

Characterization of Physical Body Traits and Carcass Evaluation of Guinea Fowl in a Humid Tropical Environment

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Abstract – A total of 240 day-old keets of two varieties of guinea fowl generated from a base population of 120 adult guinea fowl were used in a randomized complete block design to characterize physical body traits and carcass evaluation of the birds. Parameters used in the characterization include; thigh length, shank length, breast length, body girth, growth rate and carcass traits. Results indicate that mean values of body weight and linear body traits showed no significant ($P>0.05$) difference among progeny groups. The correlation among different body traits in all progenies were positive and highly significant ($P<0.05$). The coefficient of determination for the progenies were PL/PL (91.9), La/La (91.9) depicting the progeny as fast growing native guinea fowl. The entire carcass yield measured were significantly higher ($P<0.05$) in Pearl when compared with Lavender progeny. This suggests that Pearl guinea fowl may be suited for improvement of meat type bird in the humid tropics.

Keywords - Carcass, Guinea Fowl, Humid Tropics, Physical Body Traits.

I. INTRODUCTION

Guinea fowl is indigenous to Africa and it is possible to plan that research into its breeding, nutrition and management may develop the guinea fowl into economic farm birds [1]. It has been estimated that there are about 124 million indigenous domestic fowl which contribute only 0.35% of the available protein resources in Nigeria [2]. Among domestic types which the local farmers in Nigeria have long identified and given local names based on their coloration are pearl, lavender, black and white, [3], [4]. Information of guinea fowl keets for broiler and layers are limited. There is need to evolve a standard for characterizing different varieties of guinea fowl. Linear body measurement helps in the comparison of growth in different parts of the body. It has been severally used to characterize variety, evaluate carcass yield, sex performance, and predict live weight gain in livestock [5]. A study of the relative relationship between eviscerated carcass weight and body weight may be of help in the evaluation of meat production.

The objective of the study was therefore to characterize the physical body traits of the guinea fowl and determine the carcass characteristics in terms of their production and adaptability for meat production.

II. MATERIAL AND METHODS

The research was conducted at the Poultry Unit, University Teaching and Research Farm, Michael Okpara

University of Agriculture, Umudike, Abia State, Nigeria, located at latitude $05^{\circ}29'N$, longitude $07^{\circ}33'E$ and altitude of 122m above sea levels. Umudike lies within the humid rainforest zone of West Africa, characterized by long duration of rainfall and short period of dry season with maximum and minimum temperature of $32^{\circ}C$ and $22^{\circ}C$ respectively. Relative humidity ranges from 50-95%

Acquisition and mating of base population

A base population of 120 adult guinea fowls consisting of 12 Pearl males, 48 Pearl females, 12 Lavender males and 48 Lavender females were used for the study. The birds were obtained from the Poultry Unit, Teaching and Research Farm. Each group was divided into 3 with 20 birds per replicate the mating ratio was 1:4.

The entire mating scheme resulted into two homozygous crosses each of Pearl and Lavender as shown in Figure 1

Pearl Male (PL/PL) x Pearl female (PL/PL)

(PL/PL)= Homozygous Pearl variant main cross)

Lavender Male (La/La) x lavender female (La/La)

(La/La=Homozygous Lavender variant main cross)

Fig.1. Mating scheme of the base population for the production of F_1 native guinea fowl

The birds after being mated (Fig. 1) produced fertile eggs which were identified by phenotypic group and set in a western type cabinet incubator at a temperature of $37.5^{\circ}C$ and relative humidity of 60% were maintained. A total of 240 day - old keets was produced. The keets were brooded for the first 5 weeks of life under continuous illumination. Thereafter they were raised on deep litter under natural light. 120 keets per progeny group replicated into three groups of 40 keets were randomly selected and moved into the pens. The keets were fed growers mash containing 2700Kcal/kg ME and 18% CP and water *ad libitum*.

Data Collection and Statistical Analysis

The following linear body measurement were taken weekly on the progeny generated with the aid of weighing scale and measuring tape. All measurement of the legs was taken on the right leg in centimeter with a measuring tape. Thigh length was taken from the beginning of the fibula to the hock joint.

Shank length was taken from the beginning of the hock joint to the last ring before the tarsi-metatarsus digit.

Breast length was taken from the point of the depression to the sharp edge (keet length).

Body girth was taken in centimeter using a tape rule, the circumference of the bird anterior to the leg.

The growth rate was determined from the regression analysis of average body weight on age using the regression coefficient estimate.

