Evaluation of body weight and body linear measurements of broad and narrow helmeted French broiler guinea fowl in the semi-arid condition of Nigeria.

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Abstract

The study was carried out in Mashi, Jibia, Dutsin-Ma, Charenchi, Batsari, Mai adu'a and Kaita local government areas of Katsina state, Nigeria on the French broiler guinea fowls. About 101 broad helmeted strain and 73 narrow helmeted strain reared under free range management were studied. Data were collected on body weight and body linear measurements. The data were subjected to analysis of variance, the effect of sex and strain was determined. There was a significant (P<0.05) effect of sex on body weight and all body linear measurements. Guinea cocks were superior over guinea hens, except the claw length which showed no significant difference due to sex among the narrow helmeted broiler strain. The claw length in the broad helmeted guinea hens was longer than in guinea cocks. There was a significant (P<0.05) effect of strain on mean body weight. The broad helmeted guinea cocks were higher than the narrow helmeted guinea cocks (2.90 ± 0.04 versus 2.77 ± 0.05 kg.) in body weight. Similar trends on body weight were observed among the broad versus narrow helmeted guinea hens (2.76 ± 0.04 versus 2.45 ± 0.03 kg). The broad helmeted guinea cocks significantly (P<0.05) differ from the narrow-pointed helmeted guinea cocks in shank length, wing span, chest circumference, neck length and helmet width (9.60 ± 0.12 versus 9.02 ± 0.10 cm., 52.78 ± 0.47 versus 50.54 ± 0.60 cm., 38.53 ± 0.20 versus 37.67 ± 0.26 cm., 17.12 ± 0.13 versus 16.47 ± 0.16 cm. and 1.49 ± 0.04 versus 1.31 ± 0.05) whereas all other body linear measurements were statistically the same. Thigh length, wing span, neck length, body length, wattle length, helmet length and helmet width of the broad helmeted guinea hens were higher than those of the narrow helmeted guinea hens (13.20 ± 0.18 versus 12.86 ± 0.14 cm., 49.63 ± 0.54 versus 48.28 ± 0.42 cm, 16.06 ± 0.15 versus 13.55 ± 0.12 cm., 26.43 ± 0.23 versus 25.86 ± 0.18 cm., 2.95 ± 2.06 ± 0.06 cm., 2.58 ± 0.06 versus 2.44 ± 0.04 cm. and 1.17 ± 0.05 versus 1.01 ± 0.04 cm). All other body linear measurements were statistically similar (P>0.05). The Broad helmeted guinea fowl had significantly higher body weight and body linear measurements, and would as such yield more carcass than the narrow helmeted strain.

Keywords: Broiler-guinea-fowl, Broad helmeted, Body weight and body linear measurements, Narrow helmeted.

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Introduction

The quest to overcome malnutrition especially for a developing country like Nigeria can only be won when the entire human populace has access to affordable balance diet. The average Nigerian consumes 25% less than the recommended 34gm/head/day animal protein [1]. In Nigeria, chicken is the largest consumed poultry. This comes from broiler chickens which are raised intensively and the local chicken on free range from rural households [2]. The challenge to meet the demand for daily animal protein intake especially among most rural populaces would require the diversification of rural poultry production. The French broiler guinea fowl strains have comparative advantages due to their genetic credibility for higher body weight and fast growth rate and ability to be reared on free range. Hence, there is a need to diversify poultry production in Nigeria by introduction of the French broiler guinea fowl. Guinea fowl has the potential for rural production, the cost of production are low compared to broiler chicken high cost of production were birds are raised under intensive management. The broiler guinea fowl has the ability to thrive under free range management with minimal supplementation with kitchen waste and grains. The birds are also known for higher resistance to poultry diseases, higher number of keeps produce, lower mortality rate when compared to the chickens [3].

Guinea fowl has promising potentials for rural poultry production and as world's alternative poultry enterprise [4]. Therefore information on the evaluation of the French broiler guinea fowl under the semi-arid climate will be useful to guides its introduction to other zones of Nigeria to diversify poultry production for alleviation of protein deficiency and poverty among the rural and the urban populace in Nigeria. The assessment of phenotypic variations may provide useful information to both large scale and smallholder farmers situated in other climatic belt of Nigeria where better environments exist for introduction of the guinea fowl for improve growth rate and egg productivity. The study was designed to evaluate the differences in body weight and body linear measurements of guinea fowls and identify the strain with superior capability for carcass yield and potential for introduction into other zones of Nigeria.

