IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 12 Ver. III (Dec. 2014), PP 41-46
www.iosrjournals.org

Comparative Growth Parameters and Feed: Gain Ratio of Pure- and Inbred Nigerian Indigenous Chickens

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Abstract: *The objectives of the study were to evaluate and compare the growth performance (body weight, BWT, and body weight gain, BWG), feed intake (FI) and feed:gain (F:G) of G_1 and G_2 generations of inbred Nigerian indigenous chickens (NIC). A total of 500 chicks (250/generation) were used for the study. The G_1 birds were produced from sire families established from a base population of random breeding NIC whereas the G_2 birds were progenies of half and full sib matings involving the G_1 population. Result showed significant ($P< 0.05$) sire and line effects for BWT in G_1 and G_2 generations, respectively. Feed intake did not vary much between sire groups (G_1 generation) but varied without a definite trend between sire lines in G_2 generation. Differences between sire group and their progenies were non-significant in most of the parameters except for BWT at hatch and 12 wk of age (G_1S_1 vs G_2L_1: 27.06 ± 0.41 vs 24.42 ± 0.29g and 671.42 ± 19.66 vs 619.85 ± 18.60g, respectively), and at wk 16 and 20 (G_1S_2 vs G_2L_2 for wk 16: 794.33 ± 22.58 vs 741.93 ± 18.50g and G_1S_4 vs G_2L_4 for wk 20: 950.98 ± 22.05 vs 888.33 ± 18.50g). For feed intake, significant differences were observed at wk 4 and 20 (G_1S_5 vs G_2L_5: 17.84 ± 0.46 vs 21.64 ± 0.63g and 84.78 ± 1.80 vs 90.16 ± 1.87g, respectively). Comparison between $G_1$and G_2 generations for growth parameters was significant for BWT at hatch, 12 and 20 wk of age ($\%\Delta$ = -4.95*, -3.91 and -4.00, respectively, $P< 0.05$), FI at wk 4 and 20 (18.66 ± 0.24 vs 20.20 ± 0.29; $\%\Delta$ = 8.50* and 88.94 ± 0.90 vs 92.78 ± 0.81, $\%\Delta$ = 4.32*, respectively, $P< 0.05$), BWG and F:G across the age periods (range: -13.72 to -24.97%, and 19.93 to 27.97%, respectively, $P< 0.05$). It was concluded that inbreeding could be used to establish sire lines to be used in crosses for the improvement of productive traits in populations of NIC.*

Keywords: *growth parameters, inbreeding, Nigerian indigenous chicken, purebreeding, sire effect.*

I. Introduction

Indigenous chickens play important roles in the supply of animal protein and income to the rural populace [1]. These birds also possess valuable genetic potentials for production and adaptation acquired over years of natural selection and evolution. These genetic attributes are beneficial and indispensable for sustained production under low input and continuously changing environments [2, 3, 4]. Integrating the NIC into a target gene pool required for organized and sustained poultry production and breeding in Nigeria will enhance the infusion of these adaptive genes into the National germplasm for present and future uses. To achieve this, the NIC must be 'purified' that is, made homozygous at loci controlling most of the productive and adaptive traits [5]. Carefully planned and coordinated inbreeding (mating of individuals related by descent) or within line/family breeding (involves inbreeding) provides ready means of achieving this. Inbred lines are known to be homozygous for favourable genes at most loci (depending on the level of inbreeding) [5] and to manifest positive heterosis when genetically divergent lines from different genetic backgrounds are intercrossed [5, 6, 7]. Again, inbred lines allow the unlimited production of animals of the same genotype for repeated genetic evaluation and phenotypic characterization [5]. Performance of purebred and inbred genotypes are therefore more predictable when compared with randombred or terminal products in which most productive genes are at intermediate frequencies or unfavourable genes masked by dominant alleles [8, 9]. Lonergan et al. [10] exploited inbred Leghorn and Fayoumi lines for the study of breast meat quality and composition. Inbred lines of Fayoumi, White Leghorn and New Hampshire have also been employed for genetic studies of production traits [11, 12]. Purebreeding/inbreeding concentrates favourable genes and reveals deleterious genes which are eliminated through natural or artificial selection. Subjecting the NIC to systematic inbreeding could hence reveal unproductive genes which could be selected against, as well as concentrate favourable ones leading to improved performance. The objectives of the present study were therefore to produce and evaluate two generations (a purebred and an inbred generation) of NIC for growth parameters (body weight, BWT, feed intake, FI, body weight gain, BWG and feed:gain ratio, F:G) as part of their characterization subsequent to further improvement through selection.

