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Phenotypic characteristics of local chickens in Dass and Tafawa Balewa local government areas of Bauchi State, Nigeria

[1]Shuaibu, A., [1]Ma'aruf, B. S., [1]Maigado, A. I., [2]Abdu, I., [1]Ibrahim, Y. and [3]Mijinyawa, A.

[1]Department of Animal Science, Faculty of Agriculture, Federal University of Kashere, Gombe P. M. B. 0182 Gombe State
[2]Department of Animal Production, Faculty of Agriculture and Agricultural Technology, Abubakar Tafawa Balewa University, P. M. B. 0248, Bauchi State
[3]Department of Animal Production, School of Agriculture, Federal polytechnic Bauchi, P. M. B. 0231, Bauchi State

Corresponding Author: *ashuaibu1984@gmail.com* ***Phone Number:*** *+2348034948947*

Target Audience: *Breeders, Poultry scientists and Farmers*

Abstract

The study was conducted in Dass and Tafawa Balewa local government areas of Bauchi State, between January and April 2018 to determine some characteristics of local chickens. A total of 400 matured chickens of mixed sex were used to determine the following morphometric traits; live weight (LW), wing span (WSP), body length (BL), girth circumference (GC) and shank length (SHL). Most of the birds available for the study were normal feathered (80.75 %), single combed (94.50 %), orange eyed (81.50 %), had white ear lobes (43.75 %), milky shanks (37.75 %) and red plumage (36.75 %), while the fewest types were frizzled (7.50 %), rose combed (5.50%), Brown eyed (2.50%), those with red ear lobes (22.75 %), ash shank (2.00 %), and blue plumage (1.00 %). Single combed (95.60%), orange eyed (84.10%) had white skin (98.60%) white ear lobe (44.50%), pink shank (36.00%) and red plumage (38.8%) and the fewest were rose combed (4.40%), brown eyed (1.10%), yellow skinned (1.40%), those with red ear lobe (22.31%), ash shanked (1.10%) and those with blue plumage (0.50%). Data generated on morphometric traits were analyzed using analysis of variance and Pearson's correlation analysis was used in the estimation of relationships among the measurements (morphometric traits). The overall mean of 1.67 kg, 43.19 cm, 41.27 cm, 31.49 cm and 10.19 cm for LW, WSP, BL, GC and SHL were estimated. Sex had effect on all the parameters recorded. Males were significantly heavier than female (1.79 vs 1.55 kg; $p<0.001$) and had wider girth ($p< 0.001$), longer wings ($p<0.05$), body ($p<0.01$) and shank ($p<0.05$). Non-significant effect of location, genotype and qualitative body traits (comb type, plumage, eye, ear lobe and shank colours) were however observed on most parameters. The correlation coefficients among the morphometric traits were high, positive and significant indicating that they can predict each other specifically during selection.

Keywords: *Morphometric traits, Local chickens, Correlation and Selection*

Description of Problem

Indigenous chicken is used to describe birds kept in a certain location under extensive management; scavenging the free-range, indescript, multi-purposed and unimproved (1). In Africa, they are also referred to as family chickens or Sahel chickens (2). These highly adapted creatures are found throughout the regions of Nigeria and in every culture. Indigenous chickens form part of the agricultural activities among rural communities, although farmers regard them as secondary to the other activities such as crop, cattle, sheep and goat production. Therefore indigenous chickens are mostly under the management of women (3)

Research reports from different parts of Nigeria indicated that, the local chicken exhibit less than optimum productivity (slow growth rate, late maturity, few egg yield, small sized eggs, extended reproduction cycle and inter-clutch and high mortality) (4) and had adaptive features that predisposed them to local environment (5). These include relatively small adult body size, flighty nature, thick egg shells and the presence of some major genes affecting their feather structure and distribution. Local chickens and eggs are preferred by most consumers because they are tastier and suitable for traditional sauces due to the deep yellow coloured yolks (6). Nigeria is endowed with numerous domestic animal species which are indigenous to her. These animals have lived, adapted and reproduced for centuries under the Nigerian environment (7). They, therefore, constitute untapped genetic resources capable of being developed into modern improved breeds and strains. Over the years the Nigerian ruminant species have developed into fairly uniform breeds e.g Bunaji and Gudali in cattle, Uda and Yankasa in sheep and, West African Dwarf and Red Sokoto in goats. Except for a few strains e.g Fulani ecotype and dwarfs among the local fowl that are being identified, the poultry species, especially the indigenous chickens are essentially indescript. Therefore, the need to characterize indigenous chickens for selection purposes arises. This study was therefore intended describe the morphometric characteristics of local chicken population in Dass and Tafawa Balewa local government areas.

