Original Research Article

Morphological Traits Study of Three Indigenous Poultry in Nigeria

ABSTRACT

Aim: This study investigated relatedness among three indigenous chicken types using morphological features and morphological trait interdependence within three indigenous poultry species in Nigeria

Study design: A complete Random sample design was employed in this study to investigate morphological relatedness.

Place and Duration of the study: Birds of reproductive age were sampled from 12 states across Nigeria between February 2013 and November 2015.

Methodology: Morphological traits were measured according to the FAO description. Nearest neighbor analyses (hierarchical cluster) were done using SPSS 23.0 version.

Results: The nearest neighbor analyses showed that higher degree of relatedness exists between the wild type chicken and the frizzle feather indigenous chicken type in Nigeria. Traits interdependence was observed between and among the different morphological traits within the different poultry species.

Conclusion: The characters measured could be of useful genetic importance that may play significant role as markers for selection or breeding programmes for improved productivity under free range or scavenging feed resource-based production systems.

Key words: Morphology; Poultry; Indigenous; Traits-interdependence

1. INTRODUCTION

Poultry plays great role in food security (animal protein) in most part of the world. The indigenous domesticated birds are said to cover over 60% of the world's total poultry population in most Africa nations [1]. In Nigeria, they are mostly found and reared by the rural populations in the rural home sets harnessing the birds for meat and income sources [1, 2]. These local indigenous poultry species have been identified to possess traits of great economic interest and values: they are hardy, show great ability

in resisting certain avian diseases or pathogens and require less attention on feed quality demand [2- 4]. These local poultry types are a great source of genetic reservoir for particularly genes that confer ability to adapt to the tropical and subtropical regions [1, 5].

Variations have been reported to exist among poultry populations and types. The variations come in many different forms, genetic and morphological makeup consisting of high important differences. Furthermore, traits interdependence in poultry species has been reported [3, 6- 8]. Adekoya [2] stated that traits interaction exists within indigenous chicken types and observable relatedness between and among the chicken types. Significant sexual dimorphism in the body measurements between both sexes of muscovy duck in the ecotypes studied and low to high correlation between traits has also been reported by Ogah [7].

The understanding of the diverse morphological differences and the relationship which may exist provide valuable information on the poultry genetic reservoir: variations within and among different populations and types. Sustainable management, characterization, conservation and use of indigenous poultry is a necessity for increased and large scale poultry production, poverty alleviation, proper breeding programs and schemes, national development and global food security[9]. Variations within populations can be established or estimated using analytical packages such as the multifactorial analyses to analyze the morphological traits present within the population. Cluster analysis can show relatedness and or dissimilarity within and among items of a data set [10].

The present study aimed at examining the degree of relatedness among three indigenous chicken types: wild type, naked neck and frizzle feather, and the interdependence between and among morphological traits in the indigenous chicken, duck and guinea fowl populations.

2. MATERIALS AND METHODOLOGY

2.1 Study location

The sampled locations include the following states in Nigeria: Lagos, Ogun, Oyo, Osun and Kwara (South-West), Akwa-Ibom, Edo (South-South), Imo, Anambra and Enugu (South-East), Taraba, (North-East) and Benue (North central) states (Fig 1).

