PHENOTYPIC CHARACTERISATION OF LOCAL-EXOTIC NAKED NECK CROSSBRED AND NORMAL FEATHERED CHICKEN POPULATION

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ABSTRACT
Phenotypic characterization of two phenotypes (normal feathered and naked neck) and two lines (white and brown) of local-exotic crossbred layer chickens was undertaken at 22 and 36 weeks of age. A total of 240 birds were randomly selected for the experiment. The sample comprised 120 males and 120 females with 60 birds per line (brown and white) and 30 birds per phenotype per line (naked neck and normal feathered). Data were collected twice at 22 weeks (during the period of sexual maturity) and at 36 weeks (peak performance). Qualitative traits (eye colour, comb type, comb colour, ear lobe colour, plumage colour, beak colour and shank colour), body weight (BW), and morphometric traits namely body width (BWd), body length (BL), shank length (SL), shank circumference (SC), comb length (CL) and wattle length (WL) were measured. Data on BW and morphometric traits were subjected to ANOVA and descriptive analysis was used for the qualitative traits assessed. Male chickens had significantly ($p<0.05$) heavier BW and higher morphometric traits than the females at both 22 and 36 weeks of age. This is because higher is preferred to heavier in describing morphometric traits. Chicken line has significant ($p<0.05$) effect on BW and BWd at 22 weeks and BL and SC at 36 weeks. Chicken phenotype also significantly ($p<0.05$) influenced BWd and SL at 22 weeks and BL, SL and SC at 36 weeks. Important interactions of sex, line and phenotype also exist for some of the morphometric traits. For the qualitative traits, the predominant comb type, comb colour, earlobe colour and eye colour were single comb (100%), red (76%), red (90%) and orange (82%), respectively. Body plumage was either white or brown for both lines. In conclusion, this study highlighted the phenotypic diversity within the local-exotic crossbred genetic resource.

Keywords: *morphometric traits, qualitative traits, normal feathered, variation*

INTRODUCTION
Poultry production has proven to be one of the means of alleviating poverty among people, especially, in rural settings since poultry is a major source of protein in human diet in terms of meat and eggs (Aswani *et al*., 2017). In developing countries, investments and policies regarding poultry production are seen to be mostly focused on using exotic breeds for production systems (FAO, 2007), whilst local and indigenous poultry breeds are usually avoided because of their relatively lower performance compared to the exotic breeds. Okantah *et al*. (2003) attributed this to the rapid population growth in developing countries and hence higher demand for poultry products leading to the increase use of high per-

forming birds. However, local chickens are reported to have some mutant traits that are useful for survival in hot and humid environments pertaining in the tropics (FAO, 1998). Among these mutant genes are the naked neck (*Na*), dwarf (*dw*), slow feathering (*K*), frizzle (*F*), silky (*h*), fayoumi (*Fa*) and fibromelanosis (*Fm*).

The improvement of domestic animals including chickens to meet human needs is dependent on variations within and between breeds which offer opportunities for selection and breeding. Without relevant information on a breed's or species' history, it is practically impossible to efficiently utilize, improve and conserve them (Gizaw *et al.,* 2011). According to Oguntunji *et al*. (2016), researchers widely use phenotypic diversity, morphological characters and indices which are easily assessed, cost effective and easy-to-measure to characterize, distinguish and assess inherent variations in farm animals.

There has been widespread crossbreeding of the different exotic breeds of chicken with indigenous chicken breeds in many households in the tropics. The crossbred chickens in the tropics have higher productivity in terms of meat and egg production (Kitalyi, 1997). For instance, hen -day egg production and hen house egg production were highest in naked neck-Rhode Island crossbred chickens compared to the respective pure breeds under southern Guinea Savanna rearing conditions in Nigeria (Amao, 2017). The growth performances of crossbred naked neck-Rhode Island Red chickens were higher than pure naked neck chickens under tropical climatic conditions (Alam *et al*., 2021).