Materials and Methods

The study was conducted in some selected local government areas of Katsina state. Katsina is situated within North West Region of Nigeria, within the tropic region of the world between latitude 12º59N/longitude 7º36' E and latitude 12.983º N and 7.600ºE of the Greenwich Meridian (GMT) with altitude of 182.82 to 457 meters above sea level. According to Koppen climate classification system, Katsina has a hot semi-arid climate. The annual rainfall is short and lies between 500-800 mM, the temperature ranges between 21°C and 35°C, the area experiences relative humidity variations of 20% to 40% in January and then rises to 80% in the rainy season [5].

The experimental birds were from flocks managed on free range management system. Birds feeding were supplemented with cereal grains and kitchen waste in the morning and evening before or after grazing. Birds were also provided with drinking water around the shade where they roost at night. The experimental design was the Completely Randomized Block Design (RCBD) where the effect of sex was blocked. Sampling technique used was the stratified random sampling. The birds were be sampled from Mashi, Dutsin-ma, Charenchi, Jibia, Batsari, Mai adu'a and Kaita local government areas of Katsina state. Body linear measurements were collected on beak length, shank length, thigh length, keel length, body length, wing span, wattle length, head length, helmet length, helmet thickness, claw length, chest circumference, tail length and body weight.

Data analysis

Data collected from the study were analyzed using Statistical Package for the social sciences (SPSS). Descriptive statistics and analysis of variance (ANOVA) were conducted on parameters measured using the model below

$Y_{ijk}=\mu+X_{i+}S_j+e_{ijk}$

Where:

Y_{ijk}=Observation on the k^{th} individual belonging to the j^{th}strain in the i^{th} sex

μ=Overall mean in the population

X_i=Effect of the i^{th} sex

S_j=Fix effect of the j^{th} strain

$_{ijk}$=Residual random error with mean zero and variance that of the population.

Phenotypic (r_p) correlation between body weight and body linear measurements was determined using the fomular described by Quaas et al. in (1984):

$$r_p = \frac{\mathrm{Cov}(X)_{ij}}{\sqrt{\mathrm{Var}\left(X_{ii}\right).\mathrm{Var}\left(X_{jj}\right)}}$$

Where:

$Cov(x)_{ij}$=the genetic (a), and environmental (e) covariances between the first and second trait, respectively.

Var. x_{ii}=the genetic (a), and environmental (e) variances of the first trait, respectively.

Var. x_{jj}=the genetic (a), and environmental (e) variances of the second trait, respectively.

Results

Effect of sex on body weight and body linear measurements

Table 1a and 1b presents the result of the effect of sex on body linear traits and body weight of the broad and the narrow helmeted broiler strains respectively. There was a significant difference ($P<0.05$) due to sex effect on all the parameters evaluated. Guinea cocks were superior over guinea hens in all parameters investigated except for the average claw length in both strains.

Effect of strain on body weight and body linear measurements

The broad helmeted guinea cocks strain was significantly higher in body weights than their counterpart guinea cocks of the narrow helmet strain (Table 2a). The broad helmeted guinea cocks were significantly ($P<0.05$) higher than the narrow-pointed guinea cocks in terms of shank length, wing span, chest circumference, neck length and helmet width, whereas all other body linear measurements were statistically the same (Table 2b). The broad helmeted guinea hens had higher mean body weight, thigh length, wing span, neck length, body length, wattle length, helmet length and helmet width over counterpart narrow-helmeted guinea hens whereas all other body linear measurements were statistically similar ($P>0.05$).

Phenotypic correlations

The association between body weight and body linear measurements is presented in Table 3. There were strong significant ($P<0.01$) positive correlations between body weight and all body linear measurements, except for body weight and claw length.

