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Genetic diversity analysis of a large cocoa trees collection from the Ecuadorian Amazon safeguarded for local and sustainable cocoa production

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ABSTRACT

Ecuador is the top cocoa-producing country in South America and the leading exporter of fine and flavor cocoa worldwide. The production of aromatic cocoa has a direct positive impact on the sustainability of the agricultural sector thanks to a significantly higher producer price paid to the farmer. The aromatic Nacional variety, emblematic of Ecuador, is highly sought after by the chocolate industry. The modern Nacional is a hybrid population resulting from genetic admixture that has lost the specificity of the ancestral variety. In the context of the progressive disappearance of the forests, several collection expeditions (2010 to 2019) have been organized in the Ecuadorian Amazonian provinces of Zamora-Chinchipe, Morona-Santiago and Pastaza, in close collaboration with the local communities, in order to collect and safeguard the maximum number of native aromatic cocoa trees. The objective of our study was to evaluate the genetic diversity of this new collection of cocoa trees previously targeted in the putative area of origin of the Nacional variety and areas further north. A total of 283 native accessions was collected and safeguarded at experimental stations and in local communities. The genetic diversity of the cocoa trees was analyzed by comparison to known genetic groups with a set of 48 SSR markers. This new collection shows that this region is a hotspot of cocoa diversity that clearly enriches the currently known diversity and improves knowledge of the global genetic structure of T. cacao. Our results clarify the geographic origin of the Nacional variety in the vicinity of an archaeological site that housed a Maya Chinchipe population that consumed cacao 5000 years ago. The collected cocoa trees were replanted in nearby experimental stations and directly in local communities so that farmers have free access. These new genetic resources will be used in breeding programs for the varietal

improvement of new aromatic cocoa varieties and more globally for the selection of new varieties adapted to environmental changes.

Keywords: Diversity hotspot, Ecuadorian Amazon, Nacional variety