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Patterns of genetic diversity and structure of *Eucalyptus grandis* breeding population in Kenya: Implication for genetic improvement

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Eucalyptus grandis is an important commercial plantation tree species providing raw materials for many industrial products. The species is widely cultivated in the tropics because of its wood quality and adaptability to wider climatic conditions, and is currently undergoing genetic improvement in Kenya for first growth and superior wood quality. Generally, tree breeding operations involve recurrent selection of genetically superior individuals, which potentially alters genetic diversity in the breeding populations. It is therefore essential to determine the genetic diversity of breeding populations to support improvement programmes. We evaluated the genetic diversity and structure of 250 individuals from five first generation breeding populations of *E. grandis* in Kenya using seventeen nuclear microsatellite markers. The microsatellite markers revealed an average polymorphic information content (PIC) of 0.826, confirming their suitability for discriminating the genotypes and populations. High genetic diversity was found within all the breeding populations. The number of alleles per population (Na), observed heterozygosity (Ho), expected heterozygosity (He), and Shannon's information index (I) averaged at 6.9, 0.801, 0.821, and 1.662, respectively. The findings indicate that the breeding population has high levels of genetic variability offering possibilities to develop advanced generation breeding programmes for the species. Furthermore, lower fixation index (F) was detected in the seed trees (-0.101) than their offspring (0.121), suggesting selection against inbred individuals between seedling and adult stages. The genetic differentiation among the breeding populations was low and non-significant (Rst = 0.017; P = 0.117), indicating close genetic relationship among the germplasm used to establish the breeding populations. The studied breeding populations are viable for genetic improvement; however, new genetic infusions are recommended to expand the gene pool in the subsequent breeding generations.

Keywords: breeding population, genetic diversity, germplasm, genetic improvement, inbreeding

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