DISCUSSION

Beak length

The significant difference between average beak length of guinea cocks and guinea hens for the broad and narrow helmeted

***Table 1a**. Least Square means of body linear measurements by sex of the mature (>10 months) broad helmeted French broiler guinea fowls.*

Parameter, BLM (cm)	Broad helmeted guinea cocks	Broad helmeted guinea hens
Beak length	2.44 ± 0.03[a]	2.28 ± 0.03[b]
Shank length	9.60 ± 0.12[a]	8.47 ± 0.10[b]
Thigh length	15.15 ± 0.15[a]	13.20 ± 0.18[b]
Wing span	52.78 ± 0.47[a]	49.63 ± 0.54[b]
Chest circ.	38.53 ± 0.20[a]	36.40 ± 0.23[b]
Claw length	1.53 ± 0.14[b]	1.75 ± 0.16[a]
Tail length	15.70 ± 0.18[a]	14.30 ± 0.21[b]
Neck length	17.12 ± 0.13[a]	16.06 ± 0.15[b]
Body length	28.87 ± 0.20[a]	26.43 ± 0.23[b]
Wattle length	3.86 ± 0.07[a]	2.95 ± 0.08[b]
Keel length	14.43 ± 0.12[a]	12.99 ± 0.13[b]
Head length	8.20 ± 0.06[a]	7.38 ±0.07[b]
Helmet length	2.95 ± 0.05[a]	2.58 ± 0.06[b]
Helmet width	1.49 ± 0.04[a]	1.17 ± 0.05[b]
Weight (kg)		
Body weight	2.90 ± 0.04[a]	2.76 ± 0.04[b]

[a,b]Means with different letter(s) superscripts differ significantly.
BLM: Body linear measurements.

Table 1b. *Least Square means of body linear measurements by sex of the mature (>10 months) narrow helmeted French broiler guinea fowls.*

Parameter, BLM (cm)	Broad helmeted guinea cocks	Broad helmeted guinea hens
Beak length	2.48 ± 0.04[a]	2.30 ± 0.03[b]
Shank length	9.02 ± 0.10[a]	8.35 ± 0.07[b]
Thigh length	14.14 ± 0.20[a]	12.86 ± 0.14[b]
Wing span	50.54 ± 0.60[a]	48.28 ± 0.42[b]
Chest circ.	37.67 ± 0.26[a]	35.95 ± 0.18[b]
Claw length	1.50 ± 0.18[a]	1.52 ± 0.13[a]
Tail length	16.20 ± 0.23[a]	14.92 ± 0.16[b]
Neck length	16.47 ± 0.16[a]	13.55 ± 0.12[b]
Body length	28.13 ± 0.26[a]	25.86 ± 0.18[b]
Wattle length	3.67 ± 0.09[a]	2.06 ± 0.06[b]
Keel length	14.17 ± 0.14[a]	12.84 ± 0.10[b]
Head length	7.97 ± 0.08[a]	7.40 ± 0.06[b]
Helmet length	2.83 ± 0.06[a]	2.44 ± 0.04[b]
Helmet width	1.31 ± 0.05[b]	1.01 ± 0.04[b]
Weight (Kg)		
Body weight	2.77 ± 0.05[a]	2.45 ± 0.03[b]

[a,b]Means with different letter(s) superscripts differ significantly.
BLM: Body linear measurements.

Table 2a. *Least square means of body weight and body linear measurements by strains of mature(> 10 months) Broad and Narrow-pointed helmeted French broiler guinea cocks.*

Parameter, BLM (cm)	Broad helmeted guinea cocks	Narrow helmeted guinea cocks
Beak length	2.44 ± 0.03[a]	2.48 ± 0.04[a]
Shank length	9.60 ± 0.12[a]	9.02 ± 0.10[b]
Thigh length	15.15 ± 0.15[a]	14.14 ± 0.20[a]
Wing span	52.78 ± 0.47[a]	50.54 ± 0.60[b]
Chest circ.	38.53 ± 0.20[a]	37.67 ± 0.26[b]
Claw length	1.53 ± 0.14[a]	1.50 ± 0.18[a]
Tail length	15.70 ± 0.18[a]	16.20 ± 0.23[a]
Neck length	17.12 ± 0.13[a]	16.47 ± 0.16[b]
Body length	28.87 ± 0.20[a]	28.13 ± 0.26[a]
Wattle length	3.86 ± 0.07[a]	3.67 ± 0.09[a]
Keel length	14.43 ± 0.12[a]	14.17 ± 0.14[a]
Head length	8.20 ± 0.06[a]	7.97 ± 0.08[a]
Helmet length	2.95 ± 0.05[a]	2.83 ± 0.06[a]
Helmet width	1.49 ± 0.04[a]	1.31 ± 0.05[b]
Weight (Kg)		
Body weight	2.90 ± 0.04[a]	2.77 ± 0.05[b]