Materials and Methods

Location

The study was conducted at Dass and Tafawa Balewa Local Government Areas of Bauchi State from January to April 2018. Bauchi State occupies a total land area of 49,119 km^2 representing about 5.3% of Nigeria's land mass and is located between latitude 9^0 3' and 12^0 3' north and longitude 8^0 50' and 11^0 east (8). Bauchi state is bordered by seven states, Kano and Jigawa to the north, Taraba and Plateau to the south, Gombe and Yobe to the east and Kaduna to the west.

Climate and vegetation

The rainfall in Bauchi state ranges between 1300 mm per annum in the south and only 700 mm in the extreme north (9). The rain fall is usually due to the moisture laden south westerly winds. The rain therefore starts earlier (April) in southern part of the state and varies to June and July in the more northerly areas. The average relative humidity, daily sunshine hours and temperature values range between 35 - 94 % for months of February and August, 5.0 - 10.0 hours in August and November and 36.6 – 12.8^0 C during April and December, respectively.

It spans three vegetation zones, namely, northern guinea, Sudan and Sahel savannahs (8). The northern guinea savannah consists of thick barked trees of medium height dominated by *Isoberlinia spp* and short grasses mainly *hyperrhenia*/ *Andropogon spp*. The sudan savannah is essentially grass land vegetation with a few scattered short trees. *Combinbretum Acacia* and *Comphora spp* are the most common trees while *Andropogon gayanus* is the dominant grass. The sahel savannah also known as semi-desert extend from the middle to extreme north of the state (8). Generally the vegetation is not uniform and grasses are short (8). Prolonged human activities in the form of continuous bush burning, perennial cultivation, settlement activities have changed the natural vegetation into an open landscape with scattered trees preserved for their economic values. This has resulted in what is popularly referred to as parkland vegetation (9). The south-western part of the state is mountainous, a continuation of the Jos Plateau.

Table 1: Proportions of the various qualitative body traits observed

Qualitative traits	N	%
Genotype		
Normal feather	323	80.75
Naked neck	47	11.75
Frizzled feather	30	7.50
Sex		
Male	60	15.00
Female	340	85.00
Comb type		
Single	378	94.50
Rose	22	5.50
Eye colour		
Orange	326	81.50
Red	64	16.00
Brown	10	2.50
Ear lobe colour		
Red	91	22.75
White	175	43.75
Red and white	134	33.50
Plumage colour		
Red	147	36.75
White	48	12.00
Silver	74	18.50
Black	31	7.75
Gold	17	4.25
Buff	17	4.25
Barred	8	2.00
Red and mottled	34	8.50
White and mottled	7	1.75
Silver and mottled	6	1.50
Black and mottled	7	1.75
Blue	4	1.00
Shank colour		
Yellow Yellow	102	25.50
White	88	22.00
Milky	151	37.75
Black Black	51	17.75
Ash	8	2.00

N = Number of observation % = Percentage

Table2: Average live weight (kg) and linear body measurements (cm) according to location, genotype, sex and comb type

	Parameters				
Factors	LW	WSP	BL	GC	SHL
Overall mean ± SE	1.67±0.26	43.19±1.11	41.27±0.87	31.49±1.04	10.19±0.42
Location	*	NS	NS	NS	NS
Bakin kogi	1.70±0.31[a]	43.15±0.83	40.66±0.88	31.45±0.79	10.25±0.29
Bagel	1.58±0.33[b]	42.10±1.32	41.88±1.64	31.53±1.46	10.14±0.54
Gital	1.71±0.27[a]	43.30±0.99	39.93±0.54	30.80±0.88	10.10±0.26
Bununu	1.72±0.24[a]	42.21±1.19	42.61±0.92	332.18±1.07	10.29±0.41
Genotype	*	NS	NS	NS	NS
Normal feathered	1.72±0.11[a]	42.98±1.05	40.81±0.92	31.75±0.47	10.17±0.25
Naked neck	1.65±0.15[b]	43.09±1.12	41.47±1.05	31.60±0.55	10.51±0.23
Frizzled	1.64±0.28[b]	43.50±1.26	41.53±1.19	31.13±0.77	9.90±0.29
Sex	***	*	**	***	*
Male	1.79±0.29	46.05±1.09	45.34±1.01	32.29±1.34	11.78±0.46
Female	1.55±0.23	40.33±0.97	37.20±1.11	30.08±0.82	8.61±0.37
Comb type	*	NS	NS	***	NS
Single	1.71±0.17	43.28±0.96	41.24±1.59	33.09±0.74	11.11±0.13
Rose	1.63±0.24	43.10±0.78	41.30±0.81	31.90±1.02	9.28±0.28

LW = Live weight, WSP = Wing span, BL = Body length, GC = Girth circumference, SHL = Shan k length, * = P<0.05, ** = P<0.01, *** = P<0.001 and NS = Non-significant

Experimental bird and management

A total of 400 matured local chickens (60 males and 340 females) were used for this study, out of which 323 were normal feathered, 47 naked neck and only 30 frizzled. The birds were obtained from 67 randomly selected households in four villages of Dass (Bagel and Bakin kogi) and Tafawa Baewa (Bununu and Gital) local government areas. The number used was determined according to the following expression by (44).

$$n = \frac{N}{1+N\,(e)^2} \quad - \quad - \quad - \quad - \quad (1)$$

n = sample size
N = population size
e = level of precision

$$n = \frac{100{,}000}{1+100{,}000(0.05)^2}$$

n = 398

If the population size is >100,000 to ∞, the sample size will be = 400 (10).

