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# Morphostructural Characteristics of Three Varieties of Greybreasted Helmeted Guinea Fowl in Nigeria

## Características Morfoestructurales de Tres Variedades de Gallineta de Guinea Pechigris en Nigeria

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**SUMMARY:** Three hundred eggs were obtained from settlements around New Bussa, Niger state during the month of August 2006 and transported to Ekiti state by road. 93.33 % of the three hundred (300) eggs collected were selected for hatching. The eggs were hatched at the aviary unitof Ekiti state Agricultural Development Project, Ikole Ekiti, Nigeria. At hatching the keets were separated on the basis of their plumage colours as shown by the distinct difference in the colour of the downy feathers of the keets into three genotypes, pearl, ash and black. The keets of each genotype were randomly allocated to brooder rooms where they were floor brooded using kerosene stove. The keets were fed with diet containing 24% CP, 3000 kcal/kg ME and water ad libitum for the first 8 weeks at the brooder house and fed diets containing 18 % CP, 2850 kcal/kg ME and water ad libitum for the last phase of the experiment. Measurements were taken every fourteen (14) days on body weight and body linear measurements on shank length, drumstick length, keel length, body girth, body length and wing length. The results showed that the birds demonstrated low body weights and small body size in all the parameters examined.

**KEY WORDS: Aviary; Keets; Downy feather; Body weight; Linear measurement.**

## INTRODUCTION

Village poultry production, if developed, can be employed as a tool to alleviate poverty, promote gender equality and ensure food security for economically disadvantaged peasant farmers. In Nigeria, several species of poultry abound and they include chickens, guinea fowls, turkeys, ducks and pigeons. Guinea fowl, Numida meleagris, originated in Africa (Nova Scotia Department of Agriculture and Fisheries Archives, 2001; Embury, 2001) and were first domesticated by ancient Egyptians (Oakland Zoo, 2001) from where they spread to other parts of the world such as France, Belgium, Canada and Australia where they are now produced commercially on a large scale (Robinson, 2000; Embury). However, in most African countries including Nigeria, Malawi and Zimbabwe, guinea fowl production is in its infancy (Dondofema, 2000; Ligomela, 2000; Smith, 2000).

In Nigeria, there are two types of guinea fowl species - *Numida ptilorhycha* and *Numida meleagris*.The *N. ptilorhycha* is indigenous to the deciduous rain forest zone of southern Nigeria while *N. meleagris* is currently domiciled in the Northern part of Nigeria but it is spreading to other smallholder farming areas (Ayorinde, 1987). Guinea fowl, *N. meleagris*, production is associated with smallholder farmers in Africa (Smith, 2000) and is described as a "poor man's pheasant" (Bonds, 1997). Some farmers keep guinea fowls out of curiosity and as "watch animals" around homesteads because they have an excellent eye-sight, a harsh cry, and shriek at the slightest provocation (Smith). In addition, they are kept for income generation (Ligomela) and for control of snakes, mice, ticks, other pests and weeds (Cactus Ranch, 2001; Frit's Farm, 2001) thus eliciting its production.. The increase in guinea fowl production has led to the development of informal traders who buy and sell the birds for breeding and consumption, especially during the festive seasons.

Compared to village chickens, its advantages are: low production cost, premium quality meat, greater capacity to scavenge for insects and grains, better ability to protect itself

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against predators and better resistance to common poultry parasites and diseases for example, Newcastle Disease and fowl Pox (Dieng *et al.*, 1999; Happyson, 2005). This indicates that there is potential for smallholder farmers to improve its production in order to increase household protein supply, combat rural protein-energy-malnutrition and increase income.