[a,b]Means with different letter(s) superscripts differ significantly.
BLM: Body linear measurements.

guinea fowl strains may be due to variation in body size. The males had higher body sizes than the females. The effect of strain may likely have accounted differences. The average beak lengths in this study were lower than the reported range 3.66 ± 0.02 to 3.95 ± 0.03 cm [6]. This could be due to differences in breed and population composition since individual birds within a strain may tend to have similar beak length values as compared to between strains.

Shank length

The average shank lengths of the guinea cocks that were significantly higher than shank lengths of counterpart guinea hens for the broad helmeted strain and the narrow helmeted strain were due to sex dimorphism. The existence of significant variations due to sex dimorphism in shank length does not

Table 2b. *Least square means of body weight and body linear measurements by strains of mature(> 10 months) Broad and Narrow-pointed helmeted French broiler guinea hens.*

Parameter, BLM (cm)	Broad helmeted guinea hens	Narrow helmeted guinea hens
Beak length	2.28 ± 0.03[a]	2.30 ± 0.03[a]
Shank length	8.47 ± 0.10[a]	8.35 ± 0.07[a]
Thigh length	13.20 ± 0.18[a]	12.86 ± 0.14[b]
Wing span	49.63 ± 0.54[a]	48.28 ± 0.42[b]
Chest circ.	36.40 ± 0.23[a]	35.95 ± 0.18[a]
Claw length	1.75 ± 0.16[a]	1.52 ± 0.13[a]
Tail length	14.30 ± 0.21[a]	14.92 ± 0.16[a]
Neck length	16.06 ± 0.15[a]	13.55 ± 0.12[b]
Body length	26.43 ± 0.23[a]	25.86 ± 0.18[b]
Wattle length	2.95 ± 0.08[a]	2.06 ± 0.06[b]
Keel length	12.99 ± 0.13[a]	12.84 ± 0.10[a]
Head length	7.38 ± 0.07[a]	7.40 ± 0.06[a]
Helmet length	2.58 ± 0.06[a]	2.44 ± 0.04[b]
Helmet width	1.17 ± 0.05[a]	1.01 ± 0.04[b]
Weight (Kg)		
Body weight	2.76 ± 0.04[a]	2.45 ± 0.03[b]

[a,b]Means with different letter(s) superscripts differ significantly.
BLM: Body linear measurements.

agree with the findings of Venkatesan et al. [7], who observed no significant difference in mean shank length of guinea hen and guinea cocks. The average shank lengths obtained for the strains were higher than 7.73 ± 0.08 cm reported by Daria et al. [8] for the Nigerian indigenous guinea fowls in Nasarawa state [8-12]. The superiority of guinea cocks over guinea hens in shank length in this present study is consistent with the trend (9.75 ± 0.13 and 9.30 ± 0.11, 9.8 ± 0.14 and 9.48 ± 0.13, 9.81 ± 0.14 and 9.43 ± 0.11 and, 10.07 ± 0.23 and 9.23 ± 0.26 cm) for the Purple neck, Royal purple, Lavender and Royal blue guinea cocks and guinea hens respectively by Kozaczynski et al. [12]. The average shank length of guinea cocks and guinea hens broad helmeted and narrow-pointed helmeted guinea fowl strains investigated were lower than the values obtained by Kozaczynski et al. [12] for the Purple neck, Royal purple, Lavender and Royal blue guinea cocks and guinea hens. These differences may be due to genetic dilution of the birds due to rebreeding within the improved stock by the rural farmers who reared these birds.

