys) kept in Africa. RIM (1992) and Ajayi (2010) estimated that indigenous chicken makes up 80% of the 120 million different types of poultry species that are reared in Nigeria's rural areas. They can adapt to tough environments and resist extreme weather because they are independent and resilient birds (Mpenda *et al*., 2019; Tlou *et al*., 2020).

The Nigerian local chickens can be classified into heavy and light ecotype on the basis of body weight and size (Momoh, 2005). The heavy ecotype, whose mature body weight ranges from 0.9 to 2.5kg, is found in the guinea savannah, sahel savannah, and some montane locations, while, the light ecotype, whose adult body weights vary from 0.68 to 1.5 kg, are found mostly around the mangrove, swamp, rainforest, and derived savannah agro-ecological zones (Momoh, 2005). These ecotypes have been surviving and reproducing in the Nigerian environment through natural selection for years. Thus, it is anticipated that they would have adapted to their surroundings and possessed some genes favorable to the poultry industry and for continuous reproduction (Momoh and Nwosu, 2008).

Nigerian heavy local chicken ecotype (NHLCE) is a dual purpose chicken breed, bred to produce eggs and meat, and developed in the Local Chicken Breeding Unit, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. This breed of indigenous to Nigeria (Udeh *et al*., 2018). It is evident in the literature (Udeh *et al*., 2020; (Udeh *et al*., 2021), that the Nigerian local heavy ecotype chickens possess some genetic merits that can enable them sustain the country in terms of food security.

But, these birds are challenged with slow growth rate, small body size, poor feed conversion ratio and poor egg quality, which has resulted into total dependence on exotic chickens for meat and egg production in Nigeria. Sequel to these inherent demerits and over dependence on exotic chickens, the Nigerian indigenous chickens are susceptible

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to extinction. The aim of the study was to assess the body weight and growth traits of the Nigerian heavy local chicken ecotype selected for generations G7 and G8 through selection index

MATERIALS AND METHODS

Location of the study

The study was conducted at the Local Chicken Breeding Section, Poultry Unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka lies in the derived Savannah region, and is located on longitudes $7^0\ 24^1$E and latitudes $5^0\ 22^1$N with annual rainfall range of 986 – 2098mm. The climate is of humid tropical setting with relative humidity range of 56.01**-**100%. The average diurnal minimum temperature ranges between 20.99**-**370C (Okonkwo and Akubuo, 2007). Nsukka is characterized by two seasons of the year. The rainy season extends from April -October while the dry season spans from November-April with no sharp demarcation (Dateandtimeinfo, 2022).

Experimental Birds, Management and Design

A total of 350 and 345 day-old chicks for generations (G) 7 and G8, respectively, were used for the study. Generation G7 chicks were produced from the existing generation G6 parent stock, while G8 chicks were generated from G7 parents, in the Teaching and Research Farm, Department of Animal Science, University of Nigeria, Nsukka. Thirty (30) mature cocks and 90 mature laying hens were randomly chosen from the G6 parent stock, and randomly divided into six mating/breeding groups at mating ratio of 1 male: 3 females, to produce the G7 chicks. Artificial insemination was used to inseminate the hens. Semen collected from the males were used to inseminate the females according to the mating ratio and breeding groups. The insemination was done on two days interval and lasted for two weeks. Fertile eggs were collected, incubated and hatched according to mating groups to produce the contemporaneous aged chicks for the study. Similar protocol was applied to generate the chicks for G8 study. The two generations (G7 and G8) birds were studied independently. Generation G7 chicks were produced from G6 parents, while, G8 chicks were produced from G7 parents. Feed and water were provided to the birds *ad libitum*.

The birds were fed formulated diets: Chick mash (Protein 21%, Energy 2878kcal/kg ME), Grower mash (Protein 18.5%, Energy 2640kcl/kg ME) and Breeder mash (Protein 16.60%, Energy 2705kcl/kg ME) according to their growth phases. Routine management, medication and vaccination were provided as and when due. Data on body weight were collected at 4 weeks interval. Data on feed intake were collected on daily basis and finally used to calculate the feed conversion ratio (FCR). Data collection lasted for 24 weeks. The study lasted for 24 weeks. The term generation G7 and G8 was used to describe birds that have been subjected to continuous selection by index for up to seven and eight generations.

