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"Agricultural development within the rural-urban continuum"

A Global Assessment of Population Structure and Genetic Diversity in Chicken Populations from Africa, Asia, Europe, and Commercial Breeds

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Abstract

The analysis of global diversity and population structure of chickens plays a vital role in priority settings and strategy development for genetic diversity conservation schemes, especially in the era of using genetic variations for future intensive selection programmes and breeding stock development. The genetic diversity and population structure of 114 chicken populations from Africa, Asia, and Europe were studied using 29 microsatellite markers. Three populations of wild chickens (RJF), nine commercial purebreeds and one inbred line encompassing four sublines were used for comparison. Allele frequencies, mean number of alleles, heterozygosity, Wright's fixation indices, marker-estimated kinship and molecular coancestry coefficients were estimated to investigate the extent of genetic variability between and within chicken populations from different geographical regions. Population structure was determined by using Bayesian model-based clustering and phylogenetic neighbour net was derived from marker estimated kinship distances. High heterozygosity was observed in African (0.614) and Asian (0.603) chickens relative to European (0.454) and Commercial (0.453) breeds. European chicken breeds showed higher range of variability in heterozygosity, while the majority of Asian and African chicken populations had heterozygosity levels above the mean of all populations. They also showed lower differentiation (FST estimates) than European or commercial breeds. A spatial difference of Marker-estimated kinship was obtained from similarity matrices calculated from the allele frequencies of the microsatellites over chicken populations under geographical distribution. The cluster analysis revealed high admixture in African and Asian chicken populations whereas European breeds partitioned into distinct groups with minimum sharing of genetic material. Attention should be drawn to conservation of some European chicken breeds.

Keywords: Coancestry, genetic diversity, microsatellite markers, population structure

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