Genetic differentiation of Ethiopian and Nigerian village chicken

Raman A. Lawal¹, Ayotunde. O. Adebambo², Takele T. Desta¹, David Wragg¹, Olivier Hanotte³
¹School of Life Sciences, The University of Nottingham, University Park, Nottingham. NG7 2RD, United Kingdom
²Department of Animal Breeding and Genetics, Federal University of Agriculture, P. M. B. 2240, Abeokuta, Nigeria
Corresponding author: Raman Lawal (plxral@nottingham.ac.uk)

Introduction
Archaeological evidence shows that chicken, which millions of subsistence farmers depend on, likely entered the African continent first through the North of Africa, and subsequently dispersed towards Eastern and Western Africa. It is assumed that this geographical dispersion pattern may have caused variation in the genetic structure of the village chicken. This study examines the differentiation that may have taken place between and within Ethiopian and Nigerian village chicken populations.

Methodology
A total of 52 samples from 14 populations of village chickens across Ethiopia (East Africa) and Nigeria (West Africa) were genotyped using the high density (580K) Axiom® genome-wide chicken genotyping array. Quality control included SNP (Single Nucleotide Polymorphism) call rate of > 0.95, maf (minor allele frequency) > 0.05. Principal component analysis (PCA) was performed in R² of GenABEL and Adegenet² libraries using custom script, genetic relationships using MEGA 5.2 and admixture analysis using R², distruct³ and GSview version 5.0⁴. The Fst and heterozygosities (H₀ and Hₑ) of the population were calculated also in R² using custom scripts.

Results and Discussion
The PCA results are presented in figure 1. 1st and 2nd PC explains together about 50% of total variance. Both separate the Nigerian and Ethiopian chicken with more genetic variations across Ethiopian chicken. A group of 3 Ethiopian and one Nigerian chicken occupied an intermediate position (C2) and 3 Nigerian chickens were separated from the others (C1). Relationship tree (figure 3) largely support the PCA results (C1 and C2). Incomplete genetic differentiation (Fst = 0.053) was observed between the two countries despite the presence of large geographical distances. Admixture (k = 2) clearly separate Ethiopian and Nigerian populations (figure 2). At advance level of k there is more diversity within Ethiopian population than in Nigerian population.

Conclusions
1. Despite large geographical distance between the two populations, incomplete genetic differentiation was observed between countries perhaps reflecting a legacy of common ancestry and recent arrival of chicken on the studied geographic areas.
2. Alternatively, common commercial introgression may have happen in some birds in Nigeria and Ethiopia.
3. Higher proportion of molecular variations observed within Ethiopian population may have happen in some birds in Nigeria and Ethiopia.
4. Further studies with more locations and birds may further clarify these issues.

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References