Thigh length

The average thigh length of guinea cocks and guinea hens varied significantly with the former being superior over the later, and the broad helmeted strain having longer mean thigh length over the narrow helmeted strain. The average thigh lengths obtained in this study were higher than the average thigh length of indigenous guinea fowl 8.94 ± 0.07cm in Lafiya, Nasarawa state [11]. The superiority in average thigh length of the birds in this study over counterpart indigenous strains could be due to selection for genetic improvement to produce birds with superior higher body weight in the broiler strains (broad helmeted and narrow-pointed helmeted). Furthermore, guinea cocks in this study were higher in average thigh length whereas guinea hens were lower over the reported 13.89 ± 0.06, 13.68 ± 0.09 and 13.66 ± 0.08 cm for the pearl, ash and black indigenous guinea fowls, respectively [12].

Table 3. *Correlation between body linear traits and body weight of the broad versus narrow helmeted broiler guinea fowls.*

Trait	BkL	ShL	ThL	WnS	ChC	CL	TaL	NkL	BoL	WtL	KL	HL	HeL	HeT	BW
BkL	1	.148	.212*	.086	.336**	.196	.416**	.253*	.304**	.141	.199	.188	.123	.290**	.217*
ShL	.460**	1	.705**	.316**	.490**	-.150	.305**	.084	.457**	.554**	.534**	.561**	.653**	.465**	.550**
ThL	.368**	.714**	1	.387**	.660**	-.119	.277*	.239*	.631**	.669**	.734**	.621**	.614**	.598**	.564**
WnS	.332**	.411**	.561**	1	.325**	-.011	.212*	.150	.048	.383**	.271*	.350**	.311**	.150	.201*
ChC	.194	.510**	.403**	.323**	1	-.022	.461**	.440**	.597**	.426**	.679**	.517**	.475**	.536**	.693**
CL	.078	-.189	.020	-.005	-.086	1	.026	.106	-121	-.105	-.032	-.046	-.098	-.183	-.080
TaL	.366**	.538**	.455**	.388**	.429**	-.094	1	.302**	.239*	.243*	.337**	.273*	.384**	.347**	.239*
NkL	.336**	.407**	.304**	.358**	.545**	-.145	.535**	1	.539**	.271*	.451**	.262*	.160	.347**	.391**
BoL	.456**	.558**	.538**	.334**	.446**	-.118	.455**	512**	1	.356**	.716**	.433**	.434**	.501**	.567**
WtL	.125	.406**	.453**	.405**	.487**	.018	.154**	.092	.216*	1	.645**	.475**	.488**	.593**	.556**
KL	.416**	.666**	.633**	.532**	.538**	-.098	.482**	.571**	.622**	.456**	1	.589**	.585**	.632**	.668**
HL	.410**	.578**	.498**	.491**	.463**	-.012	.475**	.513**	.465**	.369**	.592**	1	.528**	.461**	.526**
HeL	.267*	.536**	.567**	.402**	.681**	-102	.405**	.482**	.513**	.552**	.678**	.466**	1	.475**	.510**
HeT	.290*	.474**	.405**	.333**	.434**	-.047	.309**	.235*	.413**	.507**	.432**	.608**	.436**	1	.522**
BW	.218*	.527**	.344**	.186	.595**	-.135	.289**	.413**	.482**	.511**	.530**	.446**	.555**	.451**	1

**Correlation is significant at 0.001 alpha level.
*Correlation is significant at 0.05 alpha level.
The coefficients below the diagonal are the values for the broad helmeted broiler guinea fowl.
The coefficients above the diagonal are the values for the narrow helmeted broiler guinea fowl.

Wing span

The average wing span of birds showed significant difference ($P<0.05$) due to sex with guinea cocks having longer mean wing span than guinea hens 52.78 ± 0.47 versus 49.63 ± 0.53 cm for the broad helmeted strain and 50.54 ± 0.60 versus 48.28 ± 0.42 cm for the narrow pointed helmeted strain. The longer average wing span of guinea cocks over guinea hen may be an indication for massiveness or higher body weight in guinea cocks as larger birds must be equipped with longer wings for flight attempt. Similar observation for guinea cocks was reported by Abdul-Rahman et al. [9]. Furthermore the average wing spans obtained in this study are higher than the values (31.3 and 30.9 cm.) reported [6] guinea cocks and guinea hens. Effect of sex was significant in the present study.