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Data Analysis

Data obtained on body weight and growth traits in generations G7 and G8 were subjected to analysis of variance (ANOVA), with Generalized Linear Model Procedure, PROC GLM, using Statistical Analysis Software (SAS, 2022).

Statistical model was given as:

$$Y_{ijk} = \mu + S_i + A_j + G_l + \varepsilon_{ijk}$$

Where Yijk = Performance of k^{th} progeny

μ = Population mean

S_i = Random effect of i^{th} body weight

A_j = Fixed effect of j^{th} sex

G_k = Fixed effect of k^{th} generation

ε_{ijk} = Residual or random error term

RESULTS AND DISCUSSION

Growth Trait Performances

The mean±SE of growth traits from hatch to 24th week of age for generations G7 and G8 males and females of the Nigerian heavy local chicken ecotype across the mating groups are presented in Table 1.

Table 1: The Mean±SE of Growth traits from hatch to 24th week of age for generations G7 and G8 Males and Females of the Nigerian heavy local chicken ecotype across the Mating/Breeding Groups

Para meters	Gen	Sex		Mating/Breeding Groups)					
		Male	Female	1	2	3	4	5	6
IBW (g)	7	39.66± 4.35^{NS}	39.12± 2.04^{NS}	40.38± 4.06^{a}	40.25± 4.83^{a}	38.03± 3.65^{ab}	37.19± 4.72^{b}	40.64± 3.81^{a}	39.87± 3.24^{b}
	8	41.86± 4.35^{NS}	41.83± 2.04^{NS}	39.95± 4.06^{ns}	42.06± 4.83^{ns}	49.79± 3.65^{ns}	39.51± 4.72^{ns}	39.22± 3.81^{ns}	40.53± 3.24^{ns}
FBW (g)	7	1520.78± 25.29^{a}	1187.32± 22.87^{b}	1411.33± 24.73^{a}	1385.15± 26.81^{ab}	1371.32± 26.92^{ab}	1342.97± 32.46^{ab}	1351.55± 29.76^{ab}	1261.98± 31.59^{b}
	8	1792.27± 25.29^{a}	1461.57± 22.87^{b}	1562.50± 24.73^{b}	1654.06± 26.81^{ab}	1531.82± 26.92^{b}	1731.70± 32.46^{a}	1654.60± 29.76^{ab}	1626.84± 31.59^{ab}
TWG (g)	7	1481.11± 252.47^{a}	1148.20± 28.86^{b}	1370.95± 24.79^{a}	1344.90± 26.6.8^{ab}	1333.29± 26.9.7^{ab}	1305.78± 32.34^{ab}	1310.91± 29.74^{ab}	1222.11± 315.02^{b}
	8	1750.44± 252.47^{a}	1419.71± 28.86^{b}	1522.55± 24.79^{b}	1612.00± 26.6.8^{ab}	1482.04± 26.9.7^{b}	1692.19± 32.34^{a}	1615.38± 29.74^{ab}	1586.30± 315.02^{ab}
ADWG (g)	7	8.82± 1.50^{a}	6.83± 1.36^{b}	8.16± 1.48^{a}	8.01± 1.59^{ab}	7.94± 1.61^{ab}	7.77± 1.92^{a}	7.80±. 177^{ab}	7.27± 1.88^{b}
	8	10.42± 1.50^{a}	8.45± 1.36^{b}	9.06± 1.48^{b}	9.59± 1.59^{ab}	8.82± 1.61^{b}	10.07± 1.92^{a}	9.62±. 177^{ab}	9.44± 1.88^{ab}
TFI (kg)	7	I3.75±	12.57±	13.18±	13.72±	13.32±	12.66±	12.87±	13.20±