II. Materials and Methods

2.1 Study location: The study was carried out in the Poultry Unit of the Department of Animal Science Teaching and Research Farm, Enugu State University of Science and Technology, Enugu State, Nigeria. The study lasted for five months (20 weeks).

2.2 Experimental materials and Management: A total of 55 mature (> 24 week) male and female local chickens (5 males and 50 females) selected from a base population of random breeding Nigerian indigenous chickens (NIC) established in the Department of Animal Science, Enugu State University of Science and Technology, Enugu State were used for the study. The birds were randomly sheared into five groups of 1 cock and 10 hens each to form 5 sire breeding groups in a mating ratio of 1 cock to 10 hens. Eggs were collected, identified according to sire and hatched in a locally fabricated incubator. A total of 250 chicks representing purebred NIC or G_1 generation were produced. The chicks were properly identified according to sire, brooded and reared together on deep litter pens from hatch to 20 wks of age. Chicks were fed chicks mash (18% CP, 2800KcalME/kg) from day old to 8 wks and growers mash (16% CP, 2670KcalME/kg) from 9 wks to 20 wks of age. The birds were vaccinated against the endemic poultry diseases (NewCastle disease, infectious bursal disease, and fowl pox) at the appropriate age periods and treated against bacteria and protozoan diseases as and when necessary. They were dewormed using piperazine at 8 and 16 wks of age, respectively. At onset of egg production, the birds were separated and reared according to sex. Four weeks into egg production (28 wks of age), 3-4 cocks were selected from each sire family based on male selection criteria (physical appearance, growth performance and manifestation of maleness). These birds were combined with hens that were equally selected from the same sire family as the cocks (full and half sib sisters) based on good physical appearance and femaleness (good laying performance) to form breeding groups in the ratio of 1 cock: ≤ 10 hens. Three to four (3-4) replicate breeding groups were established from each sire family. These breeding groups were identified as sire lines (i.e., lines established from sire families) and were used to generate the inbred (G_2) generation (Table 1). The breeding groups were fed layers mash (16% CP, 2650 KcalME/kg) from 4 weeks of onset of egg production (at ≈30% laying performance). Eggs were collected and set to hatch. The hatched chicks were identified according to sire line and brooded and reared as described for G_1 generation. As much as was possible equal management attention was given to the experimental groups and to birds belonging to the different generations.

2.3 Data collection and Analysis: The G_1 population (progenies from G_0 sire breeding groups) and the G_2 population (inbred progenies of sire families) were evaluated for growth performance, feed intake and feed:gain. Body weight was measured at hatch and bi-weekly for 20 weeks. Daily feed intake was determined as the difference between quantity supplied and the left over after 24 h divided by the number of birds in a group while daily weight gain was determined as the difference between two consecutive body weight values divided by the number of days in the interval. Feed:Gain ratio was determine as the gramme feed per gramme gain for the age period under consideration. Data generated from G_1 population (sire families) were analyzed according to the paternal half sib Analysis of Variance using a sire model to determine the effect of sire on the parameters measured. The statistical model was:

$X_{ij} = \mu + S_i + \ell_{ij}$

Where X_{ij} is an observation, μ is common mean, S_i is effect of sire and ℓ_{ij} is random error term.

Data from the inbred progeny population (G_2 generation) were similarly subjected to analysis of variance (ANOVA) to determine the effect of sire line on the parameters using the following statistical model:

$X_{jk} = \mu + L_j + \ell_{jk}$

Where ℓ_{jk} is as defined previously, X_{jk} is the k^{th} observation in the j^{th} line, μ is common mean for lines, and L_j is line effect. Significantly different sire and sire line effects were separated using the Duncan New Multiple Range test [13]. Comparison between sire family (parent population, G_1S_i) and corresponding progeny population (G_2L_i) and between G_1 and G_2 generations was performed using the independent samples t-test. The coefficient of inbreeding (F_x) in the inbred generation was calculated using the above relationship by [14]:

$$Fx = 1/2\left(\frac{1}{NmAm} + \frac{1}{NfAf}\right)$$

Where, Nm and Nf is the number of males and females, respectively and Am and Af the age of males and females at breeding, respectively.