Chest circumference

Chest circumference in bird is an integral component of body weight index. The average chest circumference of the investigated strains showed significant variations due to sex differences. The guinea cocks were superior over guinea hens. The average chest circumferences obtained in this study are greater than 34.23 ± 0.19 cm by Ogah [11] for indigenous guinea fowls, 30.47 ± 0.38, 30.00 ± 0.66 and 30.10 ± 0.40 cm for the indigenous pearl, ash and black guinea fowls by Fajemilehin [13]. The superior mean chest circumference in guinea cocks could be due to higher morphometric body linear traits over guinea hens and higher capacity for carcass yields.

Claw length

The average claw length of the broad helmeted guinea hens was higher than the value obtained for guinea cocks whereas there was no significant difference for the narrow helmeted guinea cocks and guinea hens. The claw length in birds was important to give the potential for adapting to the extreme semi-arid conditions in terms of defense against predators and scavenging for feed on free range. The variation in claw length due to sex difference in guinea fowls during the breeding season may probably be associated with the level of hyper activeness that may warrant shorter claw in the highly hyper active sex group (guinea hens) due to constant scratching nest while feeding and scraping sand for laying as oppose to the lesser hyper active sex group.

Tail length

Average tail lengths were significantly ($P<0.05$) higher in guinea cocks over guinea hens15.70 ± 0.18 versus 14.30 ± 0.21 cm (broad helmeted strain) and 16.20 ± 0.23 versus 14.92 ± 0.18 cm (narrow strains). The relatively higher tail length of guinea cocks over guinea hens could be due to significantly elongated body parts in guinea cocks. The variations of the average tail lengths due to sex difference could possibly have a role in mating courtship display of the birds. However, the findings in this study are not consistent with 10.07 ± 0.34 and 10.12 ± 0.32 cm reported by Abdul-Rahama et al. [9].

Neck length

Neck lengths of the broad helmeted guinea cocks were significantly ($P<0.05$) higher than those of guinea hens (17.12 ± 0.13 versus 16.06 ± 0.13 cm). On the other hand, similar trend was noticed (14.46 ± 0.11 versus 13.55 ± 0.11 cm) among the narrow helmeted strain. The differences in mean neck length between the strains may be as a result of genetic difference between the strains. This could be responsible for the noticed variations in the mean neck length across the strains. The neck lengths of the broad helmeted guinea cocks obtained in this study is higher than 17.03 ± 0.10 cm reported average for the indigenous guinea fowls [11]. Whereas, neck length of the broad helmeted guinea hens, narrow guinea cocks and hens were lower than the reported average.

Body length

The average body lengths of the guinea cocks were significantly higher than the average body length of the guinea hens (28.97 ± 0.20 versus 26.43 ± 0.23 cm) and (28.13 ± 0.26 versus 25.86 ± 0.18 cm). The body lengths obtained in this study are higher than the average 22.17 ± 0.13 cm reported for indigenous guinea fowl in north central. The relative superiority of the body

length in guinea cocks over the counterpart guinea hens is in conformity with 33.80 ± 0.90 and 32.10 ± 0.90 cm for guinea cocks and guinea hens, respectively [9]. The finding in this study does not agree with who reported that guinea cockerels had relatively smaller body length (33.7 cm) compared to (34.2 cm) obtained for the counterpart guinea pullets [8].

Wattle length

The wattle length of the broad helmeted strain was significantly (P<0.05) higher than the average obtained for the narrow-pointed helmeted strains. Similarly, there was a significant (P<0.05 difference due to sex differences in both strains. Thus, wattle length is one among the principal morphometric indices of sex identification in guinea fowls. The finding from this study is consistent with 2.40 ± 0.12 and 2.10 ± 0.13 cm for guinea cocks and guinea hens and 2.49 ± 0.34 versus 2.16 ± 0.35 cm. The higher wattle length value of the strains showed a breed composition with a unique phenotypic facial appearance that is characterized by elongated wattles [7,14].

Keel length

The average keel length of guinea cocks was statistically higher than the average keel length of the guinea hens in both strains. The higher average keel length of the guinea cocks may be due to the associated elongated body frame in guinea cocks than in guinea hens. The average keel length of guinea cocks in this study are higher than those of Purple neck, Royal purple, Lavender and Royal blue guinea cocks 13.08 ± 0.12, 13.56 ± 0.16, 13.05 ± 0.16 and, 13.02 ± 0.25 cm respectively. whereas guinea hens in the present study have their keel length averaging closer 13.04 ± 0.13, 12.95 ± 0.15, 12.70 ± 0.13 and 12.56 ± 0.30 cm for the Purple neck, Royal purple, Lavender and Royal blue guinea hens [12].

