

# Feather Characteristics of Three Varieties of Female Guinea Fowl in a Humid Tropical Environment

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**Abstract** – This study was conducted to determine feather distribution pattern, and evaluate feather traits. Thirty six mature female guinea fowl, comprising of 12 pearl, 12 black and 12 lavender were used for the study. Data collected from the study were subjected to analysis of variance (ANOVA) in a completely randomized design. Each of the varieties was replicated three times with four birds per replicate. Data on feather number, feather colour, feather distribution and structure were collected at the end of the study, while weekly feather loss was collected on weekly basis. There was a significant difference ( $P < 0.05$ ) in feather number among the three varieties as pearl variety showed superiority over its counterparts. From the result lavender and black had more weekly feather loss than Pearl variety. There was no variation in feather distribution, except for colour pattern among the three varieties where Pearl had black and white colour, black variety with black colour and lavender with ash colour dotted with white. The tracts distribution on parts of their body determines the structure and colour pattern of their feather. The pattern of their feather distribution followed a distinct tract in the three varieties. Seven major feather tracts were observed on the three varieties studied. Significant differences ( $P < 0.05$ ) were also observed in the feed conversion ratio values in the three varieties, with Pearl indicating better utilization of feed intake. Except in a situation of very high temperature, good feather coverage will optimize energy metabolism and feed efficiency in the female guinea fowl. Therefore, Pearl guinea fowl with more feathers may be recommended for improvement for meat or egg type guinea fowl in the humid tropics.

**Keywords** - Characteristics, Distribution, Feather, Guinea Fowl.

## I. INTRODUCTION

The guinea fowl has ubiquitous distribution in Africa and has distinct population with small holder farmers [1], [2], [3]. This bird occurs in few areas of Asia and Latin America as a semi-domesticated species, while in Europe, North America and Australia, large scale production of guinea fowl dominates [4]. It's attractive plumage and value as a table bird with game type flavour and high meat to bone ratio has led to its world-wide acceptance [4]. This species of poultry is kept for various purposes depending on the society. Like chicken, guinea fowls are a source of animal protein [5]. In addition, they are kept for income generation [6] and for control of snakes, mice, ticks, other pests and weeds [7].

Compare to village chickens, the guinea fowl's advantages are; low production cost, premium quality meat, greater capacity to scavenge for insects and grains, better ability to protect itself against predators and better resistance to common poultry parasites and diseases than

chickens, for example New Castle Disease and fowl pox [1]. In Nigeria, there are two types of guinea fowl species, *Numidia ptilorhynchos* and *Numidia meleagris*. However the commonly known varieties are four, they are namely; Pearl, Lavender, Black and White. Feathers play a major role in insulating the body of the bird. Therefore, except in situations of very high temperature, good feather coverage will optimize energy metabolism and feed efficiency. Partially defeathered birds will loose more heat, especially when exposed to cold temperatures where they are forced to use various thermoregulatory responses in order to maintain body temperature at  $41^{\circ}\text{C}$ . [8], showed birds at  $15^{\circ}\text{C}$  to have 60% higher metabolic rate than birds kept at  $25^{\circ}\text{C}$ . [9], indicated that feed efficiency in laying hens was significantly correlated with feather cover. The objective of the study therefore was to determine the variations in feather distribution and characteristics among the three female varieties of helmeted guinea fowl in Nigeria

## II. MATERIAL AND METHODS

### Location

The Research was conducted at the poultry unit of the Teaching and Research farm, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Umudike bears the coordinate of  $5^{\circ} 28$  North and  $7^{\circ} 31$  South and lies at an altitude of 122m above sea level. It is located within the tropical rain forest zone and the environment is characterized by an annual rainfall of 21.77mm.

### Experimental Birds and Management

Three varieties of mature female helmeted guinea, 21 weeks old, obtain from the Teaching and Research farm, Michael Okpara University of Agricultural Umudike were used for the study. These varieties were; 12 pearl guinea fowl, 12 black guinea fowl, and 12 lavender guinea fowl. The birds were replicated three times per variety with four birds in each replicate. The experimental birds were managed under the intensive system of management on deep litters and were all given equal treatment. The birds were fed *ad-libitum* on grower's diet, 17.5% Crude Protein, 2850 kcal/kg M.E. and good quality water was also provided.

### Data Collection

The following Parameters were measured in the three varieties;

Weekly Feather loss; Weekly feather losses were obtained on weekly basis by the collection of feather from each of the replicates and weighing them on a sensitive weighing scale. Wood shavings and dry faeces attached to

the feathers were removed before weighing to ensure accuracy.

Feather Number; Feather number of the birds was determined by the use of Hutt and Ball's formula for determining feather number. Given as:

$$Y = ax^n$$

Where y = feather number

X = body weight

a and n are constant of 910.17 and 0.185 respectively [10].