III. Results and Discussion

The population structure, mating arrangement and number of chicks for G_1 and G_2 generations is presented in TABLE 1 while TABLE 2 presents the growth performance of G_1 (sire families) and G_2 (sire lines, L_i) of the NIC at the various age periods. Average inbreeding coefficient of G_2 generation was 2.39 % (range, 2.00-2.65%). Body weight differed significantly (P □ 0.05) among sire groups and sire lines. Generally, progenies of sires 1, 2, and 4 had the highest body weights across the age periods compared to those of 3, and 5.

The same trend was observed in their progenies with those belonging to sire lines 1, 2, and 4 surpassing (P 0.05) those of lines 3, and 5 in body weight except at hatch at which no difference was observed among the sire lines in body weight. The similar trend in body weight observed across generations between sire groups in G_1 generation and their lines in G_2 generation shows that the birds in G_1 generation bred true and that sire body weight lines (or inbred lines) could be established in the local chicken for use in further crossbreeding schemes. Table 2 also shows a general reduction in the standard error of means in G_2 birds compared to the G_1 population or a greater cluster of body weight values around the mean in the G_2 population indicating a reduction in variation probably due to the effect of inbreeding which reduces genetic variation within populations [15] as expected when full and half sib mating scheme is employed as in the present study.

Feed intake did not differ significantly between sire families in G_1 generation except at wk 16 but significant (P 0.05) variation in feed intake was observed across the age periods in G_2 generation although no particular pattern or trend was apparent among the sire lines across the age periods (TABLE 3). On the average, G_1 birds consumed 18.66 ± 0.24g feed per day per bird (range: 17.84 ± 0.46 – 19.42 ± 0.55g) during the first 4 weeks of life, 68.22 ± 0.67g (range: 65.80 ± 1.77 – 70.87 ± 1.45g) and 88.94 ± 0.90g (range: 84.78 ± 1.80 – 91.25 ± 1.39g) during wk 12 and 20, respectively. Feed consumption is a very variable trait modified by genetic and environmental factors. The values obtained for feed intake in G_1 and G_2 generations are in agreement with values reported by some other workers on indigenous chickens [16, 17].

Sire groups were generally similar to their inbred progenies in body weight across the age periods (TABLE 4). For instance birds belonging to G_1S_1 surpassed their inbred progenies (G_2L_1) in body weight only at hatch (27.06 ± 0.41 vs 24.42 ± 0.29g) and at wk 12 (671.42 ± 19.66 vs 619.85 ± 18.60g) while those of G_1S_4 exceeded their progenies (G_2L_4) in body weight at wk 20 only (950.98± 22.05 vs 888.33 ± 20.86g). No significant differences in body weight were observed for other groups across the age periods. The observed similarity in growth performance between G_1 and G_2 birds is supported by Udeh and Omeje [7] who reported equivalent body weight and body weight gain at 4, 12, and 20 wk of age, respectively in inbred exotic and local chickens. These results support our earlier submission that the G_1 birds bred true and this indicates high additive genetic effect on growth performance in the NIC. The results also indicate that growth was not significantly affected by within line mating employed in production of the G_2 progenies and that inbreeding could be carried out for more generations in the population with minimal reduction in growth performance.

Significant (P 0.05) differences were observed in feed intake between G_1S_1 and G_2L_1 at 20 wk (88.47 ± 1.80 vs 95.24 ± 1.44g) and between G_1S_5 and G_2L_5 birds at 4 (17.84 ± 0.46 vs 21.64 ± 0.63g), 8 (42.79 ± 1.12 vs 38.83 ± 0.77g), and 20 wk (84.78 ± 1.80 vs 90.16 ± 1.87g) (TABLE 5). Other groups were generally similar in feed intake. These results show that feed intake was not significantly depressed in the inbred groups and this could be related to the equivalent growth performance observed between the G_1 population and their inbred progenies. The results also show that feed intake may not be liable to inbreeding depression in accord with Wiener [18] and Udeh and Omeje [7].