Extensive work has been carried out in Nigeria and elsewhere in Africa on village chickens, being the predominant poultry species, accounting for about 68% of all poultry types (Kusina *et al*., 2000) to the neglect of other poultry species like guinea fowl. Consequently, there is limited information on production and more particularly on the genetic structure of the birds. Fajemilehin *et al.* (2007) reported that genetic improvement of guinea fowl had attracted very little attention in Nigeria; hence, there is dearth of information on the subject. Information on guinea fowl genetic characteristics is necessary to encourage smallholder farmers to conserve the natural resources in conservancies close to the communal areas and to improve the current production level of the birds. It is therefore the aim of this study to characterize guinea fowl using morphostructural indices for the purposes of improvement programme and as genetic data base for guinea fowl.

## MATERIAL AND METHOD

Three hundred (300) eggs were obtained from settlements around New Bussa, Niger state during the month of August 2006 and transported to Ekiti state by road. 93.33 % of the three hundred (300) eggs collected were selected for hatching based on the size of the eggs with preference given to the bigger ones. The eggs were hatched at the aviary unit of Ekiti state Agricultural Development Project, Ikole Ekiti, all in Nigeria.

At hatching the keets were separated on the basis of their plumage colours as shown by the distinct difference in the colour of the downy feathers of the keets into three genotypes, pearl, ash and black (Table I).

**Management of the experimental birds**. The keets of each genotype were randomly allocated to brooder rooms where they were floor brooded using kerosene stove. The keets were fed with diet containing 24% CP, 3000 kcal/kg ME and water ad libitum for the first 8 weeks at the brooder house. Thereafter, they were moved from the brooder house to an open sided deep litter houses where they remained for the entire duration of the experiment (28 weeks). Here, the birds were fed with diets containing 18 % CP, 2850 kcal/kg ME and water ad libitum. Cleanliness and good management practices without medication were employed for the entire duration of the experiment.

### Data collection

**Measurement of body parts**. All measurements were taken every fourteen (14) days according to the methods adopted by Ayorinde (987) as defined below:

Shank length: Distance between the footpad and the hock joint when the tibia-tarsus and tarsometa-tarsus were held at right angles to each other using venier calipers graduated in centimeter

Drumstick length: Distance between the hock joint to the tibio-fibula-femora joint using venier calipers graduated in centimeter

Keel length: Distance between the anterior and posterior ends of keel using venier calipers graduated in centimeter

Body girth: Taken as the circumference of the body around the breast region using flexible measuring tape

Body length: Distance between the posterior end of the phygostyle and the anterior of the nasal openings using flexible measuring tape

Wing length: Distance between the tip of the phalanges and the carocoid-humerous joint using flexible measuring tape using flexible measuring tape.

**Statistical Analysis**. Data collected were subjected to an analysis of variance and the Duncan Multiple Range Test (DMRT) was used to verify significant differences among treatment means.

## RESULTS

Table I showed the summary of the number of each genotype available for screening during the experimental period. The table revealed that more pearl genotype was available for screening followed by black genotype and lastly the ash genotype. Reduction in the number of each of the genotype available for screening as the birds aged was as a result of mortality.

Table II below showed that the pearl keets were smaller in weight at day old than the Ash and Black keets though with statistical insignificant ($P>0.05$) difference. The disadvantage of the small body weight of the pearl keets at day old was overcome within the first six weeks of age when compared with black genotype and first ten weeks of age when compared with ash. Thereafter and until the end of the

Table I. Number of birds of each genotype weighed and measured fortnightly.

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 60 | 36 | 46 |
| 2 | 57 | 35 | 44 |
| 4 | 54 | 33 | 42 |
| 6 | 53 | 32 | 39 |
| 8 | 52 | 31 | 37 |
| 10 | 49 | 30 | 35 |
| 12 | 49 | 29 | 32 |
| 14 | 48 | 26 | 30 |
| 16 | 48 | 26 | 27 |
| 18 | 47 | 22 | 24 |
| 20 | 45 | 22 | 23 |
| 22 | 36 | 19 | 21 |
| 24 | 35 | 18 | 20 |
| 26 | 34 | 16 | 17 |
| 28 | 33 | 15 | 16 |