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		14.88[a]	16.56[b]	13.69[ab]	25.55[a]	24.92[ab]	29.42[b]	17.00[ab]	18.41[ab]
	8	I9.01± 14.88[NS]	18.97± 16.56[NS]	18.41± 13.69[NS]	26.88± 25.55[NS]	23.69± 24.92[NS]	14.76± 29.42[NS]	14.91± 17.00[NS]	15.28± 18.41[NS]
ADFI (g)	7	81.82± 88.57[a]	74.82± 98.59[b]	78.43± 81.49[ab]	81.68± 15.20[a]	79.28± 14.83[ab]	75.36± 17.51[b]	76.61± 10.12[ab]	78.58± 10.96[ab]
	8	113.15±8 8.57[NS]	112.90± 98.59[NS]	109.58± 81.49[NS]	160.00± 15.20[NS]	141.00± 14.83[NS]	87.87± 17.51[NS]	88.76± 10.12[NS]	90.96± 10.96[NS]
FCR	7	10.20± 8.64[b]	12.25± 11.75[a]	9.94± 11.76[b]	10.43± 17.05[ab]	10.33± 14.27[ab]	9.87± 1.90[b]	10.02± 1.26[ab]	10.91± 1.25[a]
	8	11.51± 8.64[NS]	13.00± 11.75[NS]	12.77± 11.76[NS]	17.34± 17.05[NS]	15.31± 14.27[NS]	8.85± 1.90[NS]	9.37± 1.26[NS]	9.87± 1.25[NS]

a, b = Mean in a row = significant (p<0.05) for sire families and sexes, NS = Non significant, IBW = Initial body weight, FBW = Final body weight, TWG = Total weight gain, ADWG = Average daily weight gain, TFI = Total Feed intake, ADFI = Average daily feed intake, FCR = Feed conversion ratio, G7 = Generation seven, G8 = Generation eight.

The results showed that there were significant (P<0.05) differences on initial body weight, final body weight, total weight gain, average daily weight gain, total feed intake, average daily feed intake and feed conversion ratio across mating groups and sex, but not on initial body weight on sex in generation G7 population. In generation G8, final body weight, total weight gain and average daily weight gain showed significant differences (p<0.05) across sexes and sire families, whereas, initial body weight, total feed intake, average daily feed intake and feed conversion ratio had no significant difference (p>0.05) across sex and mating groups. The male final body weights were significantly (p<0.05) higher than the female body weights. Total weight gain and average daily weight gain of males were significantly (p<0.05) higher than those of the females, both in generations G8 and G7. In addition, birds in generation G8 were higher than birds in G7, considering the total weight gain and average daily weight gain. Total feed intake and average daily feed intake in generation G8 were higher than values obtained in generation G7 across sex, as males indicated superiority over the females. Feed conversion ratio was significantly (p<0.05) affected by sex, generation and mating groups. The results showed that males were better converters of feed than females in generation G7. This was actually expected as males had higher final body weights than the females. Feed conversion ratio was also, significantly (p<0.05) influenced by generation, as generation G7 birds appeared to be better converters of feed than G8 birds, but, on the contrary, generation G8 had higher final body weight than G7 birds. Furthermore, the effects of breeding groups were significantly (p<0.05) expressed on the feed conversion ratio. Breeding group 1 had lower feed conversion ratios with corresponding highest final body weights in G7, thus, it was adjudged to be the best feed converters. The initial body weight or hatch weight in this study was higher than values reported by Adedeji *et al*. (2004) which were 36.17±0.75g and 35.30±0.75g on hatch weight of crossbred from different sire strains, and Oleforuh-Okoleh and Wagoha (2017) which recorded mean hatch weight of 35.12g to 37.18g in two Nigerian indigenous chicken strains and their crossbred. Similarly, this study's results were higher than values reported by Momoh *et al*. (2010) and Ndofor-Foleng *et al*. (2015) who obtained mean hatch weight of 27.02g from Nigerian

