

QUANTITATIVE TRAITS DIFFERENTIATION OF THE NIGERIAN FULANI ECOTYPE CHICKENS IN FOUR AGRO-ECOLOGICAL ZONES

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ABSTRACT

Quantitative traits data collected from one hundred and forty (140) Nigerian Fulani Ecotype Chickens (NFEC) from four agro-ecological zones at 44 weeks old were evaluated. The collections were made up of 25 hens and 10 Cocks from each of sudan savannah (Kebbi), guinea savannah (Kwara), derived savannah (Nasarawa) and humid forest (Osun).

Twenty morphological measurements (body weight, body length, neck length, head length, shank length, thigh length, comb length, comb height, wattle length, wattle height, toe length, drumstick length, beak length, keel length, chest circumference, shank diameter, comb serration, wing span, wing length and spur length) were taken from birds in each collection. Data were subjected to analysis of variance and forward stepwise discriminant analysis. Effect of ecological zone of collection shows significant ($P < 0.05$) difference in only four (head length, body length, shank length and thigh length) of the twenty measured traits. Forward stepwise discriminant analysis shows that body weight, toe length, thigh length, head length and neck length are the largest contributors to the discrimination between the NFEC from the different agro-ecological zones. A remarkable low variability observed in most of the quantitative traits qualifies NFEC as a potential breed. However, further study using larger sample number and molecular genetics technique may be necessary. This is to confirm if the reported variation is solely due to the environment or whether it is genetic or the interaction between the two factors.

Keywords: Ecotype, forward stepwise discriminant analysis, variance.

INTRODUCTION

The indigenous chicken has been proposed as the basis of breed development in Nigeria (Akinokun, 1990; Nwosu, 1985). According to Horst (1989), these chickens are important reservoirs of useful genes and possess a number of adaptive traits. In Nigeria as in most African countries, scavenging flocks of chickens are kept by 80-90% of families, (Sonaiya, 1990). They therefore constitute 80% of the 185 million chicken raised in the country (Sonaiya, 1992).

The Nigerian Fulani Ecotype Chicken (NFEC) is native to drier parts of the country. The chicken strain is developed in a closed nucleus flock by the Bororo clan of the pastoralist Fulani (Sonaiya, 1999). These clan members lived in isolated settlements called Kraals outside cities and towns of Northern Nigeria and some other

parts of the country. The husbandry system adopted in keeping their chicken is unique in the sense that they do not allow interbreeding with chickens from other tribes (Ige, 2014). They were able to achieve this basically because they live in isolation and though have no Pedigree records This study was therefore based on the hypothesis that NFEC is a homogenous population with similar morphological features irrespective of their agro-ecological habitat. Hence, this study was designed to compare the variation in morphological features between NFEC collections from four agro-ecological zones of Nigeria. The work will provide information on a range of descriptors that may be used in the selection of NFEC towards its registration as a breed.

MATERIALS AND METHODS

The study was carried out at the Poultry Unit of the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, in Ife Central Local Government of Osun State, Nigeria. The site lies within the humid forest ecological zone of Nigeria. One hundred and forty NFEC at 44 weeks old from an established stock on the farm were used for the study. The collections were made up of 25 hens and 10 Cocks from each of sudan savannah (Kebbi), guinea savannah (Kwara), derived Savannah (Nasarawa) and humid forest (Osun).

Twenty morphological measurements were taken on each bird, and these include: body weight, body length, neck length, head length, shank length, thigh length, comb length, comb height, wattle length, wattle height, toe length, drumstick length, beak length, keel length, chest circumference, shank diameter, comb serration and wing span. The GLM procedure of SAS was used in analyzing the data, fitting quantitative variables as independent variables and agro-ecological zone of collection of the chickens as fixed factors (Table 1).