Table II. Bimonthly bodyweight (g) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with different superscripts are significantly different (P<0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 22.95±0.67 | 24.66±1.01 | 24.38±0.44 |
| 2 | 52.54±0.65$^{b}$ | 60.48±0.98$^{a}$ | 51.77±0.65$^{ab}$ |
| 4 | 86.29±0.72$^{b}$ | 110.48±0.68$^{a}$ | 88.97±0.91$^{b}$ |
| 6 | 186.35±0.17$^{b}$ | 202.53±0.74$^{a}$ | 160.25±0.98$^{c}$ |
| 8 | 276.2±0.54$^{ab}$ | 294.98±0.38$^{a}$ | 258.34±0.45$^{b}$ |
| 10 | 388.16±0.76 | 372.47±0.91 | 382.09±0.57 |
| 12 | 510.41±0.76$^{a}$ | 466.93±1.03$^{b}$ | 478.09±0.98$^{b}$ |
| 14 | 599.24±0.62 | 554.88±0.81 | 572.54±0.82 |
| 16 | 685.26±0.71 | 650.16±0.49 | 652.83±0.90 |
| 18 | 730.01±0.70 | 710.41±0.73 | 716.26±0.65 |
| 20 | 801.65±0.92 | 770.17±0.35 | 774.86±0.46 |
| 22 | 860.03±0.45 | 836.79±0.71 | 826.09±0.67 |
| 24 | 901.50±0.87 | 870.49±0.54 | 864.20±0.73 |
| 26 | 940.38±0.63 | 908.45±0.32 | 904.56±0.74 |
| 28 | 980.15±0.30 | 970.43±0.72 | 950.78±0.70 |

experiment the pearl genotype showed consistently higher body weight than the other two genotypes. The body weight increase in the ash was superior to black until the eighth week of age. At tenth week of age and until twentieth week, the black genotype showed superiority over ash and the ash resumed its superiority in weight at the twenty second week of age till the end of the experiment.

Table III showed that the patterns of shank growth in the three genotypes investigated were statistically similar (P>0.05) in all the age groups examined. In the pearl genotype, the first four weeks is the most rapid stage of development and the first six weeks in the black and ash genotypes. Thereafter, the rate of shank development progressively slowed down.

Table III. Shank length (cm) in three genotypes of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 2.25±0.23 | 2.22±0.02 | 2.03±0.01 |
| 2 | 2.87±0.05 | 2.98±0.03 | 2.79±0.05 |
| 4 | 4.08±0.05 | 3.71±0.04 | 3.65±0.05 |
| 6 | 4.53±0.04 | 4.55±0.06 | 4.31±0.08 |
| 8 | 4.90±0.06 | 4.88±0.19 | 4.76±0.09 |
| 10 | 5.55±0.06 | 5.48±0.08 | 5.64±0.06 |
| 12 | 6.12±0.06 | 6.04±0.01 | 5.95±0.06 |
| 14 | 6.66±0.07 | 6.60±0.05 | 6.56±0.06 |
| 16 | 7.14±0.07 | 7.04±0.05 | 7.01±0.10 |
| 18 | 7.68±0.07 | 7.33±0.08 | 7.40±0.07 |
| 20 | 8.05±0.08 | 7.92±0.09 | 7.83±0.08 |
| 22 | 8.56±0.07 | 8.39±0.08 | 8.31±0.09 |
| 24 | 8.88±0.08 | 8.52±0.13 | 8.64±0.09 |
| 26 | 8.95±0.08 | 8.69±0.09 | 8.71±0.10 |
| 28 | 9.03±0.09 | 8.85±0.09 | 8.93±0.0.08 |

Table IV showed that the patterns of drumstick growth in the three genotypes investigated were statistically similar (P>0.05) in all the age groups examined. In the pearl and black genotypes, the first twelve weeks is the most rapid stage of development and the first fourteen weeks in the ash genotype. Thereafter, the rate of drumstick development progressively watered down until they become 13.89 g, 13.68 g and 13.66 g in pearl, ash and black genotypes respectively at twenty-eight weeks of age.

