Morphological and Genetic Diversity of Cacao (Theobroma cacao) in San Alejandro, Peruvian Amazon

Marie Kalousová¹, Bohdan Lojka¹, David Honys²

¹Czech University of Life Sciences Prague, Dept. of Crop Sciences and Agroforestry in the Tropics and Subtropics, Czech Republic
²The Academy of Sciences of the Czech Republic, Institute of Experimental Botany, v.v.i - Laboratory of Pollen Biology, Czech Republic

Abstract

Peruvian Amazon is the centre of origin of cacao (Theobroma cacao L.), which is an important crop in the region as it is an important source of income especially for smallholders. With the introduction of exotic hybrid germplasm, concerns of loss of the original genetic diversity and superior properties of original cacao varieties in the area emerge, as farmers give preference to high yielding hybrid varieties. This study assessed the morphological and genetic diversity of cultivated cacao in San Alejandro in Peruvian Amazon. Using two quantitative and eight qualitative morphological descriptors, 54 accessions were characterised and 84 accessions were fingerprinted by eight microsatellite loci. Mean Shannon-Wiener diversity index for the qualitative traits of morphological descriptor reached 0.95. Principal component analysis results showed qualitative descriptors of fruit form (apex form, fruit rugosity and basal constriction) and quantitative floral traits (sepal and style length) as the most distinctive. All microsatellite loci were polymorphic, with totally 77 identified alleles and 9.63 alleles per locus in average. Expected heterozygosity ranged from 0.571 to 0.844 and mean value 0.729. Mean value of allelic richness reached 4.03. Although neither analysis revealed any structure among the accessions, the results clearly showed that the study area harbours a highly diverse population of cacao with a number of original upper Amazon Forastero varieties. This high level of diversity can be explored for selection of superior clones. Farmers should be encouraged to preserve existing original varieties in situ in on-farm conservation programmes and further improve varietal deployment to prevent genetic erosion and loss of valuable germplasm.

Keywords: Descriptors, genetic diversity, microsatellites, morphological diversity, Theobroma cacao

Contact Address: Marie Kalousova, Czech University of Life Sciences Prague, Dept. of Crop Sciences and Agroforestry in the Tropics and Subtropics, Nad Kajetánkou 16, 16900 Praha 6, Czech Republic, e-mail: marie.kalousova@gmail.com