As routine management on the field, chickens were fed cereal grains and bran (dusa) in the morning and evening; left overs were also fed. They usually have access to insects, earthworm and fresh succulent grasses especially during the rainy season. During this period, productivity and reproductivity are

high. Most of the rearers were women and children. In the study areas, chickens were housed in mould buildings with roofs of thatched grasses. One of the major constraints to poultry production in the rural areas was disease outbreak, the commonest being Newcastle. This disease is traditionally thought to be controlled using powdered red pepper or bitter leaves (shuwaka) in drinking water. Other diseases such as pox and bronchitis were also treated using red pepper. Endo and ecto-parasites were cured using bitter leaves and paraffin, respectively.

Table 3: Average live weight (kg) and linear body measurements (cm) according to plumage colour

	Parameters				
Factor	LW	WSP	BL	GC	SHL
Overall mean ± SE	1.67±0.26	43.19±1.11	41.27±0.87	31.49±1.04	10.19±0.42
Plumage colour	NS	NS	NS	NS	NS
Red	1.52±0.22	43.75±1.57	41.17±1.05	31.49±0.94	10.08±0.35
White	1.56±0.23	43.48±1.70	41.66±1.14	31.49±1.02	10.36±0.38
Silver	1.78±0.22	43.42±1.56	42.08±1.04	31.62±0.93	10.22±0.35
Black	1.66±0.25	41.63±1.71	41.34±1.15	31.01±1.02	9.83±0.38
Gold	1.69±0.31	43.22±1.95	42.01±1.31	32.53±1.17	10.44±0.43
Buff	1.55±0.37	45.14±1.93	39.30±1.29	32.11±1.15	10.41±0.43
Barred	1.59±0.28	40.84±2.38	40.83±1.60	30.71±1.42	10.09±0.53
Red & mottle	1.71±0.21	44.88±1.74	41.53±1.60	31.55±1.04	10.22±0.39
White & mottle	1.74±0.19	42.46±2.50	41.66±1.67	31.07±1.49	10.21±0.55
Silver & mottle	1.75±0.20	42.50±2.70	42.31±1.81	32.44±1.62	10.80±0.60
Black & mottle	1.76±0.34	41.60±2.56	39.85±1.71	30.37±1.53	9.54±0.57
Blue	1.73±0.26	45.27±3.49	41.51±2.34	31.59±2.09	10.15±0.77

LW = Live weight, WSP = Wing span, BL = Body length, GC = Girth circumference, SHL = Shank length and NS = Non-significant

Data collection

Live weight and four linear body measurements were recorded. They include; wing span, body length, girth circumference and shank length:

Live weight: This was recorded using electronic weighing scale (with an accuracy of 0.01 g)

Wing span: This was the distance between the two tips of the wings when stretched gently.

Body length: It was determined using a measuring tape from the nasal opening, along the gently stretched neck and back to the tip of the uropygial (oil) gland.

Girth circumference: was measured using a measuring tape looped round the region of the breast under the wing.

Shank length: This was the distance between the foot pad and the hock joint.

On the other hand, the qualitative traits observed were comb type, eye, ear lobe, plumage and shank colours.

Data analysis

Data generated were subjected to analysis of variance (ANOVA) using the general linear model (GLM) procedure of SPSS, version 22 (2013)(11). Significantly different means were compared using the Duncan multiple range test (DMRT). The model utilized was as follow:

$\mathbf{Y}_{ijklmnop} = \boldsymbol{\mu} + \mathbf{L}_i + \mathbf{G}_j + \mathbf{S}_k + \mathbf{C}_l + \mathbf{P}_m + \mathbf{E}_n + \mathbf{EL}_o + \mathbf{Sh}_p + \mathbf{e}_{ijklmnop}$ - - -(2)

$\mathbf{Y}_{ijklmnop}$ = Observation on dependent variables

$\boldsymbol{\mu}$ = Common Mean

$\mathbf{L}_i$ = effect of j^{th} location

$\mathbf{G}_j$ = effect of i^{th} genotype

$\mathbf{S}_k$ = effect of k^{th} sex

$\mathbf{C}_l$ = effect of l^{th} comb type

$\mathbf{P}_m$ = effect of m^{th} plumage colour

$\mathbf{E}_n$ = effect of n^{th} eye colour

$\mathbf{EL}_o$ = effect of o^{th} earlobe colour

$\mathbf{Sh}_p$ = effect of p^{th} shank colour

$\mathbf{e}_{ijklmnop}$ = random error term

The relationships among the morphometric traits (live weight and linear body measurements) were estimated using Pearson's correlation analysis.