Table V showed that the keel lengths of the pearl and ash genotypes were consistently superior to that of the black genotype from day one to point of lay. The pearl genotype was superior to the ash genotype in keel length until week fourteen. Between week sixteen and twenty, the keel length of ash genotype was superior to that of pearl and the pearl resumed its superiority over the ash from week twenty two to point of lay. However, the differences in the length were not statistically significant (p>0.05) in all the cases.

Table IV. Drumstick length (cm) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 2.94±0.13 | 2.77±0.25 | 2.71±0.11 |
| 2 | 3.75±0.09 | 4.01±0.15 | 3.83±0.15 |
| 4 | 5.60±0.15 | 5.73±0.25 | 5.59±0.08 |
| 6 | 7.12±0.08 | 7.02±0.03 | 6.74±0.18 |
| 8 | 8.05±0.07 | 7.97±0.16 | 7.85±0.09 |
| 10 | 8.83±0.06 | 9.10±0.16 | 8.78±0.07 |
| 12 | 10.18±0.06 | 10.61±0.26 | 11.04±0.16 |
| 14 | 11.54±0.09 | 11.40±0.09 | 11.29±0.16 |
| 16 | 12.16±0.17 | 12.16±0.09 | 12.03±0.15 |
| 18 | 13.01±0.17 | 12.96±0.08 | 12.85±0.12 |
| 20 | 13.13±0.18 | 13.05±0.09 | 13.41±0.18 |
| 22 | 13.35±0.17 | 13.27±0.08 | 13.13±0.19 |
| 24 | 13.66±0.06 | 13.44±0.07 | 13.38±0.08 |
| 26 | 13.81±0.09 | 13.56±0.08 | 13.46±0.09 |
| 28 | 13.89±0.06 | 13.68±0.09 | 13.66±0.08 |

Table V. Keel length (cm) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 2.21±0.17 | 2.17±0.15 | 1.95±0.14 |
| 2 | 3.67±0.19 | 3.25±0.17 | 3.22±0.12 |
| 4 | 5.88±0.16 | 5.80±0.15 | 4.67±0.05 |
| 6 | 7.42±0.18 | 7.21±0.13 | 6.52±0.13 |
| 8 | 9.77±0.17 | 9.26±0.11 | 8.45±0.12 |
| 10 | 11.12±0.07 | 11.10±0.12 | 10.01±0.17 |
| 12 | 11.91±0.08 | 11.60±0.21 | 11.36±0.14 |
| 14 | 12.22±0.10 | 12.04±0.11 | 11.80±0.13 |
| 16 | 13.23±0.13 | 13.76±0.12 | 13.16±0.12 |
| 18 | 13.82±0.15 | 13.97±0.18 | 13.68±0.11 |
| 20 | 14.25±0.13 | 14.26±0.19 | 14.19±0.16 |
| 22 | 14.56±0.12 | 14.52±0.18 | 14.38±0.15 |
| 24 | 14.85±0.08 | 14.77±0.17 | 14.65±0.11 |
| 26 | 14.96±0.07 | 14.43±0.18 | 14.84±0.10 |
| 28 | 15.15±0.07 | 15.12±0.16 | 14.92±0.09 |

Table VI showed that the pearl genotype had consistently larger body girth than both the ash and the black genotypes for the entire duration of the experiment. The ash had wider body girth than the black for the fist two weeks of the experiment. From week four to the end of the experiment except in weeks sixteen to eighteen and week twenty two, the black genotype showed superiority in body girth compared to ash genotype. In all the cases like the keel length, the differences were insignificant (p>0.05).