The generational mean comparison (G_1 vs G_2) for growth parameters (body weight, feed intake, body weight gain and feed:gain ratio) are presented in TABLE 6. Significant (P 0.05) differences in body weight were observed at hatch (26.48 ± 0.17 vs 25.17 ± 0.13g or 1.31g difference), 12 and 20 wks of age (624.83 ± 3.28 vs 600.43 ± 6.90g, or 24.40g difference and 895.91 ± 11.40 vs 860.08 ± 9.29g or 35.83g difference, respectively). The percent changes (reduction) in body weight at these periods were hence 4.95, 3.91 and 4.00, respectively. Feed intake differed significantly (P 0.05) at wks 4, and 20 (18.66 ± 0.24 vs 20.20 ± 0.29g and 88.94 ± 0.90 vs 92.78 ± 0.81g, respectively). Thus G_2 birds consumed 8.25 and 4.32% more feeds, respectively at these age periods than their G_1 parents. Body weight gain and feed:gain ratio differed significantly (P 0.05) between G_1 and G_2 generations across the entire age periods (wk 4 to 20, respectively) and were depressed in the G_2 generation with a range of 13.72 to 24.97% for body weight gain and 19.93 to 23.97% for feed:gain ratio. The depressed body weight at hatch in inbred group could result from reduced egg size in this group as was alluded to by Udeh and Omeje [7]. The response obtained at wk 12 could relate to a delay in the initiation of the effect of genes responsible for transition from juvenile to adult body weight. It had been reported the point of inflection for NIC to be 12 wk, at which birds transit from juvenile to mature growth phase (Omeje, S. S. 1, 1983, Msc. Dissertation, University of Nigeria, Nsukka, unpublished). In addition, inbreeding has been shown to delay sexual maturity and attainment of mature body weight in animals [19]. Abdou et al. [20] also reported percentage reductions in body weight at 4, 8, 12, and 16 weeks in three lines of inbred Fayoumi chickens in which inbreeding coefficients ranged from 6.25 to 37.5%. Szwaczkowski et al. [19] reported a reduction of about 3.37g in the body weight of egg type chickens based on partial linear regression and a reduction of 39.04g per 10% of inbreeding. These reports are at variance with the results obtained in the present study probably as a result of the genetic and population structure of the experimental birds. For instance, the Fayoumi is an improved breed of chicken with many generations of directional selection and mating while the local chickens employed in the present study came from an unselected and random breeding base population with inbreeding coefficient of zero. Furuta et al. [21] found a difference of 10g in feed consumption of 3rd generation purebred

egg chickens compared to the 2nd generation population which is higher than the values reported in the present study.

Table 1: Population structure and coefficient of inbreeding (Fx) for G0 and G1 generations of Nigerian indigenous chickens used for the study

G0 generation (parents)				G1 generation (parents)			
Sire group (Si)	Dam	Fx (%)	Chicks (G1)	Sire line (G1)	Dam (G1)	Fx (%)	Chicks (G2)
S1	10	0.00	60	4	40	2.00	58
S2	10	0.00	40	3	30	2.65	50
S3	10	0.00	50	3	30	2.65	45
S4	10	0.00	50	3	30	2.65	50
S5	10	0.00	45	4	40	2.00	47
Average Fx (%)						2.39	

Table 2: Effect of sire group and sire line on body weight (g) of purebred Nigerian indigenous chicken at various age periods

Sire group (G1 generation)					
Age (wk)	S1	S2	S3	S4	S5
0	27.06 ± 0.41a	26.98 ± 0.43a	25.56 ± 0.33b	27.12 ± 0.32a	25.68 ± 0.29b
4	168.22 ± 3.36ab	170.31 ± 3.86a	160.36 ± 3.18ab	177.33 ± 3.29a	160.37 ± 3.17b
8	331.67 ± 9.68a	335.79 ± 10.89a	311.42 ± 8.75ab	332.95 ± 9.01a	291.98 ± 6.65b
12	671.42 ± 19.66a	640.82 ± 18.66a	591.79 ± 15.94b	660.00 ± 18.92a	564.60 ± 13.64b
16	750.15 ± 25.65a	794.33 ± 22.58a	666.62 ± 18.34b	759.86 ± 21.65a	647.15 ± 17.37b
20	937.88 ± 31.34a	940.00 ± 26.08a	831.50 ± 20.76b	950.98 ± 22.05a	821.95 ± 18.54b
Sire lines (G2 generation)					
Age (wk)	L1	L2	L3	L4	L5
0	24.42 ± 0.29	25.04 ± 0.31	25.06 ± 0.27	26.22 ± 0.28	25.19 ± 0.25
4	166.65 ± 2.88a	167.11 ± 3.00a	154.94 ± 2.89b	172.73 ± 2.62a	161.67 ± 2.36ab
8	320.40 ± 7.90a	321.80 ± 6.86a	300.34 ± 7.05b	331.42 ± 8.21a	288.68 ± 5.35b
12	619.85 ±18.60a	626.89 ± 12.69a	567.79 ± 14.33b	623.68 ± 16.51a	563.48 ± 12.35b
16	768.33 ± 22.34a	741.93 ± 18.50a	642.74 ± 17.31b	741.06 ± 19.42a	647.42 ± 14.43b
20	887.12 ± 24.09a	890.12 ± 21.54a	809.88 ± 17.58b	888.33 ± 20.86a	829.55 ± 15.00ab