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local chickens consisting of heavy and light ecotypes and their crossbred, and 30.11+0.12g from a normal feather female line of Nigerian local chicken, respectively. The average daily weight gain was in the ranges reported by Oleforuh-Okoleh and Wagoha (2017), but average daily feed intakes were higher than the reports of Oleforuh-Okoleh and Wagoha (2017). Final body weight at week 24 reported in this study was higher than 1072±19.14g and 880±7.17g for male and female Nigerian heavy ecotype chickens as 20 weeks body weights reported by Momoh *et al*. (2010). The improved performances obtained in this study could be attributed to the genetic gains accrued over the years of continuous generational selection.

Body Weight Performances

The mean±SE of body weight performances of the Mating groups from hatch to 24th week of age for generations G7 and G8 of the Nigerian heavy local chicken ecotype are presented in Table 2.

Table 2: Mean±SE of Body weight performances of Mating/breeding groups from hatch to 24th week of age for generations G7 and G8 of the Nigerian heavy local chicken ecotype

Age (Week)	Gen.	Tot. Gen.	Mating/Breeding Groups					
		Mean	1	2	3	4	5	6
0 (Hatch)	G7	37.45± 0.26^{NS}	40.38± 0.58^{a}	39.85± 0.54^{ab}	37.23± 0.61^{c}	36.39± 0.61^{c}	40.25± 0.43^{a}	37.52± 0.54^{bc}
	G8	38.33± 0.24^{NS}	40.19± 0.63^{a}	36.63± 0.55^{b}	35.95± 0.59^{b}	35.74± 0.46^{b}	36.32± 0.58^{b}	39.63± 0.48^{a}
4	G7	110.28± 2.48^{b}	151.60± 5.97^{a}	137.32± 3.69^{a}	107.21± 5.76^{b}	83.24± 2.90^{c}	86.36± 3.47^{c}	96.00± 3.94^{bc}
	G8	216.44± 3.66^{a}	203.69± 8.45^{b}	279.36± 7.26^{a}	195.08± 6.37^{b}	216.33± 8.02^{b}	210.03± 8.41^{b}	198.59± 5.93^{b}
8	G7	301.25± 6.11^{b}	341.54± 11.51^{b}	262.83± 11.30^{c}	399.80± 14.45^{a}	325.79± 8.39^{b}	273.79± 6.89^{c}	197.08± 8.46^{d}
	G8	487.51± 6.55^{a}	438.62± 15.59^{b}	508.39± 12.32^{a}	457.26± 12.85^{ab}	520.57± 17.78^{a}	480.40± 14.22^{ab}	522.83± 17.16^{a}
12	G7	650.84± 9.38^{b}	743.56± 19.60^{a}	729.88± 22.03^{ab}	726.36± 15.59^{ab}	665.47± 13.65^{b}	576.58± 19.35^{c}	443.46± 16.35^{d}
	G8	730.28± 11.80^{a}	649.70± 19.50^{c}	707.19± 17.85^{c}	653.10± 29.56^{c}	812.82± 29.82^{ab}	715.32± 33.07^{bc}	863.11± 25.45^{a}
16	G7	919.16± 13.59^{b}	1146.79± 34.00^{a}	975.69± 27.87^{b}	926.08± 25.34^{bc}	865.03± 19.50^{c}	825.90± 24.60^{cd}	749.00± 25.43^{d}
	G8	1028.96± 19.40^{a}	835.87± 24.42^{d}	1040.03± 35.02^{bc}	903.00± 50.80^{cd}	1222.77± 46.67^{a}	1038.73± 52.14^{bc}	1139.68± 34.62^{ab}
20	G7	1183.04± 19.57^{b}	1366.15± 45.17^{a}	1115.69± 28.91^{b}	1350.77± 51.52^{a}	1230.06± 38.47^{ab}	1132.76± 43.50^{b}	924.98± 37.44^{c}
	G8	1434.29± 19.79^{a}	1264.42± 25.25^{c}	1354.09± 53.09^{bc}	1384.18± 44.41^{bc}	1593.97± 41.51^{a}	1514.72± 54.40^{ab}	1496.90± 51.81^{ab}
24	G7	1352.11± 17.39^{b}	1407.45± 41.97^{NS}	1376.38± 37.33^{NS}	1362.06± 50.14^{NS}	1338.21± 40.90^{NS}	1346.49± 44.65^{NS}	1266.74± 37.66^{NS}
	G8	1605.67± 18.13^{a}	1536.39± 21.58^{NS}	1643.72± 42.08^{NS}	1846.15± 32.93^{NS}	1704.14± 48.88^{NS}	1639.57± 46.01^{NS}	1606.17± 54.74^{NS}

