Two main distinct evolutionary stories describe the Italian grapevine assortment

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Abstract

A dataset of high-quality 7k SNP profiles of 1,038 unique Eurasian grapevine varieties was used to infer the most likely grapevine migration events, a spacial ancestry estimation, and a model about the origin of Eurasian grapevine germplasm. The comparison of putative gene flow scenarios from Caucasus throughout Europe aided to fit the more reliable spreading routes around the Mediterranean Basin. The same dataset was also used to assess the population genetic diversity, structure, and relatedness of Italian varieties. This data suggested a different history between Northern and Southern Italian grapevines.

More interestingly, the Italian genotypes were shown to be distinguishable from all the other Eurasian populations for the first time.

The same SNP panel was used to determine parental relationships, to identify the main parents of traditional Italian and closely related cultivars. The parentage network suggested that Italian germplasm largely originated from a few main parents distributed into several geographical areas of genetic influence, with more or less large overlaps. These key cultivars are 'Bombino bianco', 'Garganega'/'Grecanico dorato', 'Mantonico bianco', 'Orsolina', 'Sangiovese',

'Termarina'/'Sciaccarello', 'Visparola' and 'Vulpea'. The pedigree reconstruction by full-sib and second-degree relationships highlighted the pivotal role of some cultivars, like the little known 'Visparola'. A hypothetical migration of this variety from South to North of the Italian Peninsula along the Eastern side, as well as 'Sangiovese' migration from South to Central Italy along the Western side might be supposed. Moreover, 'Moscato bianco', mainly through its offspring 'Malvasia aromatica di Parma', furnished a consistent contribution to the development of many aromatic grapes grown in the Norther-Western part of the Italian Peninsula.

These results represent the most accurate and complete study of population genetics that has been carried out until now on the Italian germplasm.

Keywords: *Vitis vinifera* L., SNP markers, migration events, cultivar geographic areas, Italian founder varieties, parent-offspring relationships, second-degree relationships, pedigree