



Assessing genetic diversity and differentiation in Portuguese coarse-wool sheep breeds with microsatellite markers

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Abstract

Population structure and genetic diversity in the Portuguese native breeds of sheep Algarvia (AL), Badana (BA), Galega Bragançana (GB), Galega Mirandesa (GM), Mondegueira (MO) and Churra da Terra Quente (TQ), as well as the exotic Assaf (AS), were analyzed by typing 25 microsatellite markers in 210 individuals. The markers used exhibited high levels of polymorphism, with means for total and effective number of alleles per locus of 13.0 and 4.2, respectively, and an expected heterozygosity of 0.72 across loci. The mean number of alleles per locus and expected heterozygosity were highest in GM and GB, and lowest in AS. Exclusive alleles were found in 10 of the 25 markers analysed, mostly in the AS breed. The proportion of loci which were not in Hardy–Weinberg equilibrium in each breed ranged between 0.12 (GB) and 0.40 (AL and GM), mostly due to a lower than expected number of heterozygotes in those loci. All breeds showed a significant deficit in heterozygosity, which was more pronounced in GM ($F_{IS} = 0.113$) and BA ($F_{IS} = 0.103$), suggesting that inbreeding might be a major concern in these breeds. The analysis of relationships among breeds, assessed by different methods, indicates that AS and AL are the more distanced breeds relative to the others, while the closest relationships were observed between TQ with MO and GM with GB. The estimated F_{ST} indicates that only 0.049 of the total genetic variability can be attributed to differences among breeds, and this ratio dropped to 0.029 when only the native breeds were considered. The analysis of individual distances based on allele-sharing indicates that only AS and AL had a tendency for animals of the same breed to cluster together, while for the other breeds there was overlapping among breeds. The results of this study confirm that native breeds of sheep represent an important reservoir of genetic diversity, even though the level of differentiation among closely located breeds tends to be rather small. For several of the breeds analyzed, the levels of inbreeding currently observed cause some apprehension, and recommend the establishment of appropriate conservation strategies, aimed at minimizing inbreeding to avoid further losses of genetic diversity.

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