Despite the numerous heterotic benefits of crossbreeding of the exotic and local chicken genotypes in the tropics, many countries do not have well-designed and structured crossbreeding programmes for these valuable genetic resources. These have resulted in indiscriminate crossbreeding of exotic and local chicken genotypes. Although there have been some studies on genetic and phenotypic characterizations of local chickens in the tropics (Guni and Katule, 2013; Maharani *et al*., 2021; Negasse *et al*., 2014), many of these studies have largely focused on the characterization of the purebred chicken genotypes or breeds (Maharani *et al*., 2021). In Ghana, several studies have been undertaken in breeding programmes aimed at developing highly productive chicken breeds using predominantly the local chicken breeds, especially the naked neck phenotype (Addison, 2013; Aboagye, 2016). However, not enough knowledge exists with regards to assessing the diversity of local poultry resources and phenotypically or genetically characterizing local chickens or locally developed chicken breeds especially crossbreds. More works probably need to be undertaken in characterization of chickens in our part of the world. This information is needed for the conservation and utilization of these valuable genetic resources. The objective of this study therefore was to phenotypically characterize local-exotic crossbred chicken lines in Ghana.

MATERIALS AND METHODS

Location and duration of the experiment

The study was undertaken at the Poultry Section of the Department of Animal Science at Kwame Nkrumah University of Science and Technology (KNUST). The study lasted for a period of five (5) months.

Experimental birds

The chickens used for the study were obtained from the Department of Animal Science (KNUST). These birds were local-exotic naked neck crossbred layers which were offspring of a seventh-generation cross between local naked neck cocks and exotic layers. The chicken stock was made up of both normal and naked neck birds of brown and white lines. The birds were 22 weeks at the time of the first phase of the experiment and 36 weeks during the second phase of the study.

Two hundred and forty (240) birds were randomly selected for this experiment. This comprised 120 cocks and 120 hens with 60 birds per line (brown and white) for each sex and 30 birds per phenotype (normal feathered and naked neck) per line.

Experimental procedure

Traits which were quantified and assessed on the experimental birds used were categorized into qualitative and morphometric traits. Data on both qualitative and morphometric traits were taken on individual birds twice during the period of the study. The first set of data was collected at 22 weeks when birds were presumed to have reached sexual maturity (Hagan *et al.,* 2013) and the second set of data was taken at 36 weeks of age during peak egg production period of the birds.

Data collection

The qualitative traits examined were comb colour, comb type, eye colour, ear-lobe colour, beak colour, wattle colour, shank colour and plumage colour. Direct visualization using FAO guidelines for phenotypic characterization of animal genetic resources (FAO, 2012) was employed in characterizing the qualitative traits. The morphometric traits used for characterizing the birds were recorded at 22 and 36 weeks of age for the different phenotypes and are defined below:

Shank circumference (SC) – measured as the distance around the shank.

Shank length (SL) – measured from the hock to the spur.

Comb length (CL) - measured from comb's attachment at the base on the beak to the posterior curve of the last spike.

Wattle length (WL) – measured from wattle's upper point of attachment to its lower point.

Body length (BL) – measured from the tip of the beak to the tip of the tail feathers.

Body width (BWd) – measured across the shoulders or wings of the birds.

In addition to the morphometric traits, body weight (BW) being weight of a bird was measured with an electronic weighing scale. Body weight was assessed in kilograms (kg) and linear body measurements were taken using a plastic flexible tape measure in centimetres (cm).

Statistical analysis

Data collected were organized in Microsoft Excel (2016). Body weight and the morphometric traits were subjected to Analysis of variance (ANOVA) using GLM procedure of Genstat software (11.1 Edition, 2008). Differences between means were considered significant at $p<0.05$ and were separated using Least Significant Difference (LSD). The model used for the analysis of morphometric traits at ages 22 and 36 weeks is presented below:

$$Y_{ijkl} = \mu + S_i + L_j + P_k + (SL)_{ij} + (SP)_{ik} + (LP)_{jk} + (SLP)_{ijk} + e_{ijkl}$$

Y_{ijkl} = observation of the l^{th} morphometric trait; μ = overall mean; S_i = fixed effect of the i^{th} sex of chicken (male or female); L_j = fixed effect of the j^{th} chicken line (brown or white line); P_k = fixed effect of the k^{th} chicken phenotype (normal feathered or naked neck); SL_{ij} = fixed effect interaction of the i^{th} sex and the j^{th} chicken line; SP_{ik} =fixed effect interaction of the i^{th} sex and the k^{th} chicken phenotype; LP_{jk} = fixed effect interaction of the j^{th} chicken line and the k^{th} phenotype; SLP_{ijk} = fixed effect interaction of the i^{th} sex, j^{th} chicken line and k^{th} chicken phenotype; e_{ijkl} = the random residual ~ $N(0, \sigma^2_e)$ where σ^2_e is the residual variance.

For the analysis of the qualitative traits, the data collected were coded and descriptive statistics used to analyze the data in the first phase of the study.