Table 4: Average live weight (kg) and linear body measurements (cm) according to eye, ear lobe and shank colours

		Parameters			
Factors	LW	WSP	BL	GC	SHL
Overall mean ± SE	1.67±0.26	43.19±1.11	41.27±1.87	31.49±1.04	10.19±0.42
Eye colour	NS	NS	NS	**	NS
Orange	1.60±0.28	43.18±1.40	41.37±0.94	30.32±0.84^{b}	10.07±0.31
Red	1.62±0.27	42.23±1.54	41.67±1.04	31.20±0.92^{ab}	10.30±0.34
Brown	1.79±0.31	44.16±2.71	40.77±1.82	32.87±1.62^{a}	10.21±0.60
Ear lobe colour	*	NS	NS	NS	NS
Red	1.76±0.12^{a}	43.02±1.70	41.44±1.14	31.66±1.02	10.12±0.38
White	1.53±0.24^{b}	43.07±1.61	41.06±1.08	31.31±0.96	10.22±0.36
Red/White	1.72±0.19^{ab}	43.48±1.66	41.32±1.11	31.52±0.99	10.25±0.37
Shank colour	NS	NS	NS	*	NS
Yellow	1.65±0.43	42.63±1.58	41.96±1.06	30.79±0.95^{ab}	10.11±0.35
White	1.68±0.29	42.52±1.60	41.82±1.07	32.55±0.95^{a}	10.20±0.36
Milky	1.72±0.21	43.95±1.62	41.46±1.08	32.33±0.97^{b}	10.13±0.36
Black	1.63±0.07	43.09±1.61	40.69±1.08	31.45±0.96^{b}	10.29±0.36
Ash	1.69±0.23	43.75±2.77	40.43±1.86	30.32±1.66^{bc}	10.24±0.61

LW = Live weight, WSP = Wing span, BL = Body length, GC = Girth circumference, SHL = Shank length, * = P<0.05, ** = P<0.01 and NS = Non-significant

Table 5: Phenotypic correlation coefficients among the morphometric traits in male local chickens

Parameters	1	2	3	4	5
LW (1)	1	0.24**	0.69**	0.72**	0.55**
WSP (2)		1	0.22**	0.48**	0.19*
BL (3)			1	0.65**	0.49**
GC (4)				1	0.63**
SHL (5)					1

** = P<0.01 (Significant at 1%) and * = P<0.05

Table 6: Phenotypic correlation coefficients among the morphometric traits in female local chickens

Parameters	1	2	3	4	5
LW (1)	1	0.17**	0.53**	0.68**	0.32**
WSP (2)		1	0.27**	0.36**	0.11NS
BL (3)			1	0.57**	0.52**
GC (4)				1	0.60**
SHL (5)					1

NS = Non-Significant and ** = P<0.01

Results

The numbers and percentages of qualitative characters are shown in Table 1. The Table revealed that most of the chickens available for the study were normal feathered (80.75 %), mostly females (85.00 %), single combed (94.50 %), orange eyed (81.50 %), had white ear lobes (43.75 %), milky shanks (37.75 %) and red plumage (36.75 %), while the fewest types were frizzled (7.50 %), rose combed (5.50%), Brown eyed (2.50%), those with red ear lobes (22.75 %), ash shank (2.00 %), and blue plumage (1.00 %). Average live weight and linear body measurements according to location, genotype, sex and comb type are presented in Table 2. Except on live weight, location and genotype had no significant effect on the quantitative traits recorded. Bununu had the highest for this trait, while the least value was recorded in Bagel (1.72±0.24 kg vs 1.58±0.33 kg; $p<0.05$). Similarly, heaviest chickens were observed in normal feathered strain (1.72±0.11 kg), whereas lightest birds (1.64±0.28 kg) were found frizzled feathered type. Significant effect of sex on live weight ($p<0.01$), wing span ($p<0.05$), body length ($p<0.01$), girth circumference ($p<0.001$) and shank length ($p<0.05$) was evident. Heavier birds with higher wing span, body length, girth circumference and shank length were recorded in males, whereas lighter birds with lower wing span, body length, girth circumference and shank length were observed in females