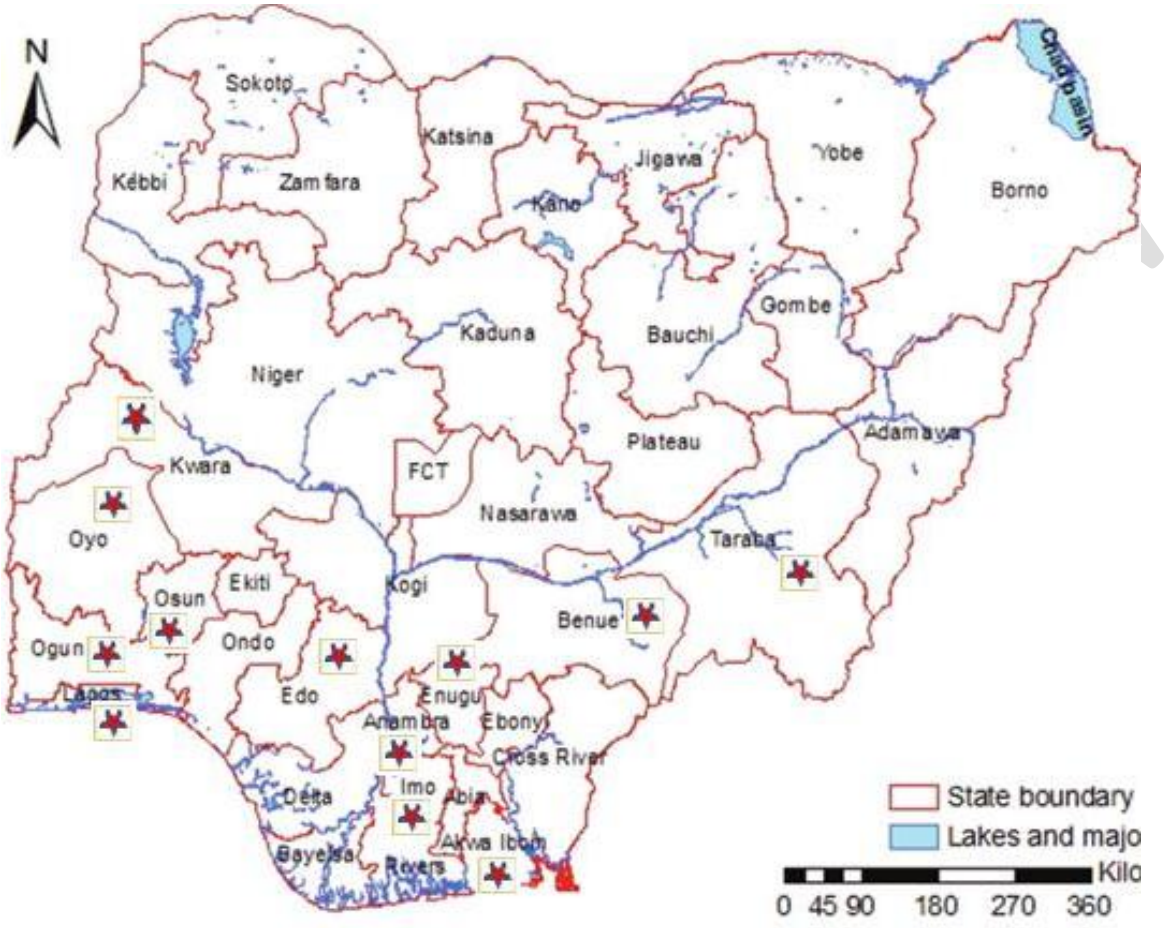

Figure 1: Sampled locations (states) in Nigeria ( )

2.2 Study population

A total of 429 indigenous birds of reproducing age: 247 chickens (96 wild type, 79 naked neck and 72 frizzle feather), 81 ducks and 101 guinea fowl were used for the study (Fig 2).

Figure 2: The different indigenous birds studied.

2.3 Morphological traits measured

Ten qualitative and ten quantitative traits in each bird type were considered based on FAO description.

2.4 Statistical analyses

Nearest neighbor analyses (hierarchical cluster) were done using SPSS 23.0 version.

3. RESULTS

The result demonstrated that some degree of relatedness and non-relatedness exist among the three indigenous chicken types investigated based on the morphological data. Closer relatedness was observed to exist between the wild type chicken and the frizzle feather chicken type with the naked neck chicken type at a distance. Furthermore, traits interdependence were observed to exist between and among some traits investigated in all the indigenous poultry species:

3.1 Relatedness among three indigenous chicken types

Strong relatedness/similarities exist between the wild type chicken and frizzled feather indigenous chicken populations, however, the naked neck indigenous chicken type was distantly related (Fig 3).

3.2 Morphological traits interdependence

3.2.1 Chickens

Within the indigenous chicken population the back length, wing length and tail length formed a cluster. Shank length, beak length and comb length showed more relationship while the height was distinctly separated from the other traits (Fig 4). The qualitative traits skin colour, shank colour and beak colour formed a cluster but showed less relationship with eye and tail colours (Fig 5).