Feed conversion ratio (FCR): This was determined as follows

$\frac{\text{Feed consumed}}{\text{Bodyweight gain}}$

Bodyweight gain

Feather Colour Patterns; The feather colour patterns for the three varieties studied were determined physically by close visual examination of the feathers in a bright day light. This was done under 3 separate headings

- (1) The overall colour
- (2) The pattern of colour distribution throughout the contour feather and
- (3) The pattern of colour distribution within the individual feathers as considered by [11].

Feather Distribution and Structure; Feather structure and their distribution on the body of the varieties of birds studied were carried out, by visual examination of various types of feathers and their location on the body of the birds. Also, the pattern of feather tracts, that is, the pattern of feather follicles were visually observed among the three varieties of guinea fowl studied.

#### Statistical Analysis

The data obtained were subjected to analysis of variance (ANOVA) in a completely randomized design (CRD) to determine whether differences among the three varieties were significant. The statistical package [12] computer application program was used for the analysis. The model of the design is indicated as follows:

$$Y_{ij} = \mu + T_i + g_{ij} + e_{ij}$$

Where  $Y_{ij}$  =  $j^{\text{th}}$  Observation of the  $i^{\text{th}}$  varieties

$\mu$  = Population mean

$T_i$  = effect of the  $i^{\text{th}}$  parameters

$g_{ij}$  = effect of varieties of guinea fowl.

$e_{ij}$  = random error assumed to be independently and homogenous variance.

Means were significant difference occur were separated using Duncan multiple range test [13].

### III. RESULTS AND DISCUSSION

Plate 1, 2, 3, 4, 5, 6, and 7 showed various feather types and their trait's name for the three varieties of female guinea fowl. There was no observable difference in feather distribution, except for colour pattern among the three varieties of female guinea fowl studied. The pattern of their feather distribution followed a distinct tract in the three varieties. The tracts distribution on parts of their body determines the structure and colour pattern of their feather. Seven major feather tracts were observed on the three varieties studied. However, [14] stated that eight major feather tracts are on birds. The seven major feather tracts on the three varieties could be as a result of absence of feather on their Head. The seven feather tracts observed on the three varieties are as follows;

- Alar Tract: this includes primary and secondary flight feathers plus their covert.
- Spinal Tract: includes those tracts that extend along the mid dorsal surface to the trailing edge of the wing.
- Caudal Tract: This includes rectrice and their coverts.
- Femoral Tract: situated at the dorsal surface of thigh.
- Crural Tract: located on the drum stick.
- Ventral Tract: locate at the cervical sternal and abdominal regions.
- Humeral Tract: includes those that extend from where the leading edge of the wing meets the body over the dorsal surface of the trailing edge of the wing.

The feather structure of each type of feathers on various tracts is the same, but differs in colour among the three varieties. On individual overall colour pattern, Pearl maintains a uniform colour pattern of black and white. Lavender, a uniform colour pattern of ash dotted with white colour. Black, a uniform colour pattern of black, except at the primary and secondary feathers which are similar to pearl as black and white.



Plate 1: Ventral tract (cervical sternal and abdominal feather)



Plate 2: Spinal tract (dorsal feather)



Plate 3: Alar tracts (flirt feather)



Plate 4: Femoral tract (thigh feather)



Plate 5: crural tract (drumstick feather)



Plate 6: Humeral tract (Trailing edge wing feather)



Plate 7: Caudal tract (tail feather)

Table 1 presents the average feather loss for three varieties of female guinea fowl.

Table 1: Mean weight of weekly feather loss of three varieties of female guinea fowl (g)

Weeks	Pearl	Black	Lavender	SE
1	1.38	3.58	1.85	0.58
2	0.79 <sup>b</sup>	1.84 <sup>ab</sup>	2.33 <sup>a</sup>	0.26
3	0.43 <sup>b</sup>	2.89 <sup>a</sup>	3.17 <sup>a</sup>	0.49
4	1.23 <sup>b</sup>	3.73 <sup>ab</sup>	4.86 <sup>a</sup>	0.69
5	0.46 <sup>b</sup>	2.59 <sup>b</sup>	6.07 <sup>a</sup>	0.69
6	3.55	3.04	4.47	0.49
7	5.48	3.37	6.08	0.68
8	7.78	5.99	6.77	0.67

Means with different superscripts are significantly different at  $P < 0.05$ , Se = standard error.