Head length

The head length showed significant variations due to strain and sex effect. The broad helmeted and the narrow helmeted strains guinea cocks were higher than guinea hens. The higher mean head length in guinea cocks over the counterpart guinea hens could be due to sex linkage. The average head lengths of guinea cocks in the present study are longer than the reported range 7.47 ± 0.55 to 7.69 ± 0.18 cm [15]. The higher average head length in the present study may be due to selection for large and longer head which is a pointer to the larger body that supports the head. Furthermore, the longer head length between the strains of the broiler guinea fowl may probably be due to variation in genotype.

Helmet length

The average helmet lengths were found to differ significantly (P<0.05)in both strains and sexes. The broad helmeted strain was higher in helmet length, the helmet of guinea cocks were significantly longer than guinea hens. 2.95 ± 0.05and 2.58 ± 0.07cm for the broad helmeted strain and 2.83 ± 0.06 and 2.44 ± 0.05 cm for the narrow helmeted strain. The relative superiority of the guinea cocks over guinea hens on mean helmet length could be as a result of sex dimorphism. The existence of significant variation of mean helmet length due to sex effect in this study is in consistency with the report 2.6 ± 0.04 and 2.22 ± 0.35 cm for guinea cocks and guinea hens respectively although these values were lower than the values obtained in the present study. Helmet length of the narrow-pointed guinea cocks versus guinea hens and the broad helmeted guinea cocks versus guinea hens are higher than 2.57 ± 0.40versus 2.25 ± 0.37cm reported. The average helmet lengths of the broad helmeted guinea hens, narrow-pointed guinea cocks and guinea hens fall below the reported range of 2.85 ± 0.74 to 3.47 ± 0.55 cm [7,14,15].

Helmet thickness

Helmet thickness was significantly affected by sex in both strains. The helmet thickness of the broad helmeted strains guinea cocks and guinea hens 1.49 ± 0.04 and 1.17 ± 0.05 cm were significantly (P<0.05) higher than 1.31 ± 0.05 versus 1.01 ± 0.04 cm for the narrow helmeted guinea cocks and guinea hens. The values obtained except for the narrow helmeted guinea hens fall within the range 1.11 ± 0.16 to 1.74 ± 0.63 cm [15-17]. The helmet thickness in this study is lower than 1.50 and 1.16 cm reported [9]. The differences could be due to variations in the genetic make-up between the investigated guinea fowl strains and those reported by other authors. The higher mean helmet thickness in guinea cocks over counterpart guinea hens is in agreement with Venkatesan et al. [7].

Body weight

Body weight showed significant variation due to sex effect in both strains. The values obtained were 2.90 ± 0.04 versus 2.70 ± 0.04 kg. for the broad helmeted strains and 2.87 ± 0.05 versus 2.45 ± 0.03 kg. for the narrow helmeted guinea fowl strains. The body weights of the guinea fowl strains in this study are higher than the reported range of 1126.40 to 1139.45g for the Nigeria indigenous guinea fowls. The higher mean body weight of guinea cocks over guinea hens in the present study agrees with who observed live body weight of pearl gray guinea fowls at 22 weeks old were 1591.78 ± 193.90 and 1562.37 ± 141.17 g for males and female birds respectively [4,12].

Phenotypic correlation between body weight and body linear measurements

All body linear measurements had positive correlations with body weight except the claw length which had a weak positive correlation with body weight. This was in agreement with who reported positive correlations between body weight and shank length, thigh length, chest circumference body length and keel length. Similar trends were also reported.

Conclusion

Guinea cocks were significantly higher in body weight and all other body linear traits than their counterpart guinea hens in both strains. Strain has a significant effect on body weight and some body linear measurements of guinea cocks and hens. The broad helmeted guinea cocks had significantly higher body weight than the narrow helmeted strain.

Recommendation

The broad helmeted guinea fowl had higher body weight and body linear measurements than the narrow helmeted strain. It will produce more carcass than the narrow helmeted strain. Base on body weight, potential farmers are advice to use the broad helmeted guinea fowl for broiler introduction.

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