VERIFICATION OF GENETIC IDENTITY IN THEOBROMA CACAO GERMPLASM USING MICROSATELLITE MARKERS

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Theobroma cacao is cultivated extensively in the tropical rain forest as the source of cocoa butter and powder for the confectionery industry. Cocoa germplasm must be maintained as collections of live trees in the field because storage of the recalcitrant seeds is impossible. Incorrect labeling of accessions has been a problem in national or international collections growing in tropical areas of cocoa producing countries. Comprehensive assessment of genetic identity is essential to reduce error and redundancy in these collections, thus improving the accuracy and effectiveness of cocoa germplasm conservation and utilization. Microsatellite markers provide a powerful tool for identification of mislabeled cultivars and assessment of genetic diversity in these genebanks. In the present study, we evaluated the effectiveness of 15 microsatellite primers for individual identification using cocoa germplasm maintained in the International Cocoa Genebank in Trinidad. The polymorphic information content (PIC) ranged from 0.42 to 0.82 with a mean of 0.67 among the 15 loci. The observed heterozygosity ranged from 0.51 to 0.79. The accumulated probability of identity (PI) of the 15 loci varied from 7.87×10^{-5} and 1.485×10^{-9}, depending on the population's genetic background. This result showed that the probability of a chance match between any two genotypes is negligible. Therefore, the combination of the 15 SSR primers is sufficient for cocoa individual identification. Using these 15 primers, we assessed the extent of mislabeling in 3 reference populations collected from the Amazon rain forest in the 1940s. Our result showed that only 2-3% of the original reference trees were mislabeled. Moreover, we were able to reconcile each of the mislabeled trees by comparing the SSR profile of the mislabeled one with its neighboring trees in the field. SSR markers proved to be efficient and reliable for the molecular characterization of cocoa germplasm.