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THE USE OF MORPHOLOGICAL MEASUREMENT FOR CHARACTERISATION OF LOCAL CHICKEN ECOTYPES POPULATIONS

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ABSTRACT

The study was conducted in Katsina-Ala local Government Area of Benue State, in four villages each with a minimum distance of thirty kilometers apart. Body linear measurement and body weight were measured on 1378 adult chickens. The data generated were subjected to discriminant analysis.Discirminant function models were utilized to estimate canonical discriminant functions, canonical correlation coefficients and structure matrix. The discriminating power of tail width (TW) was the highest followed by shank length (SL), tail length (TL), comb height (CH) and thigh length (THL).These five variables have large canonical discriminant coefficients with strong discriminating power which aided the allocation of the chicken populations to the four groups. The five variables showed strong discriminating power that can be used on the field for characterization, to differentiate and identify phenotypic variability between populations of local chicken ecotype.

Key words: Body-measurements, ecotype, populations, local chicken

INTRODUCTION

Local chickens account for about80 percent of the 120 million poultry found in Nigeria (Fayeye *et al.*, 2006). The local chicken resource is economically important to the people of Nigeria and the developing world at large. The rearing of local chickens demands the use of very little resources and the financial reward is within a short interval. Hence local chicken production is an important tool for poverty alleviation of the rural populace. Adaptation of the local chicken ecotypes in the tropical environment has been through reduction in body sizes as a means of reducing feed requirement and increasing feed efficiency (Rashid *et al.*, 2005). Attempts to provide adequate diet to improve performance has not been economically justifiable (Pedersen, 2002;Lwesya *et al.*, 2004). Genetic improvement of the local chickens for effective utilization of dietary nutrients appeared to be the most economically option to improve performance in the sector (Olawunmi *et al*., 2008). In Nigeria, local chickens were characterized along genetic lines of feather and plumage color (Adedokun and Sonaiya, 2001). Classification has also been on the basis of location (Momoh *et al.*, 2007). These do not provide the basis for characterization that will provide information on genetic variation that existed either within or between plumage colour variants and locations respectively. There are reports of the existence of various ecotypes of the local chickens in the different agro ecological zones of Nigeria (Oluyemi *et al.*, 1982; Nwosu 1990; Olori 1992 and Gwaza *et al.*, 2013). The origin of each ecotype is the product of mutation, genetic drift, separate adaptation, differing selection pressures which has been imposed by climate, man and available nutrition (Barker, 1994). Thus, each ecotype comprises a number of diversified adaptive and productive traits and genes even within isolated populations with special utility in their location (Daguma, 2006). The *Tiv* local chicken

ecotypes found in the derived southern guinea savannah zone of Nigeria occurs in huge numbers that are raised predominantly by the traditional family-base free range system (Alemu and Tadelle, 1997; Gwaza *et al*., 2012).These ecotypes are expected to posses diversified adaptive and productive traits that, if identified, will form the basis for characterization, selection and breeding strategies for genetic improvement in the rural poultry production.

In view of the above mentioned, this study was designed to investigate the variation in body measurement that can be used for characterization between isolated populations of the Tiv ecotype with the aim to highlight the existence of variation within the ecotype that can be useful for genetic improvement.

MATERIALS AND METHOD

Location and animal management

This study was conducted at four villages (Kpumtyo, Weryima, Kenvanger and Undende of Katsina-Ala Local Government area of Benue State. Katisna-Ala is located on latitude 7^{o} 11" N and longitude 9^{o}20"E. The selected villages were rural communities that practiced live-stock crop integrated farming. Local chickens were the predominant poultry species owned by the selected communities. The chickens are reared under free range management feeding by scavenging on kitchen wastes, farm by-products, insects, earth and wood worms etc. Water and cereal grains were occasionally provided by the farmers. Housing when provided are poorly constructed. Medication is rarely provided while incubation, hatching and brooding were naturally done by the hens.

Measurement of morphological traits

Measurements were taken on 1378 adult birds for body length (BL), body height (BH), shank length (SL), thigh length (THL), tail length (TL), tail width (TW), comb length (CL), comb height (CH), wattle length WL, wattle height (WH)and body weight (BW).

Statistical Analysis

The data generated were subjected to discriminant analysis of SPSS 2004, to estimate canonical discriminant functions, canonical correlation coefficients, and structure matrix. The following discriminant function models were utilized

D_1=(0466xbl)+(0.441xbh)+(1.189xsl)+(0.029xthl)+(0.273xtl)+(0.511xtw)+(0.032xcl)+(0.046xc

h)+(-0.201xwl)+(0.364xwh)+(0.073xbw)+(-95.515).

D2=(-0.393xbl)+(0.719xbh)+(-0.142xsl)+(-0.764xthl)+(0.812xtl)+(0.039xtw)+(-0.380xcl)

+(-0.473xch)+(0.017xwl)+(0.443xwh)+(0.19xbw)-(-95.905).