Data collected from the study was subjected to analysis of variance (ANOVA) in a randomized complete block design. [6], and [7] computer application programmes were used for the analysis. The model is shown below.

$$Y_{ijk} = \mu + b_i + g_j + (tu)_{ik} + e_{ijk}$$

Where

Y_{ijk} = k^{th} observation of the j^{th} genetic group in the i^{th} hatch

μ = population mean

b_i = Effect of the i^{th} hatch

g_j = Effect of j^{th} progeny

$(tu)_{ik}$ = interaction effect of progeny and hatch of guinea fowl

e_{ijk} = Random error assumed to be independently, identically, normally distributed with zero mean and homogenous variance, (iind $(0, \sigma^2)$)

Simple linear regression was used to determine the growth rate of the genetic groups. The regression model used is shown below

$$W_i = a + b_{(age)} + e_{ijk}$$

Where

W_i = i^{th} body weight (g)

a = regression constant

b = required growth rate

e_{ijk} = random error (iindo, ∞)

Pearson correlation analysis [8] was carried out to determine the relationship among the various body traits.

III. RESULTS AND DISCUSSION

The mean values for body weight, shank, thigh length, breast length, and body girth for the progenies are shown in Table 1.

Table 1: Linear body Traits of Pearl and Lavender Guinea Fowls between 0-8 Weeks of Age

Trait	Genetic group	Weeks								
		0	1	2	3	4	5	6	7	8
BWT (g)	PI/PI	20.01±0.00	50.01±0.01 ^c	80.01±0.01 ^c	110±0.0 ^c	132.±0.01 ^c	170.01±0.01 ^c	210.01±0.01 ^c	240.01±0.01 ^c	380.0±0.01 ^c
	La/La	20.01±0.01	49.6±0.00 ^d	79.5±0.00 ^d	109.±0.01 ^d	131.±0.01 ^d	169.±0.01 ^d	210.0±0.01 ^c	234.01±0.01 ^d	375.01±0.01 ^d
BRL (cm)	PI/PI	1.01±0.01	9.96±0.3 ^b	2.51±0.3 ^c	4.09±0.03 ^c	5.03±0.02 ^c	5.57±0.02 ^c	5.73±0.02 ^b	6.88±0.04 ^c	6.90±0.04 ^c
	La/La	1.01±0.01	1.83±0.08 ^c	2.45±0.05 ^c	4.83±0.04 ^d	5.02±0.02 ^c	6.22±0.01 ^b	6.42±0.01 ^d	12.37±0.01 ^a	4.79±0.01 ^a
BG (cm)	PI/PI	6.01±0.01	8.97±0.04 ^b	10.17±0.06 ^c	12.1±0.07 ^c	15.0±0.03 ^c	15.4±0.02 ^c	16.3±0.02 ^c	19.08±0.33 ^c	21.02±0.03 ^c
	La/La	6.00±0.01	8.55±0.22 ^b	9.95±0.03 ^d	12.0±0.03 ^d	15.0±0.02 ^c	15.4±0.02 ^c	16.0±0.04 ^d	18.74±0.019 ^c	20.70±0.05 ^d
THL (cm)	Pr/PI	2.01±0.01	3.07±0.04 ^c	4.06±0.03 ^c	5.17±0.012 ^{ab}	5.36±0.02 ^c	5.63±0.02 ^c	6.60±0.04 ^c	8.65±0.02 ^c	9.13±0.03 ^c
	La/La	2.01±0.01	3.03±0.02 ^c	3.92±0.04 ^d	5.00±0.03 ^b	5.30±0.04 ^c	5.56±0.04 ^c	6.36±0.05 ^d	8.56±0.02 ^c	9.04±0.05 ^c
SHL (cm)	PI/PI	1.21±0.01	1.47±0.02 ^b	2.13±0.03 ^c	3.03±0.02 ^c	3.11±0.03 ^c	3.20±0.05 ^c	3.451±0.02 ^c	3.73±0.02 ^c	4.13±0.05 ^c
	La/La	1.21±0.01	1.45±0.02 ^b	2.03±0.02 ^d	3.02±0.02 ^c	3.04±0.02 ^d	3.12±0.02 ^c	3.42±0.02 ^c	3.66±0.02 ^d	4.08±0.04 ^c

a-d= Means in the same column with different superscript are significantly different (P<0.05).

BWT= Body weight (g) BRL= Breast length (cm) BG= Body girth

THL= Thigh length (cm) SHL=Shanklength (cm)

The linear body traits showed no significant (P>0.05) difference among progeny group. This may be as a result of the high positive

Correlation between body weight and linear body traits in poultry [9].