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a, b, c, d, mean across rows = Significant difference (p<0.05) for Sire families, a, b, mean across columns = Significant difference (p<0.05) for Total generational means, NS = Non significant difference (p>0.05), Tot = Total, Gen. = Generation, G7 = Generation seven population, G8 = Generation eight population

The results showed significant (p<0.05) differences in the mean body weight of generations G7 and G8 and across mating groups. At week 0 (hatch), the average body weights in generation G7 were significantly (p<0.05) higher than those in generation G8 across the mating groups, except mating group six. However, such trend did not extend beyond 3 weeks of age, as it could be observed that at week 4 and week 8 of age, generation G8 began to indicate superiority over generation G7 across the six mating groups. However, the trend was interrupted at week 12, as it could be seen that mating groups 1, 2 and 3 in generation G7 had higher body weight than generation G8. Similarly, at week 16, mating groups 1 and 3, and 1 at week 20, recorded higher mean body weight in generation G7 than generation G8. Apart from these few indicated mating groups, the rest of the mating groups had their generation G8 mean body weight higher than those in generation G7. The information (body weight performances of sires) obtained from this result were useful for the mass selection employed for the selection of the cocks for breeding programmes. The results also revealed that the selection applied was effective hence, selection response is positive. Ogbu (2010) stated that when the performance of future population under selection is better than the former, it implies that there is genetic gain/response as a result of the selection applied (Ellen *et al*., 2007; Lehermeier *et al*., 2017).

The mean±SE of body weights (g) from hatch to 24th week of age for generations G7 and G8 male and females chickens of the Nigerian heavy local chicken ecotype across the mating groups are presented in Table 3.

Table 3: The Mean±SE of Body weight (g) from hatch to 24th week of age for generations G7 and G8 Male and Female chickens of the Nigerian heavy local chicken ecotype across the MatingBreeding Groups

Age	Gen	Sex (g)				Mating/Breeding Groups) (g)					
(Wk)		Male	Overall Gen. Mean	Female	Overall Gen. Mean	1	2	3	4	5	6
0	G7	42.76± 2.48^{a}	42.75± 0.23^{a}	36.24± 3.79^{b}	36.05± 0.79^{a}	41.08± 4.12^{a}	40.79± 2.71^{a}	38.49± 5.23^{b}	37.51± 4.99^{b}	40.75± 3.07^{a}	38.38± 4.49^{b}
	G8	40.75± 2.98^{a}	40.87± 0.30^{b}	35.57± 3.09^{b}	35.41± 0.23^{b}	40.83± 4.42^{a}	37.59± 3.78^{b}	37.04± 3.42^{b}	36.80± 3.28^{b}	36.91± 3.52^{b}	39.76± 3.22^{a}
4	G7	134.95± 39.06^{a}	136.03± 4.29^{b}	95.44± 29.83^{b}	96.58± 2.41^{b}	154.01± 38.24^{a}	144.93± 24.86^{a}	117.09± 34.57^{b}	89.53± 19.26^{b}	92.95± 20.81^{b}	92.67± 23.94^{b}
	G8	251.58± 39.41^{a}	253.15± 3.71^{a}	180.52± 38.68^{b}	117.69± 3.73^{a}	205.56± 52.11^{b}	271.00± 42.00^{a}	200.15± 39.52^{b}	216.33± 51.99^{b}	205.59± 47.56^{b}	197.67± 37.01^{b}
8	G7	355.69± 88.19^{a}	358.45± 9.29^{b}	260.50± 67.77^{b}	261.82± 6.04^{b}	324.81± 69.99^{b}	273.81± 70.59^{c}	394.52± 86.67^{a}	363.10± 51.02^{a}	289.65± 39.58^{c}	202.68± 49.35^{d}
	G8	560.29± 64.47	563.22± 6.32^{a}	418.25± 56.69	415.27± 5.43^{a}	454.40± 93.56^{b}	500.04± 71.86^{a}	479.58± 76.03^{ab}	503.66± 116.24^{a}	495.36± 87.64^{a}	502.56± 90.78^{a}
12	G7	717.62± 157.42^{a}	720.78± 13.91^{b}	584.79± 121.76^{b}	588.24± 10.18^{b}	746.33± 136.35^{a}	736.95± 151.02^{a}	731.22± 119.06^{a}	662.59± 92.59^{b}	583.36± 65.46^{c}	446.78± 103.43^{d}