Table VI. Body girth (cm) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 8.51±0.09 | 8.04±0.07 | 7.93±0.08 |
| 2 | 11.27±0.07 | 10.77±0.16 | 10.56±0.06 |
| 4 | 12.91±0.11 | 12.60±0.13 | 12.70±0.12 |
| 6 | 15.50±0.22 | 14.98±0.15 | 15.10±0.30 |
| 8 | 18.67±0.18 | 16.40±0.18 | 17.80±0.43 |
| 10 | 20.08±0.16 | 19.08±0.15 | 19.73±0.29 |
| 12 | 22.36±0.23 | 21.60±0.17 | 21.96±0.27 |
| 14 | 23.69±0.23 | 22.31±0.29 | 23.92±0.42 |
| 16 | 25.43±0.25 | 25.45±0.23 | 25.03±0.36 |
| 18 | 26.81±0.21 | 26.31±0.34 | 26.10±0.36 |
| 20 | 27.64±0.19 | 27.48±0.33 | 26.67±0.30 |
| 22 | 28.59±0.24 | 27.82±0.34 | 27.61±0.32 |
| 24 | 29.45±0.22 | 29.09±0.33 | 29.12±0.32 |
| 26 | 30.90±0.32 | 29.60±0.48 | 29.85±0.29 |
| 28 | 30.47±0.38 | 30.00±0.66 | 30.10±0.40 |

Table VII. Body length (cm) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 10.75±0.08 | 11.21±0.04 | 10.54±0.03 |
| 2 | 16.32±0.08 | 15.95±0.07 | 15.52±0.10 |
| 4 | 19.83±0.08 | 19.74±0.14 | 19.70±0.06 |
| 6 | 24.38±0.16 | 24.61±0.18 | 24.41±0.19 |
| 8 | 27.75±0.17 | 28.02±0.22 | 27.73±0.13 |
| 10 | 30.41±0.39 | 29.51±0.39 | 30.43±0.32 |
| 12 | 32.63±0.34 | 32.50±0.45 | 32.90±0.46 |
| 14 | 34.51±0.25 | 33.89±0.49 | 33.87±0.31 |
| 16 | 35.68±0.26 | 35.71±0.35 | 35.95±0.21 |
| 18 | 37.87±0.21 | 37.90±0.32 | 37.26±0.34 |
| 20 | 39.98±0.41 | 39.84±0.31 | 38.42±0.27 |
| 22 | 40.16±0.28 | 40.41±0.36 | 40.17±0.47 |
| 24 | 40.58±0.27 | 41.16±0.34 | 41.54±0.47 |
| 26 | 41.51±0.53 | 41.65±0.66 | 41.31±0.45 |
| 28 | 41.68±0.90 | 41.81±1.00 | 41.75±0.83 |

Table VII showed that the body length of all the genotypes were not significantly (p>0.05) affected at any

stage of the experiment. The length of the birds did not show any definite pattern between the breeds other than it increases as the age increases within each breed. At point of lay, the ash genotype had the longest length followed by the black and lastly the pearl.

Table VIII showed that the rate of growth of wings in all the genotypes were systematic from the beginning to the end of the experiment. All through the duration of the experiment, there were insignificant ($p>0.05$) differences in the wing lengths of the birds. However the wing length of the ash genotype was superior to the pearl and black at week twenty four to the end of the experiment.

Table VIII. Wing length (cm) in three varieties of greybreasted helmeted Guinea fowl in Nigeria. Figures in a row with no superscripts are not significantly different (P>0.05).