D3=(0.664xbl)+(-0.534xbh)+(.034xsl)+(0.241xthl) +(0.728tl)+(0.244xtw) +(0.687xcl)

+(-0.784xch)+(0.144xwl)+(0.049xwh)+(0.409xbw)-(-95.942).

Where

D1, D2, D3 are standardized canonical discriminants coefficients.
Bl and bh are body length and height respectively. sl, thl, tl, tw, cl and ch are shank length, thigh length, tail length, tail width, comb length and comb height respectively. While wl, wh, and bw are wattle length, wattle height and body weight respectively.

The use of morphological measurement

Standardized canonical discriminants coefficient was utilized to indentify the importance of each predictor, and the direction of the relationship. Structure matrix was utilized to identify the largest of each discriminant function.

RESULTS

Standardized Canonical Discriminants Coefficients

Tail width (TW) and shank length (SL) were the strongest predictor, while thigh length (THL) and tail length (TL) were next in importance as predictor followed by comb height (CH) (Table 1).

Table 1: Standardized Canonical Discriminant Coefficients.

	Functions		
Variables	1	2	3
BodyLength (cm)	0.466	-0.393	0.664
BodyHeight (cm)	0.441	0.716	-0.534
Shank Length	- 1.189	- 0.142	-0.034
Thigh Length (cm)	0.029	- 0.764	-0.241
Tail Length	-0.273	-0.812	-0.728
Tail Width (cm)	0.511	0.039	0.244
Comb Length (cm)	0.032	-0.380	0.687
Comb Height (cm)	0.046	-0.473	0.794
Wattle Length (cm)	-0.201	0.017	0.144
Wattle Height (cm)	0.364	-0.443	0.0409
Body Weight (g)	0.073	0.192	-0.409

Structure Matrix

Tail width had the largest loading (0.524) followed by shank length (-0.394) in discriminant function 1. In discriminant function 2, tail length had the largest loading (0.457) followed by thigh length (-0.366). In discriminant function 3, tail length had the largest loading (0.703) (Table 2).

Table 2. Structure Matrix

	Functions		
Variables	1	2	3
Tail width (cm)	0.524	-0.037	0.333
Tail Length (cm)	- 0.157	-0.457	0.703
Body Length (cm)	0.218	-0.267	0.578
Thigh Length (cm)	-0.046	- 0.366	0.497
Comb Length (cm)	0.056	- 0.142	0.436
Wattle Height (cm)	-0.066	- 0.050	0.372
Body Weight (g)	0.079	- 0.044	0.429
Shank Length (cm)	-0.394	-0.190	0.398
Wattle Height (cm)	-0.050	-0.055	0.372
Body Widht (cm)	-0.079	-0.005	0.316
Comb Height (cm)	0.91	- 0.157	0.294
Body Height (cm)	0.169	0.158	0.177

DISCUSSION

Standardized canonical discriminant coefficients

The standardized canonical discriminant coefficient provides information on the importance and strength of each predictor to the discriminant function (Meritexell *et al*., 2003). It revealed that the discriminating power of tail width (TW) was the highest followed by shank length (SL) with standardized canonical coefficients of0.511 and – 1.189 respectively for discriminant function 1. Tail length (TL) was the highest followed by thigh length (THL) in their discriminating power with the standardized canonical coefficients of 0.812 and -0.764 respectively for discriminant function 2. In discriminant function 3, tail length (TL) and comb height (CH) had the highest discriminating power with standardized canonical coefficients of 0.728 and -0.794 respectively.

These five variables with large canonical discriminant coefficients stand out as those with strong discriminating power that predicted allocation to the four populations. The five variables were sufficiently robust to be used on the field to differentiate and identify phenotypic variability between populations of local chicken ecotypes. This indicate that tail width and shank length, tail length plus thigh length and tail length plus comb height were the most accurate variable in a discriminant function model for predicting the allocation of birds to the four groups. Meritexell *et al.* (2003) had also reported two body linear measurers (Bill length and Bill depth) as the most accurate variables in a discriminant function model. Any of these variables or a combination of them could provide information on morphological differentiation of local chickens between populations that can be use for their characterization.

Structure of matrix

The structure matrix showed the correlation of each variable with each discriminant function. The highest loading of tail width and shank length suggested that the correlation between tail width and shank length was the function that discriminated between the populations in discriminant function 1. In discriminate function 2, high loading of tail length and thigh length suggested that the correlation between these was the function that discriminated between the populations in discriminant function 2. Tail length had the largest loading and was the function that discriminated between the populations in discriminant function 3. This also indicated that these variables are the most accurate in a discriminant function model for prediction of variation in body dimension of local chicken between populations.

CONCLUSION AND RECOMMENDATION

Tail length, tail width, shank length, thigh length and comb height have strong discriminating power that can be use in the field to differentiate and identify phenotypic variability between and within populations of local chickens ecotypes selection can then be applied for genetic improvement in the rural poultry subsector.

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