(1.79±0.29 kg, 46.05±1.09 cm, 45.34±1.01 cm, 32.29±1.34 cm and 11.78±0.46 cm vs 1.55±0.23 kg, 40.33±0.97 cm, 37.20±1.11 cm, 30.08±0.82cm and 8.61±0.37 cm). Influence of comb type on live weight ($p<0.05$) and body length ($p<0.001$) was observed. Single combed chickens had higher values than the rose type (1.71±0.17 kg and 31.90±1.02 cm vs 1.63±0.24 kg and 33.09±0.74 cm, respectively). Non-significant effect of comb type on wing span, girth circumference and shank length was however observed. Average live weight and linear body measurements according to plumage colour are shown in Table 3. This qualitative body trait (plumage colour) had no effect on all the parameters recorded (live weight and linear body measurements). Averages of live weight and linear body measurements according to eye, ear lobe and shank colours are presented in Table 4. Significant effect of eye colour was only observed on girth circumference ($p<0.01$). Brown eyed chickens had the widest girth, followed by those with red and orange eye colour (32.87±1.62 cm vs 31.20±0.92 and 30.32±0.85 cm). Ear lobe colour was found to have significant effect on live weight ($p<0.05$). Chickens with red ear lobe had the highest (1.76±0.12 cm) weight while those with white had the lowest (1.72±0.19 cm). Shank colour had considerable effect on girth circumference ($p<0.05$) but did not in any way influence other body traits such as live weight, wing span, body and shank lengths. Girth circumference of 32.33±0.97 cm in milky shanked chickens was highest, whereas 30.32±1.66 cm for those having ash colour had the lowest value. The correlation coefficients among the morphometric were as shown in Table 5 and 6. The coefficients among the measurements were in general positive, moderate to high and significant except between wingspan and shank length in females where low and non-significant value (0.11) was observed.

Discussion

Most of the chickens in the study area were normal feathered. This is in agreement with (12) who observed three feather types: normal, naked neck and frizzled (at 91.8, 3.0 and 5.2 %, respectively) in Bayelsa State, Nigeria. The frequent occurrence of normal feathered chickens may be due to rearers preference for it (13) and the fact that the other major genes are mutants (14) and naturally lower in a population. (15) also reported that naked neck and frizzle feathered chickens are majorly only used for social and traditional purposes, rituals and sacrifices in some parts of the country. They further opined that farmers consider frizzled and naked neck chickens as ugly and irritating and are raised only by the aged and for occult purposes. Single was the highest occurring comb type while rose was fewest. The results are similar to the findings of (13) in Makurdi, Nigeria, (16) and (17) but different from the report by (18). That single combs are generally higher in occurrence could be because of the fact its presence reduces body heat by 40% and hence an advantage in tropical condition (19). The commonest eye colour observed in this study was orange. This agrees with the findings of (20) in Plateau state. On the contrary, (21), (22) and (23) found dark brown, light brown and dark red, respectively as the most frequent eye colours in local chickens. That majority of the chickens in this study had white ear lobe also agrees with the finding of (19) in Ethiopia. According to the author, 67% of Ethiopian chicken had white earlobes while 17.9% and 18.6% had red with white and red respectively. A similar proportion was observed by (24) for Bangladesh village chickens. More recently, (17) reported the presence of red with white (37.53%), white (57.41%) and red (1.85%) ear lobes in indigenous chickens in the Philippines. They attributed the difference in ear lobe colours to adaptability to local conditions. There was this indication that most

of the chickens used for this study had red plumage with few silver and white. This is in agreement with (25) who reported that, the dominant plumage colour in North West Ethiopia chickens were 25.49% red, 7.79% black, 16.44% white and 22.23% white with black stripes. On the contrary, (21) observed that the predominant plumage colour of local chickens was multicoloured. The large variation in plumage colour may be attributed to lack of selection for this trait (6; 9). Of the five shank colours observed, milky was highest in occurrence. This contradicts the work of (20) who observed pink colour as the commonest shank colour in Plateau state. (25) reported yellow shank colour as highest in Ethiopian native chickens while (13) had black (42.22%) as commonest among the indigenous chickens in Makurdi. The average live weight of 1.67 kg reported in the present finding is comparable to the values recorded by (26) in local scavenging chickens of N'djamena, Chad. This is similar to works of (27), (20) and (28). However, (21) and (25) reported a much higher value of 3.0 and 2.05 kg in Northeastern Nigeria (specifically, Yobe State) and Northwest Ethiopia, respectively. The significant effect of location observed on live weight is in agreement with finding of (29) and (30). The authors observed great variability of this trait (live weight) in different chicken ecotypes native to Tanzania and Botswana, respectively. Similarly, (30) attributed the effect of geographical location on morphometric traits of local chickens to genetic and nutrition variation. (31) observed a significant variation in body weights of savannah and forest type chickens and attributed it to climatic condition and overall genetic background of the chicken populations in the study areas. The authors further suggested that farmers in savannah areas were more involved in agriculture activities and breeding practice than those in forest zone, for whom poultry keeping was more a cultural tradition. (29) compared the morphometric traits of chickens native to Ethiopia to that of Tanzania and recorded lower values in the latter. Further reports of (32) showed that local chicken populations of Cameroun exhibited higher live weight and body measurements than the forest type of Benin Republic. The mean wing span, body length, girth circumference and shank length of local chickens in this study are slightly comparable to those of (33), but higher than the values recorded by (34), (35) and (36). The fact that genotype had effect on live weight as observed in the present study corroborate the finding of (37) who recorded heavier birds in naked neck than Non-descript Deshi and cap headed chickens. This is in line with the findings of (38) and (3). Similarly, the work of (28) detected the effect of genotype on live weight and favoured polydactyl birds over other strains (normal, ptylopody and frizzle chicken). They further explain that this mutant (polydactylism) have great potential for meat production which contradicts the earlier work of many (1; 39; 40) that frizzle and naked neck genes both singly and in combination were superior to their recessive gene carriers. The effect of comb type observed on live weight agrees with the results of (37) who noticed a significantly heavier birds in pea than single combed chickens (980.00 vs 961.30 g). The non-significant influence of plumage colour observed on all the parameters recorded contradicts the work of (41) and (38). The former reported wider girth, longer body and shank in black mottled and dark red (golden) chickens while the latter recorded heavier bird among multi-colour type. The significantly higher weight observed in chickens with red ear lobe colour compared to those with white and red-white agrees with the perception of most rearers in the study area that birds with red ear lobe were heavier and less fertile compared to those with white. They believed that larger birds have higher requirement for