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	G8	841.87±157.48^{a}	833.44±16.24^{a}	651.22±141.88^{b}	651.44±12.79^{a}	656.06±130.79^{b}	712.78±104.09^{b}	661.77±169.82^{b}	830.98±193.23^{a}	735.54±189.98^{b}	882.18±128.46^{a}
16	G7	1013.29±215.16^{a}	1010.53±20.46^{b}	816.99±148.22^{b}	825.98±13.76^{b}	1154.34±212.30^{a}	973.41±182.74^{b}	928.60±158.24^{bc}	867.68±118.61^{cd}	823.25 149.62^{de}	743.55±152.59^{e}
	G8	1211.57±199.60^{a}	1212.01±21.65^{a}	894.61±242.17^{b}	1212.01±21.65^{a}	869.24±150.56^{d}	1045.15±195.01^{bc}	918.33±282.86^{cd}	1247.80±287.71^{a}	1081.95±299.55^{b}	1156.07±186.42^{ab}
20	G7	1356.14±266.37^{a}	1350.64±25.87^{b}	1032.15±221.47^{b}	1029.00±20.56^{b}	1378.62±282.09^{a}	1111.54±180.53^{d}	1355.40±304.83^{ab}	1243.95±227.59^{bc}	1142.29±253.65^{cd}	933.08±236.79^{e}
	G8	1628.14±256.53^{a}	1626.41±28.16^{a}	1293.72±195.26^{b}	1293.18±18.37^{a}	1284.81±161.71^{d}	1385.06±275.87^{cd}	1409.90±226.43^{bcd}	1612.55±249.08^{a}	1552.47±302.87^{ab}	1520.79±300.60^{abc}
24	G7	1520.78±210.56^{a}	1522,37±20.36^{b}	1187.32±185.36^{b}	1190.89±17.44^{b}	1411.33±274.01^{a}	1385.15±230.12^{ab}	1371.32±305.65^{ab}	1342.97±241.98^{ab}	1351.55±256.49^{ab}	1261.98±222.78^{b}
	G8	1792.27±219.22^{a}	1787.87±24.47^{a}	1461.57±184.13^{b}	1558.77±97.85^{a}	1562.50±194.65^{b}	1654.96±238.05^{ab}	1531.82±201.26^{b}	1731.70±293.26^{a}	1654.60±264.28^{ab}	1626.84±309.68^{ab}

a, b, c, d, e, Means across row = significant ($p<0.05$) for sire families and sexes, a, b = Mean across column = significant ($p<0.05$) for generations mean, NS = Non significant, Gen. = Generation, G7 = Generation seven population, G8 = Generation eight population,