RESULTS AND DISCUSSION

Morphometric traits measured within the population at 22 and 36 weeks of age

Body weights at 22 and 36 weeks of age

At 22 weeks of age when birds were sexually matured, males weighed significantly heavier ($p<0.05$) than females (Table 1a). Kgwatalala and Segokgo (2013) reported similar findings in their work with Australorp-Tswana crossbred chickens and purebred indigenous Tswana chickens in Botswana. Several researchers have also reported important differences in matured body weights of male and female chicken populations in Africa (Dana *et al.,* 2010; Semakula *et* *al.,* 2011; Guni *et al*., 2013; Assefa and Melesse, 2018). The observed difference in BW between male and female chickens in this study could be attributed to sexual dimorphism in BW. Kgwatalala and Segokgo (2013) indicated the presence of sexual dimorphism in chicken BW at 10 weeks of age and attributed this to enhanced secretion of male sex hormones, androgen, that promote rapid growth. Singh *et al.* (1982) reported that heterotic effect of growth by crossbred males is more pronounced than their female counterparts. Nwenya *et al*. (2017) and Kadigi *et al.* (1998) also reported similar results of sexual dimorphism in BW in crossbred chicken populations in the tropics.

Between chicken lines, the white birds were significantly heavier ($p<0.05$) than the brown birds. It was observed that amongst the brown chicken line, birds were pecking each other, particularly amongst the naked neck phenotype and this affected feed intake and consequently weight gain. This phenomenon, however, was rare amongst the white chicken line. No significant differences ($p>0.05$) were recorded in BW between the two phenotypes even though naked neck birds are noted for their numerical superiority over their normal feathered counterparts in most production parameters.

At 36 weeks of age, males recorded higher ($p<0.05$) body weights than females. Adomako (2009) reported average 6 months' body weights of 1.54 kg and 1.18 kg for male and female normal feathered chickens, respectively; and 1.59 kg and 1.30 kg for male and female naked neck phenotypes, respectively. No significant differences ($p>0.05$) in BW at 36 weeks were recorded between chicken lines and chicken phenotypes.

Significant interactions of line*phenotype ($p=0.032$) and line*phenotype*sex ($p=0.003$) existed for BW at 22 weeks of age as depicted by their p-values (Table 1b). White naked neck birds weighed heavier ($p<0.05$) than other groups of birds. Similarly, white naked neck male birds were heavier than the brown normal feathered female birds. Significant interaction of line*phenotype*sex ($p=0.006$) also existed for BW at 36 weeks of age. Brown normal feathered males were the heaviest ($p<0.05$) at 36 weeks within the flock. Benyi *et al.* (2015) and Akinsola *et al.* (2019) have both reported significant genotype*sex interaction in body weights of broiler chickens.

Body Width

Male chickens recorded significantly ($p<0.01$) higher BWd values at both 22 and 36 weeks of age than female chickens (Tables 1a and 2a). In the physiology of chickens, males tend to be larger than females and therefore score higher values when measuring linear body parameters. This is as a result of sexual dimorphism (Kgwatalala and Segokgo, 2013) in animals. The white line chickens also showed superiority ($p<0.05$) in BWd over the brown line chickens. This could partly be attributed to the pecking phenomenon amongst the brown line chickens which led to reduction in feed intake and subsequently body size.

Between the two chicken phenotypes, normal feathered chickens recorded significantly ($p<0.05$) higher BWd than naked neck chicken phenotype. The differences in BWd due to chicken phenotype observed in this study agrees with Nwenya *et al*. (2017) who reported differences in body width of frizzle-naked neck crossbred chickens in Nigeria after 8 weeks of age.

No significant differences ($p>0.05$) in BWd were recorded between chicken lines and chicken phenotypes at 36 weeks of age. Significant line*sex interaction was also observed in BWd at 22 weeks ($p=0.019$) and 36 weeks ($p=0.002$) (Tables 1b and 2b). The significant interaction of line*sex in the present study corroborates the findings of Fayeye *et al*. (2014) that significant interaction of sex*genotype was present in body length of Isa Brown and Ilorin ecotype chickens.

Body Length

Male chickens recorded longer ($p<0.05$) BL at 22 and 36 weeks of age compared to the female chickens (Tables 1a and 2a). This is an addition-al indication of sexual dimorphism between sexes as males tend to be longer than females. There were no significant differences (*p>0.05*) in BL for chicken line and phenotype at 22 weeks but not 36 weeks of age.