both growth and reproduction. Therefore, the reproductive capacity of these birds (those with red ear lobe) in this area remains low because of poor feed management. This disagrees with the finding of (37). The significant effect of shank colour on girth circumference observed in the present study agrees with the report of (41) which indicated that milky shanked bird had wider girth than red, ash-yellow, ash, dark ash, light yellow, pink and yellow shanked chickens. However, (37) reported non-significant influence of shank colour on body weight, length and girth. The fact sex had effect on live weight as observed in the current study conform the report of (18) in Ethiopia who noticed that males were significantly heavier than females by 36, 20 and 28 % in Farta, Horro and Konso chicken populations, respectively. The same tendency was observed by (42) and (43) in local chickens and further explained that sexual dimorphism becomes more noticeable with advanced age. The lower body measurement values observed for females than for male chickens in this study are also consistent with the report of some investigators (44; 45), suggesting that sexual dimorphism in chickens is manifested with respect to a large number of body attributes. This could be as a result of hormonal differentiation in the both sexes.

The high and positive correlations observed among the morphometric characters are indications that body traits can predict each other. This is supported by the work of (46) in some indigenous chickens of Bhutan (Seim, naked neck and frizzled). Similarly, (34) reported positive correlation among the morphometric traits of local hens. They suggested that selection for body weight in local chickens would lead to correlated response of linear body parameters. A similar result was reported by (35) using Nigerian local chickens. Further reports of (47) also showed a positive and significant correlation between the body weight and linear body traits (breast girth, body, shank and comb lengths) which suggest that selection for any of these body parameters will cause direct improvement in body weight.

Conclusions and Applications

1. It can be concluded that most of the chickens available for the study were normal feathered, mostly females, single combed, orange eyed, had white ear lobes, milky shanks and red plumage, while the fewest types were frizzled, rose combed, Brown eyed, those with red ear lobes, ash shank, and blue plumage.
2. Location, genotype and qualitative body traits (comb type, plumage, eye, ear lobsse and shank colours) had no effect on most morphometric traits (live weight and linear body measurements)
3. Sexual dimorphism was evident on all the parameters observed.
4. The relationships among the morphometric traits were moderate to high, positive and significant.

References

1. Horst, P. (1989). Native fowl as reservoir for genomes and major genes with direct and indirect effects on adaptability and their potential for tropical oriented breeding plan. *Archeo Gefluegel kunde*, 53: 93-101.
2. Gueye, E. F. and Bessei, W. (1998). About food bans and taboos on poultry products in Senegal. *Landwirt Tropen Veterenaria*, 96: 97 - 109.
3. Tadelle, D. and Ogele, B. (2001). Village poultry production system in the central high lands of Ethiopia. *Tropical Animal Health Production*, 33: 521 - 537.
4. Nwosu, C. C., Gowon F. A., Obioha F. C., Akpan, I. A. and Onuora, G. I. (1985). A biometrical study of the conformation

of the native chicken. *Nigerian Journal of Animal Production*, 12: 141 - 146.

