Genetic diversity of goose (*Anser anser*) and guinea fowl (*Numida meleagris*) local breeds using whole genome sequencing

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The conservation of genetic diversity in local poultry breeds is essential for maintaining unique genetic resources and ensuring their adaptability to future agricultural and environmental challenges. Local breeds like the Oca Padovana (OPD) and the Faraona Camosciata (FAC) represent valuable genetic reservoirs that contribute to biodiversity and cultural heritage. This study aimed to evaluate the genetic variability of OPD and FAC to assess their conservation status. For both breeds 50 animals were sampled: 16 males and 34 females for the OPD, and 26 males and 24 females for the FAC. Blood samples (2 mL per individual) were collected to extract DNA, followed by whole-genome sequencing. The sequencing data were subjected to SNP calling analysis, resulting in the identification of more than 200,000 SNP molecular markers for each breed. These markers were used to estimate genetic variability indices such as minor allele frequency, expected heterozygosity (H_E), observed heterozygosity (H_O), and inbreeding coefficients based on homozygosity (F_{HOM}) and runs of homozygosity (F_{ROH}). To further assess the variability within OPD and FAC, genetic structure analyses were performed using Admixture, multidimensional scaling, and identification of runs of homozygosity. Low levels of H_E and H_O were observed in both breeds (OPD: H_E = 0.129±0.071 and H_O = 0.143±0.149; FAC: H_E = 0.219±0.145 and H_O 0.221±0.280), coupled with high inbreeding coefficients due to an excess of homozygosity (OPD: F_{HOM} = 0.473±0.174 and F_{ROH} = 0.451±0.376; FAC: F_{HOM} = 0.528±0.098 and F_{ROH} = 0.536±0.138). Genetic structure analyses revealed low variability within the OPD and highlighted the presence of two distinct subpopulations within the FAC. These findings were corroborated by genetic background analyses. The runs of homozygosity identification enabled the characterization of specific genomic regions with high homozygosity, including genes of potential significance. The present study provided the genetic characterization of the OPD and FAC local breeds, contributing valuable starting information for optimizing conservation plans for the two breeds.

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