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Use of microsatellite markers to analyze genetic polymorphism among goats in a major farm in Sri Lanka

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Goats, being a cost-effective, high-stress resistant, multi-purpose animal contribute significantly to the economy of rural farmers. Market opportunities for value-added goat products are wide. For a sustainable industry, acquiring prolific goat herds through animal selection is vital. Phenotypic characterization has several limitations and genetic information is required to improve high-producing animals for selective breeding process. Effective molecular tools should be introduced for genetic analysis of main herds for goat farm expansion in the country. In this context, the present study aimed to genetically characterize 20 goats (Saanen=13, Jamnapari=5, and Alpine=2), at a major goat management center in Sabaragamuwa province by Inter Simple Sequence Repeat (ISSR) PCR. Blood DNA was extracted using QIAamp mini kit (Promega, USA). The DNA was separately amplified by two ISSR Primers P1 and P2 with sequences of 5'-AGAGAGAGAGAGAGAGAGC-3' and 5'-GAGAGAGAGAGAGAGAGA C-3' respectively, as per published protocols. Amplified products were analyzed by gel analyzer 23.1.1 and NTSYS-PC program version 2.10 software after gel electrophoresis. Genetic relationships were measured using Jaccard's similarity coefficient and UPGMA analysis. The microsatellite primers totally generated 49 loci, bands ranging from 286bp to 1665bp. P1 primer and P2 primer generated 27 and 22 loci respectively. P1 yielded bands from 317bp to 1665bp and P2 range was 286bp to 1631bp. Number of bands yielded were 5-6 by P1 and 4-5 by P2. All bands were identified as rare bands being present in <= 50% of the goats. Tested Alpine goats produced three bands at 1272bp, 598bp, and 317bp sizes, exclusive to their breed. One band of 535bp was 61.5% common for the Saanen breed and one band of 335bp was 60% common in Jamnapari, by P1. There were no unique bands in latter two breeds. The similarity index ranged from 0.7551 to 0.9592 cumulatively, and individual primer similarity indexes of P1 and P2 ranged from 0.7143 to 0.9688 and 0.6855 to 0.9352 respectively. Dendrogram analysis resulted from two major clusters, the bigger first cluster contained 15 goats from all Saanen and Alpine breeds. Saanen were in three sub-clusters having 04, 04, and 05 goats in each. The smaller cluster has two sub-clusters containing five Jamnapari animals only. Two Alpines were deviated as one main sub-cluster of the first major cluster. ISSR PCR successfully disclosed the genetic structures and produced informative polymorphisms among the goats. The dendrogram indicated the comparable genetic relations between Saanen and Alpine breeds and comparable distance to Jamnapari goats. Phenotypic characteristics, such as milk production, heat tolerance, and growth rate can be correlated with the genetic profiles to select animals and propagate beneficial traits among offspring. Improved offspring will be profitable sources for goat farmers. Present results demonstrated microsatellite markers' effectiveness as a feasible method for identifying gene polymorphism in goats. Further studies with larger groups are recommended for extensive applications.

Keywords: Goat, Microsatellite marker, Polymorphism, Sri Lanka

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