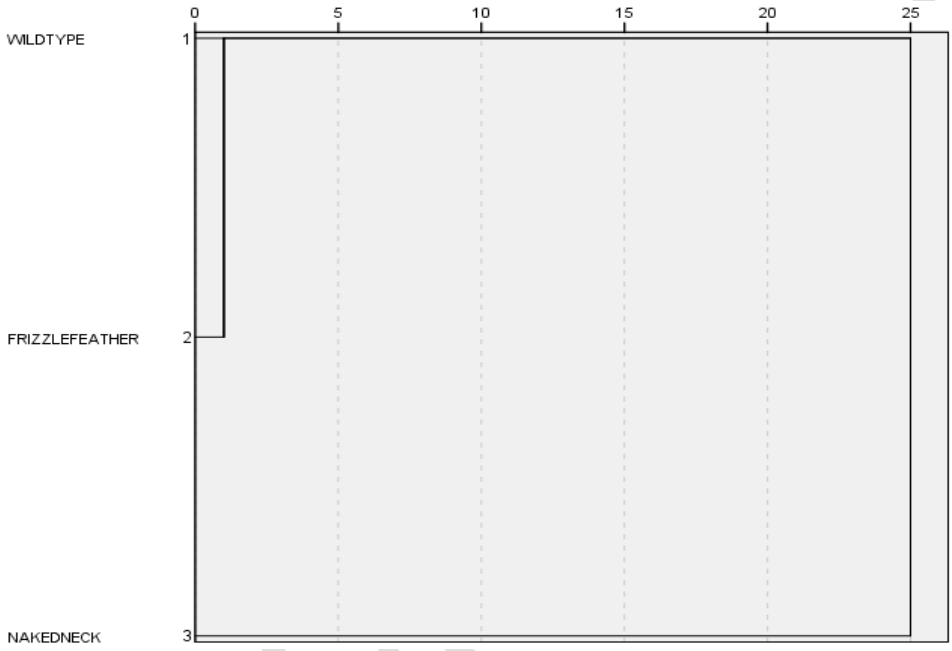

Figure 3: Closest neighbour relatedness among 3 indigenous chicken types.

The wild type and frizzled feather indigenous chicken populations showed more similarity but the naked neck type distantly related (Fig 3).

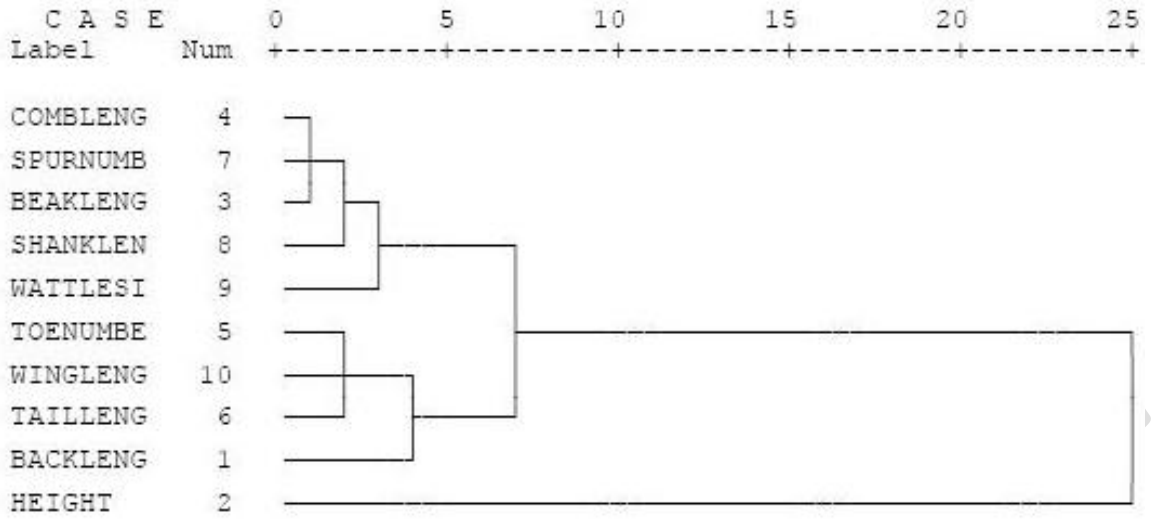

Figure 4: Interdependence among quantitative traits within the chicken population.

Within the chicken population comb length and the beak length formed a cluster (0.96 coefficient level) while the wing length, back length and tail length cluster (0.93 coefficient level) (Fig 4).