| Age (wks) | Pearl | Ash | Black |
|---|---|---|---|
| 0 | 3.98±0.06 | 4.11±0.09 | 4.18±0.08 |
| 2 | 7.79±0.05 | 7.30±0.07 | 6.95±0.06 |
| 4 | 10.86±0.10 | 11.02±0.09 | 10.93±0.08 |
| 6 | 12.74±0.20 | 13.00±0.22 | 11.30±0.19 |
| 8 | 15.05±0.16 | 14.98±0.13 | 14.83±0.187 |
| 10 | 16.37±0.13 | 15.86±0.11 | 15.64±0.15 |
| 12 | 16.78±0.21 | 16.40±0.20 | 16.50±0.19 |
| 14 | 18.60±0.22 | 18.13±0.18 | 18.38±0.20 |
| 16 | 19.26±0.23 | 19.50±0.21 | 19.53±0.24 |
| 18 | 20.22±0.20 | 20.41±0.19 | 20.34±0.21 |
| 20 | 20.54±0.16 | 20.87±0.15 | 20.68±0.17 |
| 22 | 22.07±0.21 | 21.91±0.23 | 21.92±0.14 |
| 24 | 22.57±0.20 | 22.63±0.25 | 22.54±0.12 |
| 26 | 22.69±0.30 | 22.78±0.31 | 22.68±0.29 |
| 28 | 22.96±0.34 | 23.13±0.36 | 22.97±0.38 |

## DISCUSSION

This result showed that the body weight of the three genotypes were low even at maturity being 980.15 g, 970.43 g and 950.78 g respectively for pearl, ash and black genotypes at twenty eight weeks of age thus supporting the reports of Ayorinde *et al.*, (1988); Mundra *et al.*, (1993); Nwagu & Alawa (1995) that indigenous guinea fowl varieties have lower body weight than improved strains reared in developed countries such as France and Australia (Microlivestock, 1991; Embury). On account of low body weight of these three different genotypes, it is suggestive that the local guinea fowls are the light strain types that are likely suitable for egg rather than for meat production.

The additions of shank and drumstick lengths constitute the length of the leg. The leg length of the ash and pearl genotypes were longer than that of the black guinea fowls. This is a pointer to the fact that the pearl and the ash genotypes have the potentials of possessing heavier bodies than the white genotype suggesting that the pearl and ash genotypes are probably more suitable for body weight development than the black. This assertion was consistent with the report of Maciejowski & Zieba, 1982 who reported that rapid leg development is a criterion used for assessing growth rate.

The keel length and the body girth taken around the chest region indicate breast development. Breast development is a good measure of meatiness in poultry.

In all the physical measurements taken, as the birds approach maturity only very little increment occurred in all the parts. This finding is consistent with the finding of Fajemilehin *et al*. (2007) though in goat. It could be inferred that the small body size and body parameters are the features required by the animals to survive in the wild.

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**RESUMEN:** Trescientos huevos fueron obtenidos de los asentamientos alrededor de Nueva Bussa, estado de Níger durante el mes de agosto de 2006 y transportados por carretera al estado de Ekiti. El 93,33% de los 300 huevos recolectados fueron seleccionados para su incubación. Los huevos fueron incubados en la unidad de pajarera de estado de Ekiti Proyecto de Desarrollo Agrícola, Ikole Ekiti, Nigeria. En la eclosión, los polluelos fueron separados sobre la base del color de su plumaje, como lo demuestra la clara diferencia en el color de las plumas suaves del polluelo en tres genotipos, perla, ceniza y negro. El polluelo de cada genotipo fue asignado aleatoriamente a habitaciones de crianza donde se calentaba el piso utilizándose una estufa de querosén. Los polluelos fueron alimentados con una dieta que contuvo 24% PC, 3000 kcal / kg ME y agua *ad libitum,* durante las primeras 8 semanas, en la unidad criadora y alimentados con dietas que contenían 18% PC, 2850 kcal / kg ME y agua *ad libitum* para la última fase del experimento. Las medidas fueron tomadas cada 14 días, éstas fueron: peso corporal y medidas lineales del cuerpo, longitud de la pierna, longitud de la quilla, circunferencia del cuerpo, longitud del cuerpo y longitud del ala. Los resultados evidenciaron que las aves presentaban bajo peso corporal y pequeño tamaño corporal en todos los parámetros examinados.

**PALABRAS CLAVE: Pajarera; Polluelo; Plumaje; Peso corporal; Medida lineal.**

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