Correlation among body traits of indigenous guinea fowl progeny is shown in Table 2.

Table 2: Correlation among Body Traits of Crossbred Indigenous Guinea Fowl 0-8 Weeks of Ag

Genotype	Traits	BWT	BRL	BG	THL	SHL
PI/PI	BWT	-				
	BRL	0.80**	-			
	BG	0.84**	0.87**	-		
	THL	0.85**	0.84**	0.97**	-	
	SHL	0.80**	0.87**	0.85**	0.83**	-
La/La	BWT	-				
	BRL	0.80**	-			
	BG	0.84**	0.88**	-		
	THL	0.85**	0.84**	0.87**	-	
	SHL	0.80**	0.87**	0.85**	0.83**	-

**Correlation is significant at $P < 0.01$

BWT= Body weight
 THL= Thigh length

BRL= Breast length
 SHL= Shank length

BG= Body girth

The correlation among different body traits; body weight (BW), Breast length (BL), body girth (BG), thigh length (THL) and Shank length (SHL) in all the genotypes were positive and highly significant ($P < 0.05$).

This positive correlation observed among characters implies that improvement in any of the traits leads to corresponding improvement in others.

Table 3 shows the regression of body weight on age of the two genetic groups.

Table 3: Growth Rates of Crossbred Indigenous Guinea Fowls and Their Reciprocal Crosses (0-8 Weeks of Age)

Genetic group	Equation ^a	R ² (%)	SEM
PI/PI	$Y = 27.9 + 0.13\text{Age} - 0.33(\text{Age})^2$	95.3	23.3**
La/La	$Y = 342. + 0.11\text{Age} - 12.2(\text{Age})^2$	95.4	22.7**

a= All individual regressions are significant ($P < 0.01$)

Y= Body weight (g) A = Age (weeks)

R²= Coefficient of determination (%); SEM= Standard Mean

The coefficient of determination for progeny were PL/PL (91.9), La/La (91.9) indicating no difference. The similarity in growth rate may be as a result of random mating that is common with the guinea fowl population in Nigeria. [10], also noted that divergent significant growth among different breed, strains or genotype of birds is mostly observed in their life time as they approach sexual maturity. The high coefficient of determination values depicts the progeny as fast growing native guinea fowls and will tend to reach sexual maturity earlier.

Table 4 shows the carcass characteristics of the two progeny of guinea fowl.

Table 4: carcass traits (cut parts) of guinea fowl broiler

Live weight(g)	Pearl	400 ^a
	Lavender	317 ^b
Slaughter wt(g)	Pearl	349 ^a
	Lavender	273 ^b
Shank weight(g)	Pearl	15.5 ^a
	Lavender	8.6 ^b
Thigh weight(g)	Pearl	25.8 ^a
	Lavender	18.78 ^b
Breast weight (g)	Pearl	51.53 ^a
	Lavender	42.51 ^b
Drum stick(g)	Pearl	20.5 ^a
	Lavender	17.50 ^b
Wing weight(g)	Pearl	33.4 ^a
	Lavender	29.50 ^b
Back(g)	Pearl	39.80 ^a
	Lavender	31.50 ^b
Neck(g)	Pearl	9.95 ^a
	Lavender	8.60 ^b

a-b= Means in the same column with different superscript are significantly different ($P < 0.05$).

All carcass yield measured were significantly higher ($P < 0.05$) in Pearl when compared with Lavender progeny. The live weight and all cut-parts also showed significant ($P < 0.05$) difference among progeny group (Table 5) with higher values in pearl progeny.

Table 5: carcass traits (internal organs) of guinea fowl broiler 0-8 weeks of age

Internal organ	Variety	Weight (g)
Gizzard (g)	Pearl	10.30 ^a
	Lavender	8.55 ^b
Liver (g)	Pearl	8.0 ^a
	Lavender	5.90 ^b
Heart (g)	Pearl	1.56
	Lavender	1.48
Crop (g)	Pearl	12.5 ^a
	Lavender	8.8 ^b
Lung	Pearl	2.83
	Lavender	2.50

a-b= Means in the same column with different superscript are significantly different ($P < 0.05$).

This suggests that Pearl may be suited for meat type guinea fowl among other progenies in the humid tropics.

IV. CONCLUSION

The result of the study indicates that Pearl progeny manifested superiority over lavender especially in carcass traits and may be recommended for improvement for meat production in the humid tropics.

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