

Mitochondrial DNA-Based Genetic Differentiation of Six Improved Tropically Adapted Chicken Breeds in Imo State, Nigeria

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Abstract:

Genetic characterization of poultry population is an essential tool for sustainable poultry breeding, conservation and Improvement programs. This study evaluated mitochondrial DNA (mtDNA) variation among six Improved tropically adapted chicken breeds raised in Imo State Nigeria. Blood samples were extracted from 77 chickens representing breeds of Noiler, FUNAAB-Alpha, Shika Brown, Kuroiler, Sasso and Fulani Ecotype chickens. A fragment of the mitochondrial control region (D-loop) was amplified and sequenced to evaluate haplotype diversity, nucleotide diversity, phylogenetic relationships, and population differentiation. Eight (8) haplotypes identified were defines by 150 polymorphic sites across the studied population. Haplotype diversity ranged from 0.731 to 0.970, thus indicating moderate mitochondrial genetic variations among populations. The reconstructed phylogenetic and haplotype network analysis revealed multiple maternal lineages corresponding to known global chicken haplogroups (A–E). Results of the Analysis of Molecular Variance (AMOVA) revealed a higher within population variation (87.89%), with only a small proportion occurring among populations. The findings from this study demonstrated that despite selective breeding and indiscriminate dissemination of chickens in the Nigerian smallholder farming systems, the studied improved tropically adapted chicken breeds (iTABs) in Nigeria still maintained a significant maternal genetic diversity. This result offers a valuable molecular genetic insight for understanding the genetic structure, evolutionary history, and conservation status of poultry populations in the tropics. The study further highlighted the relevance of mitochondrial genome variation in molecular genetics research and supported its potential applications in designing sustainable breeding strategies for climate-tolerance chicken production.

Keywords:

Mitochondrial DNA, haplotype diversity, poultry genetics, tropical chicken breeds, molecular breeding.