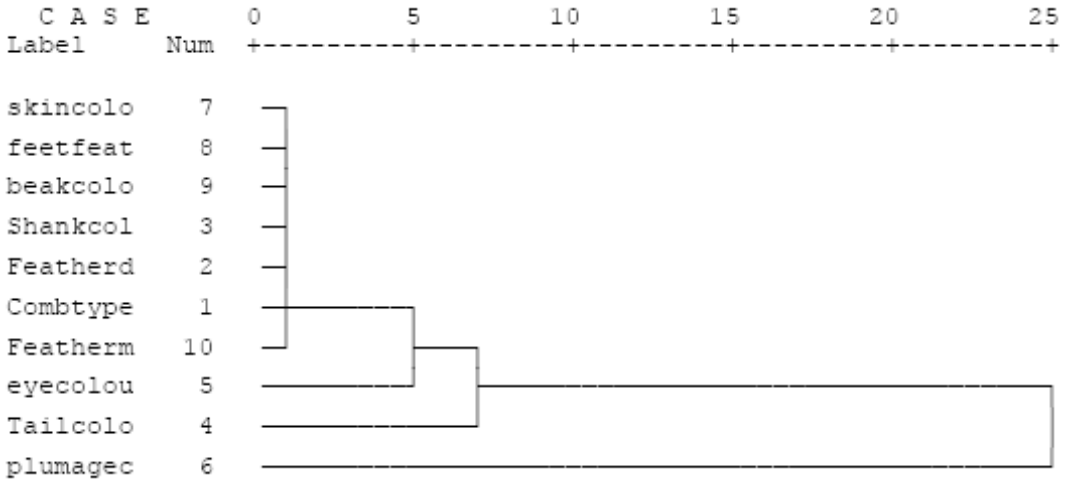

Figure 5: Degrees of interdependence among qualitative traits within the chicken population.

At 0.96 coefficient level skin colour, beak colour, shank colour, comb type and feather morphology showed strong interaction while the plumage colour was distinctly separated (Fig 5).

3.2.2 Guinea fowls

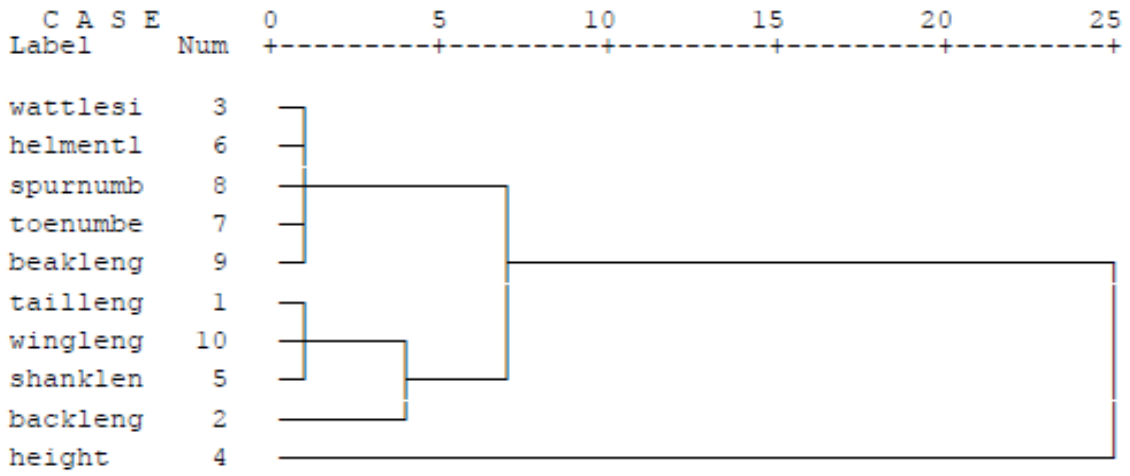

Figure 6: Dendrogram of quantitative traits interdependence within guinea fowl.

Trait interdendepence at 0.96 coefficient level among wattle length, helment length and beak length showed strong morphological trait interaction. Tail lenghth, wing length and shank length also showed some traits interdependence by clustering together to form a sub cluster while

the wing length, tail length and shank length formed a cluster (Fig 6). Among the qualitative traits measured the skin, shank, eyes and helmet colours formed a sub cluster (Fig 7).