a, b: means in the same row having different superscripts are significantly different (P < 0.05).

Table 3: Effect of sire group and sire line on daily feed intake (g) of purebred Nigerian indigenous chickens at various age periods

Sire group (G1 generation)					
Age (wk)	S1	S2	S3	S4	S5
4	18.72 ± 0.50	19.42 ± 0.55	19.15 ± 0.54	18.00 ± 0.52	17.84 ± 0.46
8	39.52 ± 0.85	40.50 ± 1.03	41.87 ± 0.90	42.22 ± 1.02	42.79 ± 1.12
12	69.59 ± 1.52	66.50 ± 1.29	67.82 ± 1.14	65.80 ± 1.77	70.87 ± 1.45
16	77.56 ± 0.76b	78.36 ± 0.78ab	77.31 ± 0.69b	76.00 ± 0.94b	80.94 ± 1.79a
20	88.47 ±1.80	88.94 ± 2.55	91.25 ± 1.39	91.04 ± 2.45	84.78 ± 1.80
Sire line (G2 generation)					
Age (wk)	L1	L2	L3	L4	L5
4	19.83 ± 0.63ab	20.58 ±0.74a	20.26 ± 0.58a	18.67 ± 0.47b	21.64 ± 0.63a
8	38.08 ± 1.00c	41.00 ± 0.77ab	42.23 ± 1.04a	41.76 ± 0.83a	38.83 ± 0.77bc
12	67.39 ±1.32b	69.64 ± 1.38ab	66.16 ± 1.38b	66.15 ± 1.22b	70.89 ± 1.34a
16	79.74 ± 0.79a	78.35 ± 0.92a	79.60 ± 1.46a	75.00 ± 1.86b	78.19 ± 0.65a
20	95.24 ± 1.44a	90.13 ± 2.10b	94.65 ± 1.88a	93.02 ± 1.68ab	90.16 ± 1.87b

a, b: different superscripts in the row are significantly different (P < 0.05).

Table 4 Comparison between sire groups (G1Si) and sire lines (G2Li) for body weight (g) across the age periods

Age (wk)						
Group	0	4	8	12	16	20
G1S1	27.06 ± 0.41a	168.22 ±3.36	331.67 ± 9.68	671.42 ± 19.66a	750.15 ± 25.65	937.88 ± 31.34
G2L1	24.42 ± 0.29b	166.65 ± 2.88	320.40 ± 7.90	619.85 ± 18.60b	768.33 ± 22.34	887.12 ± 24.09
G1S2	26.98 ± 0.43	170.31 ± 3.38	335.79 ±10.89	640.82 ± 18.66	794.33 ± 22.58a	940.00 ± 26.08
G2L2	25.04 ± 0.31	167.11 ± 3.00	321.80 ± 6.86	626.89 ± 12.69	741.93 ± 18.50b	890.12 ± 21.54
G1S3	25.56 ± 0.33	160.36 ± 3.18	311.42 ± 8.75	591.79 ± 15.94	666.62 ± 18.34	813.50 ± 20.76
G2L3	25.06 ± 0.27	154.94 ± 2.89	300.34 ± 7.05	567.79 ± 14.33	642.74 ± 17.31	809.88 ± 17.58
G1S4	27.12 ± 0.32	177.33 ± 3.29	332.95 ± 9.10	660.00 ± 18.92	759.86 ± 21.65	950.98 ± 22.05a
G2L4	26.22 ± 0.28	172.73 ± 2.62	331.42 ± 8.21	623.68 ± 16.51	741.06 ± 20.86	888.33 ± 20.86b

G1S5	25.68 ± 0.29	160.37 ± 3.17	291.98 ± 6.65	564.60 ± 13.64	647.15 ± 17.37	821.95 ± 18.54
G2L5	25.19 ± 0.25	161.67 ± 2.36	288.68 ± 5.35	563.48 ± 12.35	647.42 ± 14.43	829.55 ± 15.00

a, b: different superscripts indicate significantly different means (P < 0.05).

