Morphometric Traits of Muscovy Ducks from Two Agro-Ecological Zones of Nigeria

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Summary

Morphological variation between Muscovy ducks from the guinea savannah and rainforest zones of Nigeria was examined using multivariate discriminant analysis. Data comprised eight morphometric traits measured in a total of 435 adult ducks randomly selected in the two agro-ecological zones. Common descriptive statistics showed that ducks from the rainforest zone had higher (P< 0.05) body weight, foot length and thigh circumference, while their guinea savannah counterparts were longer (P< 0.05) in the neck. Stepwise discriminant analysis indicated that foot length, neck length, thigh circumference and body length were more effective in discriminating between the duck populations. The low Mahalanobis distance of 3.39, as revealed by the canonical discriminant analysis, is an indication of high gene flow between ducks from the two agro-ecological zones. The cluster analysis also revealed the homogeneity of the genetic identity of the duck populations. The present information will be the basis for further characterization, conservation and sustainable genetic improvement strategies for indigenous ducks.

Introduction

Poultry has long been recognized as a major contributor to long lasting solution to insufficient protein intake in Nigeria. Ducks represent the second largest poultry population in Africa after chicken. They are hardy, less exigent for feed quality, less susceptible to diseases than chicken, and quite promising among indigenous poultry species because of their rapid growth rate and dressed weight of drakes (4). According to Adesope and Nodu (1), the meat of Muscovy ducks, which make up about 74% of the total duck population in Nigeria, contains less fat and it’s healthier. Animal genetic resources in developing countries in general, are being eroded through the rapid transformation of the agricultural system, in which the main cause of the loss of indigenous AnGRs is the indiscriminate introduction of exotic genetic resources before proper characterization, utilization and conservation of indigenous genetic resources. Characterization includes a clear definition of the genetic attributes of an animal species or breed, which has a unique genetic identity and the environment to which species or breed populations are adapted or known to be partially or not adapted at all (3, 13, 19). Characterization, conservation and use of indigenous animal resources under low levels of input in the tropics are usually more productive than is the case with...
exotic breeds. The locally adapted animals are also more readily available to resource-poor farmers and they can be productive without high disease-control inputs (7). Yet, paucity of information on the genetic resources present in the indigenous farm animals in developing countries has led to their underutilization, replacement and dilution through crossbreeding. This, therefore, underscores the paramount significance of the characterization, management and conservation of the indigenous ducks. Phenotypic comparison based on morphological characters can provide to some extent a reasonable representation of genetic difference among populations. This genetic variation in the duck populations is essential for the development of appropriate breeding goals and programmes for each agro-ecological zone of the country. However, earlier work on the body conformation characteristics of ducks in Nigeria (5) and elsewhere in Africa (17) had been centred on univariate statistical techniques, which is highly limited (it analyzes each variable separately) in assessing variation within and between livestock populations. The current trend involves the use of multifactorial discriminant analysis of morphological characters, which explains how populations under investigation differ when all measured variables are considered jointly (12, 18).

The present investigation therefore, aimed at examining the morphological variation between Muscovy ducks of two agro-ecological zones of Nigeria using multifactorial discriminant analysis. This could aid their proper management, conservation and improvement in breeding programmes.

Materials and methods

Location of study and experimental animals

Data were obtained from four hundred and thirty-five randomly selected adult Muscovy ducks of both sexes from three states within two agro-ecological zones of Nigeria. This comprised 221 ducks from the guinea-savannah (Nasarawa state) and 214 ducks from the tropical rainforest zones (Lagos and Cross River states), respectively. The birds, which were over 45 weeks old were selected in villages and market places from December, 2008 to December, 2009. Information on the age of the ducks was provided by the owners, and this was consolidated by the researchers using anatomical reference points were as earlier described (17,18). Measurements were restricted to apparently healthy birds that conformed to the species’ classification descriptors. A 5-kg measuring scale was used for the weight measurement. The length and circumference measurements were effected using a measuring tape calibrated in centimetres (cm). All measurements were taken by the same individual early in the morning before the birds were fed.

Statistical analysis

MEAN procedure of SPSS (15) statistical package was used to study morphological variation in the duck populations of the two agro-ecological zones, with means separation done using t-test of the same statistical package. Stepwise discriminant procedure was applied using PROC STEPDISC (14) to determine which morphological traits have more discriminant power than others for eventual use in the cluster analysis. The CANDISC procedure was used to calculate the Mahalanobis distance between ducks from the two agro-ecological zones. The degree of morphological similarity or divergence between the ducks was determined using the Ward’s option of PROC CLUSTER procedure.