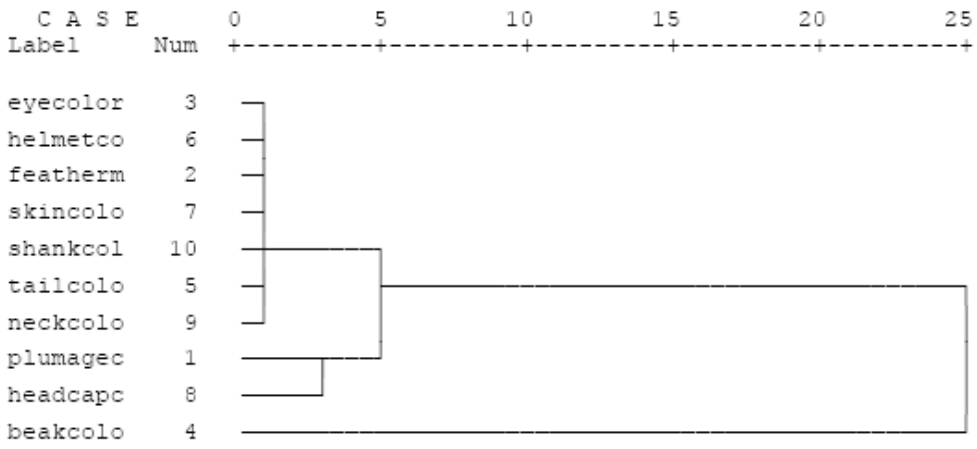

Figure 7: Degree of relatedness based on qualitative traits measurments within the guinea fowl.

3.2.3 Ducks

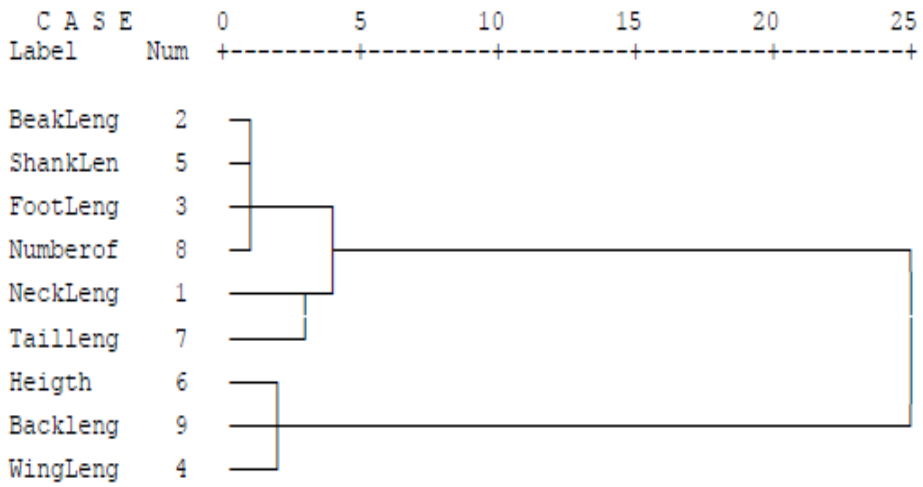

Figure 8: Dendrogram of qualitative traits interdependence within the ducks.

Among the ducks beak length, shank length and foot length made a sub cluster (0.96 coefficient level) while the height, back length and wing length made sub cluster(0.92 coefficient level) (Fig 8).

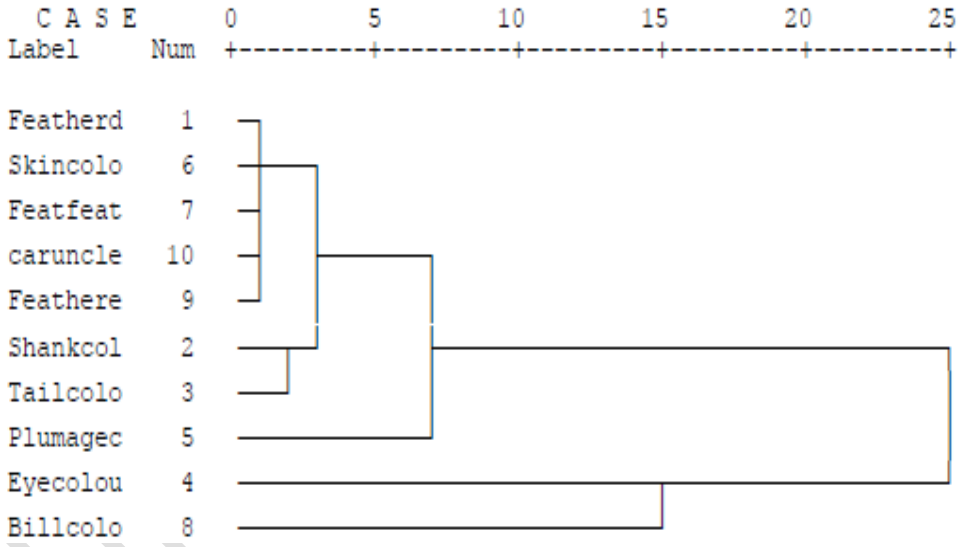

Figure 9: Degree of relatedness based on qualitative traits measurements within the ducks.

The skin colour, feather distribution, caruncle, shank colour and tail colour (0.92 coefficient level) clustered together. However, the eye and bill colours were distinctly separated from the other morphological features (Fig 9).

