

Evaluation of introgression of Asian germplasm into natural populations of *Castanea sativa* Mill. from southern Europe

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Abstract:

Introgression refers to the incorporation (via hybridization and backcrossing) of genetic material from one species into the gene pool of another species. Introgression usually facilitates the rapid adaptation of tree populations to new environments, but can also have negative effects on tree species, such as genetic erosion of native populations and limitations to conservation efforts. Evidence of chestnut introgression, i.e., the transfer of genetic material between Asian *Castanea crenata* and *C. mollissima* and the native *C. sativa* through spontaneous hybridisation and later backcrossing, has been documented in wild chestnut populations in northwest Spain. However, the extent of this introgression has not been monitored in other natural *C. sativa* populations in southern Europe. We examined a natural *C. sativa* forest in Bergondo (Galicia, Spain), where ink-disease-resistant *C. crenata* and *C. mollissima* seedlings had been planted in the 1940s. Adult trees and open pollinated saplings were genotyped by 13 SSRs, and six new alleles that were private to *C. crenata* were identified. Additional five natural *C. sativa* populations in southern Europe are being studied using this approach. We discuss why chestnut populations may benefit from the transfer of alleles involved in resistance to ink disease, and why introgression could be detrimental to drought tolerance. The study provides a reliable method for detecting the presence of Asian germplasm of *Castanea* spp. in *C. sativa* forests, which will allow for better certification of *C. sativa* germplasm. Moreover, it allows monitoring the evolutionary and ecological processes of the species in areas where ink disease resistant interspecific chestnut hybrids have been planted.

Keywords: chestnut, interspecific hybridization, genetic differentiation, microsatellite markers, monitoring system, *Phytophthora cinnamomi*