At week 1, 6, 7, and 8, there was no significant difference ( $P < 0.05$ ) in the weight of weekly feather loss for the three varieties. At week 2 and 4 there was significant difference ( $P < 0.05$ ) in weight of weekly feather loss as the variety lavender had more feather loss followed by black variety and lastly Pearl variety. At week 3 there was significant different ( $P < 0.05$ ) in feather loss as black and lavender had more feather loss than Pearl variety. At week 5 there was significant difference in feather loss as lavender showed more feather loss than the other two varieties (Pearl and Black). The result suggest that lavender and black had more weekly feather loss than Pearl variety.

The rate of feather loss in the three varieties could be attributed to their temperament. [15], reported that Guinea fowl are nervous and shy. Their nervous reaction lead to feather shed known as “fright moult”. It has been noted that feather retention is under the control of the autonomic nervous system. Also, the weight of feather loss depends on the type of feather dropped, as rectrice and remiges tend to increase the weight of feather loss more than the other types of feathers. Pearl variety may be selected for improvement for meat/egg type guinea fowl for showing better temperament.

Table 2 presents the average feather number of three varieties of female guinea fowls.

Table 2: Mean feather number and feed conversion ration of three varieties of female guinea fowl.

Feather trait	Pearl	Black	Lavender	SE
Feather number	3529.96 <sup>a</sup>	3418.28 <sup>b</sup>	3433.75 <sup>b</sup>	15.3
FCR	0.81 <sup>a</sup>	0.89 <sup>b</sup>	0.86 <sup>b</sup>	0.50

Means with different superscripts are significantly different at  $P < 0.05$ , SE = standard error. FCR = Feed conversion ratio

There was a significant difference ( $P < 0.05$ ) in feather number among the three varieties as Pearl variety showed superiority over the other two varieties, lavender and black, which showed no significant difference ( $P < 0.05$ ) in their feather number. Higher feather number in Pearl variety could be as a result of higher body weight, as it was reported that humming birds had smallest number of feather among other species counted, since it was the smallest of birds examined, suggesting that Pearl variety

may be select for meat type among the three varieties. Significant differences ( $P < 0.05$ ) were also observed in the feed conversion ratio values in the three varieties, with Pearl indicting better utilization of feed intake. Guinea fowl should be raised in a good and conducive environment and less stressed as they are nervous to avoid “fright moult” and Pearl guinea fowl with more feather may be recommended for improvement for meat or egg type guinea fowl in the humid tropics.

## REFERENCES

- [1] Micro livestock, Little known Small Animals with Promising Economic Future, Board in; Science and Technology for International Development, Washington DC: National Academy Press, Washington, USA, 1999 PP.115-125.
- [2] B. I. Nwagu and C. B. Alawa, Guinea Fowl Production in Nigeria World Poultry Science Journal 9, 1995 51:260-270.
- [3] H. Bonds, Alternative farming: A “United Nations” of alternative farming on the Morning ton Peninsula. Available in: [www.independentnewsgroup.com.au/archive/helmi/>1997.PP.1-4.access:19/11/2001](http://www.independentnewsgroup.com.au/archive/helmi/>1997.PP.1-4.access:19/11/2001).
- [4] Embury, Raising guinea fowl. Agfact, 2001 A5.0.8, New South Wales Agriculture Publications, USA, 1997 PP.4.
- [5] J. D. Mallia, Observations on family poultry Units in parts of Central America and Sustainable Development Opportunities. Livestock Research for Rural Development 1999 11(3):10
- [6] B.Ligomela, Population Growth Compatible with Sustainable Development. The Zambezi Newsletter. Musokotwane Environment Resource Centre for Southern Africa. 2000 PP.3 Available in: <http://www.sardc.net/imercsa/zambezi/znewsletter/Issue30f2/district.htm>
- [7] Cactus Ranch, Guinea fowl assortment. Available: <http://www.cactusranchgamebirds.com/guineaf.html> 2001, pp1-2.
- [8] S. A. Richard, The Influence of loss of Plumage on Temperature regulation in laying hen. J. Agric. Sci. Camb. 1977 89:393-398.
- [9] S. Leeson, and J. D. Summers In: Commercial Poultry, Publ. Univ. Books, 1997 Guelph. Ontario.
- [10] F .B .Hutt and L. Ball, Number of feathers and body size of passerine birds. Auk 1938, 55:651-657.
- [11] L. Stevens, Genetics and Evolution of the domestic fowl. 1991 Cambridge University Press.
- [12] SPSS, Statistical Package for Social Sciences. SPSS Inc. 2007 16.0 for windows.
- [13] R. G .D. Steel and J. H. Torrie, Principles and procedures of statistics. A Biometrical Approach. Second edition, MC GRAW-Hill Book Coy. Inc. 1980 New York.
- [14] J .C. Welty, The life of Birds. W.B. Saunders Co; 1975 Philadelphia, PA.
- [15] National research council, Micro livestock. Litter known small animals with a promising economic future, 1991 National Academy press Wessington D.C.