5. Adebambo, O. A., Ikeobi, C. O. N., Ozoje, M. O., Adenowo, J. A. and Osinowo, O. A. (1999). Colour variations and performance characteristics of the indigenous chickens of South-west Nigeria. *Nigerian Journal of Animal Production*, 26: 15 - 22.
6. Moges, F., Aberra, M. and Tadelle, D. (2010). Assessment of village chicken production system and evaluation of the productive and reproductive performance of local chicken ecotype in Bure district, North-West Ethiopia. *African Journal of Agricultural Research*, 5(13): 1739 - 1748.
7. Nwosu, C. C. (1990). Review of indigenous poultry research. In: Sonaiya, E. B. (Ed) Rural Poultry in Africa: Proceedings of an International Workshop held in Ile-Ife, Nigeria, November 13 - 16, 1989. Thelia house, Ile-Ife. Pp: 62-71.
8. Abubakar, Y. A. (1974). The establishment and development of Emirate Government Bauchi, 1805-1903. Unpublished Ph.D. Dissertation, Department of History, Ahmadu Bello University, Zaria, Nigeria.
9. Muhammad, B. Y. (2003). Bauchi State Economic, Political and Social Survey.1st Edition, Open Press Ltd, Zaria, Kaduna State, Nigeria. Pp.6 - 8.
10. Yamane, T. (1967). Statistics, An Introductory Analysis, 2nd Ed. New York, Harper and Row.
11. SPSS (2013). Statistical Package for the Social Sciences. SPSS Inc. an IBM Company
12. Ajayi, F. O. and Agaviezor, B. O. (2009). Phenotypic characteristic of indigenous chicken in Selected Local Government Areas in Bayelsa State. Nigeria International Poultry Summit Feb. 22-26, Abeokuta. Pp: 75 - 78.
13. Egahi, J., Dim, N., Momoh, O. and Gwaza, D. (2010). Variations in qualitative traits in the Nigerian local chicken. *International Journal of Poultry Sciences*, 10: 978 - 979.
14. Solomon, D. (2003). Growth performance and survival of local and White Leghorn chickens under scavenging and intensive systems of management in Ethiopia. *Livestock Research for Rural Development Volume*, 15(1): 5 - 12.
15. Sonaiya, E. B., Odubote, L. K., Badman, R., Demey, F., Wimmers, K., Valle-Zarate, A. and Horn, P. (1998). Evaluation of the Nigerian local poultry ecotypes for genetic variation, disease resistance and productivity. In: Animal Agriculture in West Africa: The sustainability Question (Ed: Oduguwa, O.O., Fanimo, A.O. and Osinowo, O.A).
16. Banerjee, C. A. (2012). Characterisation of Bengalore chickens. *Indian Journal of Poultry Science*, 13: 118 - 125.
17. Cabarles, J. C., Lambio, A. L., Vega, S. A., Capitan, S. S. and Mendioro, M. S. (2012). Distinct morphological features of traditional chickens (*Gallus gallus domesticus* L.) in Western Visaya. *Philippines Animal Genetic Resources*, 5:73 - 87.
18. Dana, N., Dessie, T., Vander Waaij, L. H. and Van Arendonk, A. M. (2011). Morphological features of indigenous chicken populations of Ethiopia. *Animal Genetic Resources*, 46:11 - 23.
19. Duguma, R. (2006). Phenotypic characterization of some indigenous chicken ecotypes of Ethiopia. *Livestock Research for Rural Development*, 18(5): 35 - 39.
20. Mancha, Y. P. (2004). Characterization of local chickens in Northern part of the Jos Plateau. A PhD Thesis, Animal Production Programme, School of

Agriculture, ATBU, Bauchi.

21. Mbap, S. T. and Zakar, H. (2000). Characterization of local chickens in Yobe state, Nigeria. In: Role of Agriculture in Poverty Alleviation. Editors: Abubakar, M. M, Adegbola, T. A. and Butswat, T. S. R. *Proceedings of the 34th Annual Conference of the Agricultural Society of Nigeria* (ASCN). Pp: 126 - 131.
22. Sardu, L. O. (2002). Phenotypic characterisation of local chickens in South-West Namibia. *African Journal of Animal Agriculture*, 6(9): 47 - 54.
23. Sudik, L. Y. (2007). Characterisation and management of Giza chicken in Egypt. *African Journal of Animal Agriculture*, 13(6): 38 - 43.
24. Faruque, S., Siddiquee, N. U., Afroz, M. A. and Islam, M. S. (2010). Phenotypic characterization of native chicken reared under intensive management system. *Journal of the Bangladesh Agricultural University*, 8 (10): 79 - 82.
25. Halima, H. (2007). Phenotypic and Genetic Characterization of Indigenous Chicken Populations in Northwest Ethiopia. PhD Thesis, University of the Free State, Bloemfontein, South Africa.
26. Mopate, L. Y. and Lony, M. (1999). Survey on family chicken farms in the rural area of N'Djamena, Chad. *Livestock Research for Rural Development*, 11(2):
27. Egbunike, G. N. and Oluyemi, J. A. (1979). Comparative studies of the reproductive capacity of Nigerian and Exotic poultry breeds. 1. Testis and semen characteristics. *Nigerian Journal of Animal Production*, 6(1 & 2).
28. Fayeye, T. R., Ayorinde, K. K., Ojo, V. and Adesina, O. M. (2006). Frequency and influence of some major genes on body weight and body size parameters of Nigerian local chickens. *Livestock Research for Rural Development*, 18(3): 23 - 30.
29. Msoffe, P. L. M., Mtambo, M. A., Minga, U. M., Yongolo, M. G. S., Gwakisa, P. S. and Olsen, J. E. (2001). Identification and characterization of the free ranging local chicken ecotypes in Tanzanian. *African Journal of Biotechnology*, 1: 125 - 130.
30. Badubi, S. S., Rakereng, M. and Marumo, M. (2006). Morphological characteristics and food resources available for indigenous chickens in Botswana. *Livestock Research for Rural Development*, 16 (7): 290 - 297.
31. Youssao, I. A. K., Tabada, P. C., Koutinhouin, B. G., Dahouda, M., Idrissou, N. D., Bonou, G. A., Tougan, U. P., Ahounou, S., Yapi-Gnaore, V., Kayang, B., Rognon, X. and Tixier-Boichard, M. (2010). Phenotypic characterization and molecular polymorphism of indigenous poultry populations of the species (*Gallus gallus*) of savannah and forest ecotypes of Benin. *African Journal of Biotechnology*, 9(3): 379 - 391.
32. Keambou, T. C. (2006). Caractères morphologiques, mensurations corporelles et diversité phylogénétique de la poule locale *(Gallus gallus)* des hautes terres de l'Ouest Cameroun. Thèse de Master of Science, Université de Dschang-Cameroun. Pp: 69.
33. Getu, A., Alemayehu, K. and Wuletaw, Z. (2014). Phenotypic characterization of indigenous chicken ecotype in North Gondar zone, Ethiopia. *Global Veterinaria*, 12(3): 361 - 368.
34. Ukwu, H. O. and Okoro, V. M. O. (2014). Statistical modeling of body weight and linear body measurements in Nigerian Indigenous chicken. *Journal of Agriculture and Veterinary Science*, 7: 27 - 30.