The result showed significant ($p<0.05$) differences in the mean of body weight from hatch (week 0) to week 24 of age across sexes, generations and mating groups. The overall mean body weight for males and females increased from 40.87 to 1787.87 g and 35.41 to 1558.77 g, respectively, across generation G7 and G8. Generation G8 mean body weights were significantly ($p<0.05$) higher than G7 mean body weights except at hatch where G7 hatch weights were higher than G8, and mean body weight of males showed marked superiority over the females from week 0 to 24 weeks of age. At hatch, the mean body weight of mating group 1 recorded the highest value across G7 and G8, whereas, at week 4, mating group 1 was highest in G7 and sire family 2 was highest in G8 generation. At week 8, sire family 3 recorded highest mean body weight in G7, while, mating group 6 was highest in G8. The body weights at hatch were higher than the results obtained by Agbo (2016) who studied the generations G4, G5, and G6, and recorded hatch weight of 34.40g, 35.61g and 36.50g, respectively. Similarly, the hatch weights obtained from this study were higher than the values recorded by Udoh *et al*. (2014) who reported hatch weigh of 26.40g, Kosba *et al*. (2010) reported hatch weigh of 26.85g and Adedokun and Sonaiya (2001) who reported hatch weight of 27.15g in the Nigerian local chickens. The lower hatch weight reported by these researchers may be attributed to the fact that they worked with unimproved and unselected populations of the Nigerian local chickens. Furthermore, Ogbu (2010) in his study, reported hatch weight of 30.30g, 31.65g and 33.48g for G0, G1 and G2, respectively, of the Nigerian heavy local chicken ecotype which have undergone three generations of selection by index. However, the values he recorded were lower than the values reported in this study. This could be attributed to the genetic improvement through selection that G7 and G8 populations have undergone.

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At week 4 of age, the mean body weights recorded in G7 and G8 were lower than values reported by Agbo (2016) who obtained 231.35g, 291.90g and 320.99g for G4, G5 and G6, respectively. Similar trend was observed in the mean body weight at week 8, in generation G7 as Agbo (2016) recorded 414.65g, 419.49g and 581.76g across the 3 generations he studied, but, generation G8 compared favourably with Agbo, (2016). On the other hand, the mean body weights obtained in generation G8 at week 4 and week 8 were higher than values reported by Ogbu (2010) at similar ages, though, Ogbu studied generations G0, G1 and G2 of the Nigerian heavy local chicken ecotype.

The results showed a marked increase in the mean body weight for both males and females from week 0 (hatch) to weeks 24 of age across generations G7 and G8. The male population showed steady superiority in body weight gain over the female and were consistently heavier than females from hatch to 24. The males' overall body weights were 720.78, 1010.53, 1350.64 and 1522.37 g, which were heavier than 588.24, 825.98, 1029.88 and 1190.89 g female body weights at weeks 12, 16, 20 and 24, respectively, in generation G7. On the other hand, males' overall body weights were 833.44, 1212.01, 1626.41 and 1787.87g, which were heavier than 651.44, 943.66, 1293.18 and 1558.77 g being females' body weights for weeks 12, 16, 20 and 24, respectively, in generation G8. The growth differentials between males and females were expected as it has been previously documented in researches that male chickens grow and add weight faster than female chickens (Adedokun and Sonaiya, 2001; Momoh, 2005). Ogbu (2010) and Agbo (2016) also, reported similar observations. The mean body weight of females at week 12 of age in this study was lower than the value (920.00g) reported by Ndofor-Foleng *et al*. (2015) for Nigerian local chicken females at week 12 of age. At week 16 of age, the G8 population recorded mean body weight higher than values recorded by Ogbu (2010) and Agbo (2016).

The males' mean body weight at week 20 (1626.41) agreed with the report by Udeh *et al*. (2021), who obtained mean body weight of 1627.78g at 20 week of age on the progenies of generation G8 population of the Nigeria heavy local chicken ecotype. The higher values obtained in G8 over G7 from week 0 to week 24 were expected because it showed that birds in G8 manifested realized genetic response due to selection. The higher body weight of cocks obtained in this study could be attributed to hormonal differences in their endocrinological and physiological functions and also, the fact that selection pressure was more on the males than females.