Table 5: Comparison between sire groups and sire lines for feed intake (g) across age periods

	Age (wk)				
Group	4	8	12	16	20
G1S1	18.72 ± 0.50	39.52 ± 0.85	69.59 ± 1.57	77.56 ± 0.76	88.47 ± 1.80a
G2L1	19.83 ± 0.63	38.08 ± 1.00	67.39 ± 1.32	79.74 ± 0.79	95.24 ± 1.44b
G1S2	19.42 ± 0.55	40.50 ± 1.03	66.50 ± 1.29	78.36 ± 0.78	88.94 ± 2.55
G2L2	20.58 ± 0.74	41.00 ± 0.77	69.64 ± 1.38	78.35 ± 0.92	90.13 ± 2.10
G1S3	19.15 ± 0.54	41.87 ± 0.90	67.82 ± 1.14	77.31 ± 0.69	91.25 ± 1.39
G2L3	20.26 ± 0.58	42.23 ± 1.04	66.16 ± 1.38	79.60 ± 1.46	94.65 ± 1.88
G1S4	18.00 ± 0.52	42.23 ± 1.02	65.80 ± 1.77	76.00 ± 0.94	91.04 ± 2.45
G2L4	18.67 ± 0.47	41.76 ± 0.83	66.15 ± 1.22	75.00 ± 0.86	93.02 ± 1.68
G1S5	17.84 ± 0.46a	42.79 ± 1.12a	70.78 ± 1.45	80.94 ± 1.79	84.78 ± 1.80a
G2L5	21.64 ± 0.63b	38.83 ± 0.77b	70.89 ± 1.34	78.19 ± 0.65	90.16 ± 1.87b

a, b: Different superscripts indicate significantly different means (P< 0.05).

Table 6: Comparison between generations for growth parameters across age periods

	Age (wk)					
GEN	0	4	8	12	16	20
Body weight (g)						
G1	26.48 ± 0.17a	167.44 ± 1.56	320.06 ± 4.16	624.83 ± 3.28a	719.64 ± 10.20	895.91 ± 11.40a
G2	25.17 ± 0.13b	164.40 ± 1.33	312.66 ± 3.36	600.43 ± 6.90b	706.92 ± 9.09	860.08 ± 9.29b
% Δ**	-4.95*	-1.82	-2.31	-3.91*	-1.77	-4.00*
Feed intake (g)						
G1	NA	18.66 ± 0.24a	41.38 ± 0.45	68.22 ± 0.66	78.10 ± 0.51	88.94 ± 0.90a
G2	NA	20.20 ± 0.29b	40.28 ± 0.43	68.02 ± 0.62	78.24 ± 0.47	92.78 ± 0.81b
% Δ		8.25*	-2.66	-0.29	0.18	4.32*
Body weight gain (g)						
G1	NA	6.27 ± 0.18a	8.05 ± 0.22a	9.70 ± 0.24a	5.66 ± 0.17a	7.32 ± 0.22a
G2	NA	5.41 ± 0.09b	6.04 ± 0.14b	8.01 ± 0.18b	4.72 ± 0.14b	6.06 ± 0.14b
% Δ		-13.72*	-24.97*	-17.42*	-16.61*	-17.21*
Feed:Gain						
G1	NA	3.18 ± 0.11a	5.47 ± 0.19a	7.37 ± 0.21a	14.90 ± 0.56a	13.02 ± 0.51a
G2	NA	3.86 ± 0.09b	7.00 ± 0.17b	8.89 ± 0.20b	17.87 ± 0.51b	16.13 ± 0.44b
% Δ		21.38*	27.97*	20.62*	19.93*	23.89*

a, b: different superscripts indicate significantly different means (P< 0.05), %Δ: Percent change, *: P≤ 0.05. **: negative indicates a decrease while positive indicates an increase (but does not connote improvement).

IV. Conclusion

The low average inbreeding coefficient (F_x) of 0.0239 or 2.39% in the inbred NIC population and the similarity between parent and inbred progeny growth parameters suggest low inbreeding depression in this population for the traits studied and that inbreeding could be used to establish inbred lines of the Nigerian indigenous chicken which could then be used in crossbreeding schemes to improve productive traits in this population.

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