35. Momoh, M. M., and Kershima, D. E. (2008). Linear body measurements as predictors of body weight in Nigerian local chickens. *Assessment of Scholastic Skills through Educational Testing*, 8(2): 206 - 212.
36. Udeh, I., Ugwu, S. O. C. and Ogagifo, N. L. (2011). Predicting Semen traits of local cocks using linear body measurements. *Asian Journal of Animal Sciences*, 5(4): 268-276.
37. Tabassum, F., Hoque, M. A., Islam, F., Ritchil, C. H., Faruque, M. O. and Bhuiyan, A. K. F. H. (2014). Phenotypic and morphemetric characterization of indigenous chickens at Jhenaigati Upazila of Sherpur district in Bangladesh. *South Asian Association for Regional Cooperation journal of Agriculture*, 12(2): 154 - 169.
38. Sarker, N. R., Hoque, A., Faruque, S., Islam, N. and Bhuiyan, F. H. (2014). An ex situ study on body characteristics and effect of plumage color on body weight of indigenous chicken (Gallus domesticus) in Bangladesh. *Animal Sciences*, 36: 79 - 84.
39. Mathur, P. K. and Horst, P. (1989). Temperature stress and tropical locations as factors for genotype x environment interactions in poultry production. Proceedings Genotype and environment interactions in poultry production. *Institut National de la Recherche Agronomique*, 12: 83 - 96.
40. Eberhart, D. E. and Washburn, K. W. (1993). Assessing the effect of the naked neck gene on chronic heat stress resistance in two genetic populations. *Journal of Poultry Science*, 72: 139 - 145.
41. Apuno, A. A., Mbap, S. T. and Ibrahim, T. (2011). Characterisation of local chickens in Shelleng and Song Local Government Area of Adamawa State, Nigeria. *Agriculture and Biology Journal of North America*, 2(1): 6 - 14.
42. Godonou, Y. D. (2002). Le système de production du poulet local des élevages suivis par le Programme d'Appui au Développement de l'Aviculture Villageoise (PADAV) dans la région de Ouaké : production, commercialisation et possibilité d'amélioration. Thèse Ing. Agro. FSA. UAC. Bénin. Pp: 87.
43. Dossou, F. (2005). Caractérisation phénotypique des types génétiques de populations locales de volailles de l'espèce *Gallus gallus* dans la Commune d'Abomey-Calavi. Mémoire de fin de formation à l'EPAC, UAC, Abomey-Calavi. Pp: 49
44. Semakula, J., Lusembo, P., Kugonza, D. R., Mutetikka, D., Ssennyonjo, J. and Mwesigwa, M. (2011). Estimation of live body weight using zoometrical measurements for improved marketing of indigenous chicken in the Lake Victoria basin of Uganda. *Livestock Research for Rural Development*, 23:
45. Alabi, O. J., Norris, D. and Egena, S. S. A. (2012). Comparative study of three indigenous breeds of South Africa: Body weight and linear body measurements. *Agricultural Journal*, 3: 220 - 225.
46. Dorji, N. and Sunar, K. (2014). Morphometric variations among five Bhutanese Indigenous chickens. *Journal of Animal and Poultry Sciences*, 3(3): 76 - 85.
47. Daikwo, I. S., Okpe, A. A. and Ocheja, J. O. (2011). Phenotypic characterization of local chickens in Dekina. *International Journal of Poultry Science*, 10(6): 444 - 447.