Assessing the Morphological Diversity of Ethiopian Indigenous Chicken Populations Using Multivariate Analysis of Morphometric Traits

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Abstract

In Ethiopia, there have been many morphological characterisation studies conducted to describe the existence of phenotypic variations among the indigenous chicken populations. However, most of these studies were focused on specific districts with inadequate sample size and, except a few; none of them have also attempted to morphologically differentiate them by applying a multivariate analysis. Therefore, the aim of the present study was to assess the existence of phenotypic diversity among indigenous chicken populations of four administrative zones (Kaffa, Sheka, Metekel and Bale) based on their morphometric traits by applying multivariate analysis. Data on quantitative traits were collected from 3069 adult indigenous chickens of both sexes. Traits scored were live weight (LW), body length (BL), breast circumference (BC), wingspan (WS), shank length (SL), shank circumference (SC), keel length (KL), back length (BkL) and neck length (NL). A cluster and discriminant analysis was applied to identify the combination of variables that best differentiate among chicken populations. Results indicated that Metekel chickens were characterised by higher LW, BL, KL and BkL and differed from other groups ($p < 0.05$). Sheka chickens demonstrated the highest BC, WS, SL, SC and NL being different from others ($p < 0.05$). Cluster analysis generated two distinct groups in which chickens of Bale and Sheka were clustered in one group while those of Metekel and Kaffa in another group each separated with sub-clusters. Three statistically significant ($p < 0.001$) canonical variables (CAN) were extracted of which CAN1 and CAN_2 accounted for 73.2 and 14.6 % of the total variations, respectively. The scatter plot generated by canonical discriminant analysis showed that CAN1 effectively discriminated between chickens of Metekel and Kaffa while the CAN_2 best discriminated against those of Bale and Sheka. The discriminant analysis correctly classified 95.3, 94.9, 92.3, and 82.2 % of Metekel, Bale, Kaffa, and Sheka chickens into their origin population, respectively. The current study revealed that multivariate analysis of morphometric traits provided a practical basis for differentiating the indigenous chicken populations into different groups. Genetic characterisation studies have been recommended to validate the observed morphometric-based differentiations.

Keywords: Administrative zone, genetic variation, indigenous chicken, morphometric trait, multivariate analysis

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