Among all the traits studied, BL showed the highest percentage increment of about 22% between ages 22 and 36 weeks suggesting that chickens generally appear longer at peak lay period.

There were no significant interactions observed among the factors studied except for the significant interaction between sex*phenotype for BL at 36 weeks of age (Tables 1b and 2b). This is contrary to the results of Fayeye *et al.* (2014) who reported significant interaction of sex*genotype for body length in chicken ecotypes in Nigeria.

Table 1a: Effects of sex, chicken line and chicken phenotype on body weight and morphometric traits of chickens at 22 weeks of age

Factor	Traits (cm)						
	BW (kg)	BWd	BL	SL	SC	CL	WL
Sex							
Male	2.083[a]	14.258[a]	41.300[a]	11.442[a]	5.221[a]	8.775[a]	3.868[a]
Female	1.440[b]	11.000[b]	34.860[b]	8.972[b]	1.954[b]	4.090[b]	1.786[b]
s.e.d	0.029	0.103	0.366	0.094	0.049	0.179	0.110
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chicken Line							
White	1.807[a]	12.850[a]	37.920	10.233	3.633	6.579	2.915
Brown	1.717[b]	12.408[b]	38.240	10.183	3.542	6.286	2.739
s.e.d	0.029	0.103	0.366	0.094	0.049	0.179	0.110
p-value	0.002	<0.001	0.376	0.597	0.064	0.103	0.111
Phenotype							
Normal feathered	1.755	12.758[a]	38.140	10.046[b]	3.602	6.282	2.623[b]
Naked neck	1.768	12.500[b]	38.020	10.371[a]	3.572	6.583	3.032[a]
s.e.d	0.029	0.103	0.366	0.094	0.049	0.179	0.110
p-value	0.649	0.013	0.733	<0.001	0.542	0.093	<0.001

[1]*BW= body weight; BWd= body width; BL= body length; SL= shank length; SC= shank circumference; CL= comb length; WL= wattle length*
[2]*Means within the same column with different superscripts are significantly different (p<0.05)*

Table 1b: The *p-values* for the effects of sex*chicken line (S*L), sex*phenotype (S*P), chicken line*phenotype (L*P) and sex*chicken line*phenotype (S*L*P) on body weight and morphometric traits of chickens at 22 weeks of age

Factor	BW	BWd	BL	SL	SC	CL	WL
S*L	0.733	0.019	0.481	0.724	1.000	<0.001	0.004
S*P	0.570	0.808	0.982	0.043	0.146	0.845	0.427
L*P	0.032	0.225	0.768	0.018	0.685	0.048	0.065
S*L*P	0.003	0.808	0.247	0.135	0.361	<0.001	0.003

Shank Length

Male chickens had longer ($p<0.05$) SL than female chickens at both 22 weeks (Table 1a) and 36 weeks (Table 2a). Shank length is an indicator of leg development (Fayeye *et al.,* 2014), therefore longer SL in male chickens was needed to support the bigger body sizes of male birds compared to female birds. There were no significant differences ($p>0.05$) between chicken lines for SL at 22 and 36 weeks. There were, however, significant differences ($p<0.05$) in SL between chicken phenotypes at 22 and 36 weeks. At both 22 and 36 weeks of age, naked neck chicken had longer ($p<0.05$) SL than normal feathered chickens.

Significant interactions ($p<0.05$) of sex* phenotype and line*phenotype exist for SL at 22 and 36 weeks (Tables 1b and 2b). However, no significant sex*line interaction ($p>0.05$) was observed for SL at both 22 and 36 weeks. This is contrary to the significant effect of sex* genotype interaction on SL at day-old to 9 weeks

Table 2a: Effects of sex, chicken line and chicken phenotype on body weight and morphometric traits (cm) of chickens at 36 weeks of age

	Traits						
Factor	**BW (kg)**	**BWd**	**BL**	**SL**	**SC**	**CL**	**WL**
Sex							
Male	2.437^a	14.808^a	53.700^a	11.808^a	5.650^a	11.134^a	5.820^a
Female	1.862^b	11.142^b	39.020^b	9.046^b	2.067^b	5.643^b	2.980^b
s.e.d	0.022	0.099	0.278	0.092	0.051	0.128	0.268
p-value	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chicken Line							
White	2.130	12.992	47.400^a	10.342	3.916^a	8.363	4.560
Brown	2.168	12.958	45.330^b	10.513	3.802^b	8.413	4.240
s.e.d	0.022	0.099	0.278	0.092	0.051	0.128	0.268
p-value	0.085	0.736	<0.001	0.066	0.025	0.697	0.223
Phenotype							
Normal feathered	2.133	13.042	46.680^a	10.296^b	3.967^a	8.347	4.220
Naked neck	2.165	12.908	46.050^b	10.558^a	3.751^b	8.430	4.580
s.e.d	0.022	0.099	0.278	0.092	0.051	0.128	0.268
p-value	0.154	0.178	0.024	0.005	<0.001	0.517	0.176