RESULTS AND DISCUSSION

The quantitative traits in the different collections of NFEC were shown in Table 1. It shows that variability in the measured traits was only significant ($p < 0.05$) in only four (head length, body length, shank length and thigh length) of the measured twenty traits. According to Jesuyon and Salako (2013), low level of variability among Fulani Chickens seems to be an adaptive feature to their natural environment.

Forward stepwise discriminant analysis (Table 2) identified five statistically significant ($p < 0.0001$) variables; toe length, thigh length, body weight, head length and neck length to be the largest contributors to the discrimination between the NFEC from different agro ecological zones.

Body weight was highest in the humid forest collection (1629g) followed by the derived

savannah 1600g, guinea savannah 1539g and 1486g in Sudan savannah. According to Badubi *et al.*, (2006), the environment is crucial in the phenotypic appearance of individual chickens in the tropics. The body weight values recorded in this study were between the range of 0.9-2.5kg as reported by Jesuyon and Salako (2013), Ajayi (2010). The longest thigh length (12.07cm) was recorded in the guinea savannah collection this was followed by 11.94cm, 11.58cm and 11.47cm of derived, sudan savannah and humid forest respectively. There was no significant difference (< 0.05) between the thigh length of sudan savannah and derived savannah collection. Head length was longest in the sudan savannah collection (6.55cm) followed by 6.46cm in the guinea savannah collection and 6.22cm of the derived savannah and humid forest collections. Body length values of 41.05cm, 40.98cm, 40.97cm and 40.11cm was recorded in sudan savannah, guinea savannah, derived savannah and humid forest respectively with no significant difference between the collections. Generally, it can be deduced from this result that NFEC from the Savannah have longer thigh, shank, head and body length than humid forest NFEC. Bigger body weight was also recorded to be a distinguishing characteristic of NFEC from the humid forest this may be due to highest contribution of the chest circumference (29.16cm) to body weight. Chest measurements have been reported as a reliable trait in genetic studies of poultry (Raji *et al.*, 2009, Fayeye *et al.*, 2006). Other contribution to the highest body weight of the humid forest collection came from the highest drumstick (10.88cm) and wing (16.41cm) lengths. Neck length value of 11.28cm of the humid forest collection was the highest, followed by 11.11cm, 10.98cm and 10.85cm of derived, sudan and guinea savannah respectively. Toe and beak were crucial to the scavenging ability of locally adapted chickens. Toe length was generally higher in the savannahs; 5.56cm, 5.41cm and 5.34cm in the guinea, sudan and derived savannah collections respectively. Lowest value of 4.82cm was recorded in the

humid forest. Beak length of 3.23cm recorded in the sudan savannah collection was the highest, followed by 3.14cm of the guinea savannah. This indicates that NFEC of the savannah collections are likely to be better scavengers than the humid forest collection.

CONCLUSION

The present study showed that NFEC collections from four agro-ecological zones of the country exhibit a remarkable homogeneity in their quantitative traits, qualifying NFEC as a potential breed. However, there are some discrimination in body weight, head length, neck length, thigh length and toe length between the agro ecological collections. These traits are likely to be adaptive due to different climatic conditions and feed resources availability in the different ecological zones. NFEC collections from the sudan and guinea savannah are the closest in body weight. Hence, may be classified together as Light NFEC (LINFEC) while derived savannah and humid forest NFEC may be classified as Heavy NFEC (HENFEC).

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Table 1: Pooled Means ± Standard deviation of quantitative traits of NFEC