Sex and Generation Comparison in the Chicken Populations

The comparison between sexes and generations on body weight (g) from hatch to 24th week of age for generations G7 and G8 (separated sexes) of the Nigerian heavy local chicken ecotype are presented in Table 4.

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Table 4: Comparison between Sexes and Generations on body weight (g) from Hatch to 24th week of age for generations G7 and G8 of the Nigerian heavy local chicken ecotype

Age (Week)	Sex		Mean diff.	Generation		Mean diff.
	Male (g)	Female (g)	Sj – Si (g)	G7 (g)	G8 (g)	Gj – Gi (g)
0	41.85±2.87^{a}	35.71±3.50^{b}	6.14	38.32±4.66^{b}	39.24±4.02^{a}	0.92
4	196.16±69.99^{a}	138.57±52.31^{b}	57.59	119.07±38.36^{b}	215.66±54.29^{a}	96.59
8	460.89±128.42^{a}	339.42±99.08^{b}	121,47	311.37±89.86^{b}	488.93±95.67^{a}	177.56
12	775.03±166.42^{a}	620.67±134.75^{b}	154.36	655.12±154.21^{b}	740.59±173.53^{a}	85.47
16	1108.58±296.09^{a}	860.14±202.17^{b}	248.44	920.77±206.36^{b}	1047.96±274.37^{a}	127.19
20	1487.98±296.09^{a}	1161.57±246.32^{b}	326.41	1180.33±291.08^{b}	1459.16±277.46^{a}	278.83
24	1655.15±255.25^{a}	1328.39±229.66^{b}	326.76	1356.57±257.64^{b}	1626.97±258.74^{a}	270.40

a, b, mean across row = Significant different ($p<0.05$) for sex and generation, Gen. = Generation, G7 = Generation seven population, G8 = Generation eight population, Gj = Mean of the j^{th} generation (j = G8), Gi = Mean of the i^{th} generation (i = G7), Sj = Mean of j^{th} sex (Sj = male), Si = Mean of i^{th} sex (Si = female)

The results indicated that mean body weight of males were significantly ($p<0.05$) higher than those of the females across different ages. The mean differences progressed from 6.14 g at hatch to 326.76 g at weeks 24 of age This superiority of males over females is expected and confirmed the reports of Atteh (1990) and Momoh (2005) who recorded that there were growth differential between male and female chickens. Across the generations, generation G8 population demonstrated superior ($p<0.05$) increment on body weight over generation G7 population across the age groups from hatch to week 24 of age. These superior performances were evident as the mean differences between male and female (Sj – Si) and generations G7 and G8 ($G_j – G_i$) recorded positive values across age groups. The positive values of the mean differences on sex were indication that males possessed hormones that help them build heavier tissues than their female counterparts, even under the same environmental condition (Handelsman *et al*. 2018). Male hormone – androgens have protein anabolic effect, whereas, female sex hormone – estrogen tend to accelerate early ossification of long bones, thereby limiting the ability of females for further growth (Almeida *et al.*, 2017). On the other hand, the mean differences on generations were positive and increased progressively as the age increased, indicating genetic progress with continued generational selection. Similar trends were also recorded by Ogbu (2010) and Agbo (2016).

CONCLUSION

The overall body weight at week 24 of age showed that G8 birds were higher than G7 birds. Body weight of male chickens were also, progressively higher than those of the females from hatch to week 24 of age, similarly, generation G8 birds showed superiority over the G7 birds throughout the experimental period. It was therefore, concluded that continuous selection can lead to further genetic progress, so long as there are still reasonable variation among the populations of the Nigerian heavy local chicken ecotype.

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Conflict of Interest

The authors hereby declare that there is no conflict of interest.

Author's Contribution

UFU: Design, methodology and statistical analysis, UNP: Supervision and writing of manuscript, OIJ: Data processing and analysis, OMO: Original drafting of manuscript, NC: Assisted in data collection, OCE: Supervisory Assistant, Initial design of the experiment and review editing, OAL: Assisted in data collection, review and analysis.

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