[1]BW= body weight; BWd= *body width; BL= body length; SL= shank length; SC= shank circumference; CL= comb length; WL= wattle length*
[2]*Means within the same column with different superscripts are significantly different (p<0.05)*
[3]*s.e.d - standard error of difference*

Table 2b: The *p-values* for the effects of sex*chicken line (S*L), sex*phenotype (S*P), chicken line*phenotype (L*P) and sex*chicken line*phenotype (S*L*P) on body weight and morphometric traits of chickens at 36 weeks of age

Factor	BW	BWd	BL	SL	SC	CL	WL
S*L	0.006	0.002	0.511	0.054	0.019	<0.001	0.591
S*P	0.002	0.866	<0.001	0.018	0.009	<0.001	0.005
L*P	<0.001	0.613	0.742	0.008	0.032	0.012	0.190
S*L*P	0.006	1.000	0.881	0.300	0.882	0.012	0.878

reported by Ajayi and Ejiofor (2009). The differences could be partly attributed to the differences in the ages of the experimental birds used in the two studies.

Shank Circumference

The male chickens recorded wider ($p<0.05$) shanks than the female chickens at 22 weeks (Table 1a). Similar to SL, SC is also an indicator of leg development hence the wider SC of male chickens help to support their relatively bigger body weight and size. At 36 weeks, SC was significantly higher ($p<0.05$) in males than females (Table 2b). The important effect of sex on SC corroborates that of Tadele *et al.* (2018) in indigenous chicken populations in Kaffa zone, South Western Ethiopia. In addition, chicken line and phenotype also had significant effects ($p<0.05$) on SC at 36 weeks but not 22 weeks. The white chicken line had wider ($p<0.05$) shanks than the brown line whilst the normal feathered phenotype showed superiority in SC over the naked neck phenotype. There were no significant interactions among the factors for SC at 22 weeks. However, there were significant interaction of sex*line, sex*phenotype and line*phenotype on SC at 36 weeks.

Comb Length

Males had larger combs than females ($p<0.05$) at both 22 weeks (Table 1a) and 36 weeks of age (Table 2a). The comb and wattle are two physical sexual features that are more prominent in male chickens than female chickens. Comb size and colour have been associated with fertility in cocks (Talebi *et al.,* 2018). However, few studies have reported negative correlation between comb size and sperm mobility (Graves *et al.,* 1985; Parker *et al.,* 2006; Navara *et al.,* 2012). Such findings are strain specific and therefore not so conclusive. Comb size, however, affects the dominance status of male birds as males with bigger combs are high up at the pecking order and have easy access to females for mating. Phenotypes and lines did not have significant effect ($p>0.05$) on CL at both 22 and 36 weeks. Significant interactions existed between and among all the factors studied except the effect of sex*phenotype ($p=0.845$) on CL at 22 weeks.

Wattle Length

Significant differences were recorded in length of the wattles of males and females, with the males possessing significantly ($p<0.05$) longer wattles at 22 and 36 weeks. Wattles have a more aesthetic function in birds where males with prominent wattles easily gaining or attracting the attention of females (Zuk *et al.,* 1995; Bilcik and Estevez, 2005) for mating purposes. Phenotype also had significant ($p<0.05$) effect on WL at 22 weeks with naked neck birds having longer wattles compared to normal feathered birds. Chicken line did not have significant effect ($p>0.05$) on WL at both 22 and 36 weeks. There was significant ($p<0.05$) effect of sex*phenotype interaction on WL at 36 weeks but not 22 weeks. Sex*line and sex*line*phenotype also had significant effects ($p<0.05$) on WL at 22 weeks of age but not 36 weeks. Significant genotype*sex interaction on wattle length has been reported in local and exotic chicken genotypes in Northern

Ethiopia (Markos *et al.,* 2021) which supports the findings in this study.

