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OPEN Multiple origins and a narrow gene pool characterise the African tea germplasm: concordant patterns revealed by nuclear and plastid DNA markers

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Despite the highly economic value of tea in Africa, its genetic and geographic origins remain largely unexplored. Here we address this by collecting 639 samples across 11 countries in Africa and Asia to investigate the origin and gene pool composition of African tea based on 23 nuclear microsatellites (nSSRs) and three cpDNA intergenic spacer regions. Our results indicated that the African tea represents a potpourri originating from multiple introductions over time. The nSSR analysis revealed that the majority (79%) of tea accessions collected in Africa belong to Indian Assam tea which have likely originated from India and/or Sri Lanka. The patterns of nSSR variation also showed that Chinese Assam tea is genetically distinct from Indian Assam tea, and has rarely been used in African tea breeding efforts since only 4% of the African tea accessions possessed this genotype. We found a total of 22 cpDNA haplotypes, which grouped into three main geographic clades that were concordant with the distribution of microsatellite genotypes. Several private cpDNA haplotypes were identified in Chinese Assam tea in Southern Yunnan province of China. Therefore Chinese Assam tea will be important for the enrichment of African tea gene pools. Our results is a useful guide in future tea breeding programmes in Africa.

Tea is one of the most popular non-alcoholic beverages worldwide, which is consumed by approximately 70% of the world's population for its refreshing taste, attractive aroma, therapeutic uses, and mildly stimulating properties¹. In addition, tea plant extracts have shown potential in the control of malaria², which is one of the biggest killer diseases in the tropics. The tea plant is also an important cash crop in more than 52 countries³, the main areas of tea production being Asia, Africa and South America. According to FAOSTAT⁴, Africa in particular, produced 699,057 metric tonnes of tea in 2014, which accounted for 13% of the global tea production and about 25% of the global black tea market. Africa's tea export volume in 2015 was approximately 600,000 metric tonnes, earning the continent a total income of about US\$1.5 billion. On relative terms, tea producing countries in Africa have been investing highly in tea research. For instance, in Kenya, at least one million US\$ goes towards tea improvement annually⁵. However, the lack of information with regard to how Africa's current tea genetic

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