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## Genetic Diversity and Differentiation of Date Palms (*Phoenix dactylifera* L.) in Sudan

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### Abstract

Worldwide extensive research has been conducted on the characterisation of hundreds of date palm cultivars, mainly to provide a tool for cultivars identification based on apparent characters as well as molecular markers. Although studying the population genetics of date palms was not an objective of these studies, high genetic diversity was reported among date palm cultivars and the tested molecular markers were unable to discriminate between most of cultivars from different production areas in the world. In Sudan date palm culture is an old agricultural activity practised for more than 3000 years where existence of two types of dates (date palm fruits) cultivars - soft and dry - were recognised to follow some geographic distribution. Our objective was to study the population genetics of date palms in Sudan. We collected 200 individuals from 19 populations from different geographic locations in Sudan. The collection sites grouped according to the type of dates that dominates in the area. Ten microsatellite markers were used to investigate the genetic diversity within and among populations, and the correlation between the genetic and geographic distances. The tested microsatellite markers showed a high level of polymorphism. A total of 261 alleles were detected at the ten loci. The overall mean value of fixation indices equalled -0.163, which shows the presence of excess heterozygosity. However, the chi-square tests conducted for every locus in each population indicated no significant deviation from the Hardy-Weinberg equilibrium. The AMOVA analysis exhibited that about 95 % of the total genetic variation existed within populations, while significant differentiation within the type groups could be detected. Although significant isolation by distance ( $r^2 = 0.552$ ,  $p < 0.05$ ) was detected by a Mantel test, it seems that the spatial effect has become complicated as a result from the exchange and introduction of different kinds of plant material by date palm growers and traders as well as seed dispersal. This complexity was clearly apparent in the weak clustering relationships among most of the tested populations.

**Keywords:** *Phoenix dactylifera* L., heterozygosity, microsatellite markers, date palm populations