Results

The results (Table 1) of the descriptive statistics of the morphometric traits of the ducks showed that body weight (2.2 ± 0.05 versus 2.0 ± 0.05), foot length (5.5 ± 0.09 versus 4.3 ± 0.05) and thigh circumference (8.6 ± 0.18 versus 7.5 ± 0.15) were higher significantly (P<0.05) in rainforest ducks compared to their guinea savannah counterparts. However, the latter had longer neck (P<0.05) compared to the former. There were no marked differences (P>0.05) in body length, bill length, wing length and breast circumference of ducks from the two zones.
The stepwise discriminant analysis indicated that foot length, neck length, thigh circumference and body length have more discriminating power in assessing morphological variation between the two duck populations. These four variables were used to obtain an estimate (3.39) of the Mahalanobis distance between the two duck populations. The plot derived from the cluster analysis is presented in figure 1.

**Discussion**

Studies devoted to the morphological characterization of ducks especially within the tropics are scarce and the average values obtained in the present study cannot be easily compared with others in the literature. However, the body weights of Muscovy ducks in this study are higher than the range of 1.515 kg and 1.710 kg reported for extensively reared Deshi and Deshi x Khaki Campbell cross in India by Mallick et al. (11) and 1.300-2.610 kg (drakes) and 1.230-2.325 (ducks) reported for Comb ducks in Gambia (8). They are also heavier than ducks from Fayoum Governorate in Egypt (6), although with shorter foot length (1.536-1.867 kg body weight and 7.3-7.4 cm foot length, respectively). The values are similar to the mean body weight of 2.115 kg reported for mature indigenous Muscovy ducks in Congo Brazzaville (2). The estimates obtained in this study are also comparable to the average values of 2.507 kg (drakes) and 1.734 kg (ducks) reported by Etuk et al. (5) for the same breed of ducks under similar environmental conditions. However, they fall below the average weights of 2.30-4.10 kg reported by Stevens (16) for ducks of about 3 months of age; although these values were for birds that had been subjected to selective breeding with better management practices. The present values were also lower than those (2.750-5.147kg body weight and 36.79-45.84 cm chest girth, respectively) reported for Muscovy ducks imported from France to Poland (9). The high coefficients of variation especially of body weight and thigh circumference of birds from both agro-ecological zones in the present study could be attributed to the sensitivity of these traits to environmental changes such as temperature and nutrition. The practical implication of this is that there is room for their genetic improvement based on the observed variations.

The low morphological differentiation between ducks from the two agro-ecological zones as revealed by the Mahalanobis distance did not give enough evidence to separate the populations into different genetically distinct groups or breeds. The canonical plot further

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**Table 1**

<table>
<thead>
<tr>
<th>Traits</th>
<th>Guinea savannah ducks</th>
<th>Rainforest ducks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SE</td>
<td>SD</td>
</tr>
<tr>
<td>Body weight</td>
<td>2.0 ± 0.05</td>
<td>0.78</td>
</tr>
<tr>
<td>Body length</td>
<td>42.4 ± 0.51</td>
<td>7.61</td>
</tr>
<tr>
<td>Neck length</td>
<td>16.0 ± 0.18</td>
<td>2.71</td>
</tr>
<tr>
<td>Bill length</td>
<td>4.3 ± 0.06</td>
<td>0.88</td>
</tr>
<tr>
<td>Foot length</td>
<td>4.3 ± 0.05</td>
<td>0.72</td>
</tr>
<tr>
<td>Wing length</td>
<td>20.4 ± 0.39</td>
<td>5.75</td>
</tr>
<tr>
<td>Breast circumference</td>
<td>34.5 ± 0.37</td>
<td>5.56</td>
</tr>
<tr>
<td>Thigh circumference</td>
<td>7.5 ± 0.15</td>
<td>2.16</td>
</tr>
</tbody>
</table>

* means in the same row with different superscripts are significantly different (p< 0.05)

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Figure 1: Canonical plot of the clusters of ducks of the guinea savannah and rainforest zones.
revealed the degree of relationship and similarity between the duck populations, which is an indication that they belong to the same breed. The present information arisen from discriminant analysis is the first tool available to explain the morphological variation of Muscovy ducks in Nigeria on the basis of agro-ecological zone. However, there is need for a comprehensive study of the morphological variability of ducks from other geographical zones of the country; and this should be complemented with more evidence drawn from biochemical and molecular genetics. Future research strategy might also involve the integration of the physical, economic, social and cultural conditions of the farmers. This will aid the proper management of the ducks, and assist in initiating conservation and improvement programmes for the indigenous duck genetic resource.

Conclusion

This study showed that ducks from the rainforest agroecological zone were larger in size than those from the guinea savannah zone. However, foot length, neck length, thigh circumference and body length were more discriminating in explaining morphological variability between ducks from the two zones. Maintaining this variation is important if the goal is to continue to improve the performance of the birds and respond to change in climate, disease or consumers’ preference while improving the livelihood of livestock keepers and food security of the populace. The low mahalanobis distance was an indication of the extent of genetic exchange between the two duck populations. The present information could aid their management, conservation and future selection and breeding programmes.

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Literature