Qualitative traits within the population

The qualitative traits measured within the chicken flock studied are presented in Table 3. All birds had single comb type corroborating the findings of Onasanya *et al.* (2018) who reported 99.3% single comb type in indigenous chicken populations across 6 states in Nigeria. Two comb colours were identified in the chicken population being bright red and red. Majority of the males (87%) and females (66%) had bright red combs with red combs being less frequent. Comb colour of birds is an indicator of the health or vigor of birds, especially in male chickens; as this can be used in mating assessment of males. Bright coloration of comb in birds is linked with better fertility in male birds with respect to good semen quality and sperm performance (Graves *et al.,* 1985; Navara *et al.,* 2012). The majority of chickens in this population having bright red coloured comb suggest that many of the birds in this study were fertile.

The variations in ear lobe colour, red and red interspersed with white (R_w), of the chicken population studied is fewer than the multiple variations in ear lobe colour of Ethiopian village chicken population (Desta *et al.,* 2013). Females (92.5%) recorded higher numbers of red ear lobe colour compared to males (87.5%). Males, however, had higher incidence of R_w (12.5%) than females (7.5%) in the population.

Two eye colour variants were identified in this study. These were orange colour which is the majority variant among the males (100%) and females (64%) and pale orange variant occurring in 36% of the females. Brown *et al.* (2017), however, observed four colour variants in local chicken population in Tamale, northern Ghana with orange eye colour also being in the majori-

Table 3: Percentage occurrence of qualitative traits in the chicken population studied

Parameter		% of occurrence	
		Males	Female
Comb type	Single	100	100
Comb colour	Bright red	87	66
	Red	13	34
Ear lobe colour	Red	87.5	92.5
	Red_w	12.5	7.5
Eye colour	Orange	100	64
	Pale orange	0	36
Beak colour	White	50	50
	Brown	50	50
Shank colour	White	100	82.5
	$White_{br}$	0	17.5
Plumage colour	White	50	47
	$White_b$	0	3
	Dark brown	48	43
	Brown	2	7

[1] *$White_b$=white plumage interspersed with brown, $White_{br}$= white with brown scales, Red_w= Red interspersed with white*

ty in both male and female birds in the population. The relatively few variants for eye colour in this study compared to Brown *et al*. (2017) could be partly attributed to the closed nature of the experimental flock used in this study compared to the local chicken population of Tamale.

The colour variations for beak colour in this study were white and brown. The occurrence of both phenotypes was 50% each in both males and females. Interestingly, all the white chicken line birds possessed white beak and the brown chicken line possessed brown beak. Brown *et al.* (2017) and Ogbu (2021) both reported multiple beak colour variants in local chicken populations in Ghana and Nigeria, respectively. In both studies, black beak colour was the most abundant colour variant.

Shank colour showed a similar variation. Two shank colour variants were also observed in this study. These were white and white with brown scales ($White_{br}$). All males had white shank colour whilst 82.5% of the females showed white shank colour and 17.5% of females expressed the $White_{br}$ variation. Other studies have, however, reported more than two colour variants for shank (Brown *et al.,* 2017; Ogbu, 2021).

Four colour variants were identified for plumage colour: white, white interspersed with brown ($White_b$), dark brown and brown. This suggests there is greater diversity in plumage colour of crossbred chicken population. White colour was the major plumage colour variant in both males (50%) and females (47%). Dark brown was the next most common plumage colour in both male (48%) and female (43%) chickens in the experimental population studied. Brown *et al.* (2017) have also reported white plumage colour as the most occurring colour in local chicken population in Ghana. However, Daikwo *et al*. (2011) observed brown plumage colour as the most predominant colour in local chickens in Nigeria. The multiple plumage colour variants in the present study corroborates other studies of chicken populations in the tropics (Negassa *et al.,* 2014; Brown *et al.,* 2017; Ogbu, 2021).

CONCLUSION

Generally, male chickens recorded higher values for body weight and morphometric traits than female chickens in this population due to the sexual dimorphism that exist in chicken. Among the females, the white chicken line recorded higher values for linear body measurements than the brown chicken line; whereas in the males, brown line showed superiority over the white line. This indicates that genotype*sex interaction is important in the local chicken population. There were generally few variants for many of the qualitative traits studied in the chicken population due to probably the closedness of the experimental population.

Molecular characterization of the population should be explored. This will give an in-depth understanding of the traits of importance and what contributes to their expression at the molecular level. Such information would be useful in the design and implementation of appropriate breeding programmes for improvement of local chickens.

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