Traits	Sudan savannah	Guinea savannah	Derived savannah	Humid forest
BW (g)	1486 ^a ± 340.30	1539 ^a ± 299.67	1600 ^a ± 286.29	1629 ^a ± 497.56
CC (cm)	28.57 ^a ± 1.65	28.85 ^a ± 2.24	28.66 ^a ± 2.02	29.16 ^a ± 2.44
CH (cm)	3.02 ^a ± 2.56	2.91 ^a ± 2.02	2.87 ^a ± 1.77	2.96 ^a ± 2.04
CL (cm)	5.71 ^a ± 3.91	5.60 ^a ± 3.58	5.71 ^a ± 3.42	5.66 ^a ± 3.71
CS	7.86 ^a ± 1.63	7.63 ^a ± 1.70	7.94 ^a ± 1.55	7.60 ^a ± 1.75
WL (cm)	2.54 ^a ± 2.03	2.44 ^a ± 1.56	2.36 ^a ± 1.76	2.29 ^a ± 1.64
WH (cm)	1.36 ^a ± 1.17	1.36 ^a ± 1.01	1.39 ^a ± 0.98	1.27 ^a ± 0.82
HL (cm)	6.55 ^a ± 0.54	6.46 ^{ab} ± 0.44	6.22 ^b ± 0.60	6.27 ^b ± 0.61
BL (cm)	3.23 ^a ± 0.15	3.14 ^{ab} ± 0.19	3.09 ^b ± 0.24	3.13 ^{ab} ± 0.27
NL (cm)	10.98 ^a ± 1.06	10.85 ^a ± 1.43	11.11 ^a ± 1.25	11.28 ^a ± 1.13
BdL (cm)	41.05 ^a ± 2.94	40.98 ^a ± 3.33	40.97 ^a ± 3.24	40.11 ^a ± 3.14
SL (cm)	7.23 ^{ab} ± 0.89	7.30 ^{ab} ± 0.86	7.35 ^a ± 0.69	6.89 ^b ± 0.87
DL (cm)	10.79 ^a ± 0.88	10.80 ^a ± 1.21	10.64 ^a ± 1.03	10.88 ^a ± 1.16
ThL (cm)	11.58 ^{ab} ± 1.13	12.07 ^a ± 1.28	11.94 ^{ab} ± 1.04	11.47 ^b ± 0.75
WS (cm)	43.35 ^a ± 2.94	43.35 ^a ± 3.28	42.33 ^a ± 3.68	42.75 ^a ± 3.54
WgL (cm)	16.30 ^a ± 1.24	16.09 ^a ± 1.33	16.31 ^a ± 1.08	16.41 ^a ± 1.43
KL (cm)	11.00 ^a ± 0.88	10.98 ^a ± 0.94	10.69 ^a ± 0.93	10.85 ^a ± 1.14
TL (cm)	5.41 ^a ± 0.67	5.56 ^a ± 0.66	5.34 ^a ± 0.64	4.82 ^b ± 0.53
SpL (cm)	0.67 ^a ± 0.84	0.63 ^a ± 0.76	0.50 ^a ± 0.51	0.59 ^a ± 0.68
SD (cm)	0.87 ^a ± 0.21	0.86 ^a ± 0.18	0.89 ^a ± 0.17	0.81 ^a ± 0.16

Means with the same superscript along the same row are not significantly different ($p < 0.05$)

BW: Body weight, CC: Chest circumference, CH: Comb height, CL: Comb length, CS: Comb serration, WL: Wattle length, WH: Wattle height, HL: Head length, BL: Beak length, NL: Neck length, BdL: Body length, SL: Shank length, DL: Drumstick length, ThL: Thigh length, WS: Wing span, WgL: Wing length, KL: Keel length, TL: Toe length, SpL: Spur length, SD: Shank diameter.

Table 2: Summary of forward stepwise discriminant analysis of traits

Variables entered	Partial R ²	F – value	Pr > F	Wilks' Lambda	Pr < Lambda	ASCC	Pr < ASCC
Toe length	0.168	9.13	<0.0001	0.832	<0.0001	0.559	<0.0001
Body weight	0.114	5.81	<0.0001	0.737	<0.0001	0.088	<0.0001
Thigh length	0.128	6.54		0.643	<0.0001	0.122	<0.0001
Head length	0.086	4.18	<0.0001	0.588	<0.0001	0.150	<0.0001
Neck length	0.070	3.31	<0.0001	0.547	<0.0001	0.167	<0.0001

ASCC: Average squared canonical correlation