4. **DISCUSSION**

Genetic characteristics are expressed as phenotypes with influence from the environment. These expressions are often altered by variations in both the genetic compositions and the environment; some traits classified complex traits while some are controlled by single gene [11]. In the present study the wild and frizzle feather indigenous chicken types showed more relatedness among the three indigenous chicken types. This suggested closer ancestral line between the indigenous wild and frizzle feather chicken types than with the naked neck. This observation is consistent with the finding of Adekoya [2]. It also agrees with Mogesse [3] who reported some degree of relatedness existing among some local chicken types in Ethiopia. Our report also agrees with the report from Musa [12] which revealed that relatedness exists among the three indigenous chicken types In Nigeria.

Furthermore, Nigussie [13] reported heterogeneity in most morphological, phenotypical traits, and phenotypic diversity within indigenous chicken populations. The dendrograms in this report showed the existence of diversity in the morphological features of Nigeria indigenous chicken populations. This report, therefore, highlights the rich and diverse genetic reservoir present within the indigenous poultry population. Hence calls for proper conservation of these rich genetic materials before they are eroded. The population may, therefore, possess useful genetic traits that could be employed during selection or breeding programmes for improved productivity under free range or scavenging feed resource-based production systems.

Naked neck and feather morphology and to some extent wattle size within the chicken population showed high heritability with high genetic advance. In the chicken population height was distinctly separated from all other traits. Back, tail and wing lengths also showed strong interdependence in the chickens. The shank length also showed some degree of interdependence with back, tail and wing lengths in the chickens. Furthermore, within both the chicken population beak length and wattle size often clusters together. Interdependence and or intermingling of morphological traits have also been reported by Malek [14].

Height in the guinea fowls was also distinctly separated from all other traits. Back, tail and wing lengths also showed strong interdependence within the guinea fowls. The shank length also showed some degree of interdependence with back, tail and wing lengths in guinea fowls. Beak length and wattle size also clustered together similar to what was observed within the chicken population. These may be

indications that the traits may be interdependent. The report of Ogah [15] revealed that trait interdependence and or intermingling exist between and among certain morphological traits in guinea fowls. The finding in this report may therefore, suggest that height may not have hereditary correlation with the other morphological traits in both chickens and guinea fowls.

In ducks, however, height showed strong relation with back and wing lengths. Also the shank length, beak length and tail length showed some intermingling. Our report agrees with the report of Ogah [7] that reported correlation between morphological traits, though with varied degree of interdependence between different traits. The report added that the correlation and variations among the traits may also indicate adaptability to the varied environments.

Furthermore, shank, skin, eye, beak colours and feather distribution indicated some degree of interdependence in the chickens. Similar observation was seen among the guinea fowls except the beak colour which was distinctly separated from other traits. Among the ducks however, shank, skin colours and feather distribution were within the same cluster which may also indicate trait interdependence. Adedibu [10] reported positive relationship among some morphological traits among helmeted guinea fowls in Kaduna. Yakubu and Ugbo, [4] revealed that diversity and trait independence exist in the duck's morphological trait as revealed in their study on duck populations from the guinea savannah and rainforest zones of Nigeria. They added that although morphological variation is present the studied populations might have descended from a common ancestral line or population.

These findings may be indications that the morphological traits influence or interact with one another's expression. Morphological traits interdependence has been reported by Ajayi [16]. They added that the relationship observed among the morphological features is of significance in management, characterization and conservation of the genetic resources in this bird type. Direct and indirect correlation and trait interdependence between morphological traits have been reported [7, 10, 14].

These characters, based on the relationship displayed, showed the possibility of having direct effect on one another, and direct selection may be more effective towards the improvement of yield in the poultry. Furthermore, observed morphological and phenotypical variations that have economic values have been reported among the indigenous chicken populations in different parts of the globe especially Africa [3, 10, 17-19]. It is pertinent therefore in-depth molecular studies be done to evaluate the level of genetic

differentiation and relationship present within these morphological features among the different indigenous poultry species with the aim of aiding global food security and the conservation of the genetic resources before they are eroded.

5. **CONCLUSION**

The present study revealed that rich morphological traits diversity exists within the Nigeria indigenous chicken population. It also showed that morphological traits interdependence exist between and among each other. These traits are of economic importance and values and could be employed as selection markers during breeding programmes. Therefore, the findings of this study in combination with molecular marker assisted selection could be applied by developing countries towards developing indigenous poultry types with improved traits of interest and can serve as baseline information for conservation programmes.

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