

Gene Introgression through Interspecific Hybrids: Molecular Analyses and Implications for Coffee Breeding

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SUMMARY

Transfer of desirable genes from wild relative species to cultivated varieties through wide crosses is one of the proven breeding strategies for crop improvement. However, inherent problems of interspecific introgression such as hybrid instability, infertility, non-Mendelian segregations, and low levels of intergenomic crossing-over can constitute important limitations. In coffee, the transfer of desired characters, in particular disease resistances, from the diploid relative species such as *C. canephora* into *C. arabica* cultivars without affecting quality traits has been the main breeding objective world wide. However, the ploidy difference between *C. arabica* and the donor species, and the lack of information regarding genome recombination in interspecific hybrids and DNA introgression into *C. arabica* constitute major bottlenecks. During the last few years, the behaviour of interspecific hybrids between the diploid species, *C. canephora* and *C. eugenioides*, and *C. arabica* has been investigated. Numerous plant populations resulting from the backcross (BC₁) of either triploid or tetraploid interspecific hybrids to *C. arabica* were analysed. Flow cytometric analysis of the nuclear DNA content revealed that most of the BC₁ individuals were nearly tetraploid suggesting that among the gametes produced by the interspecific hybrids, those presenting 22 chromosomes are strongly favoured. Furthermore, molecular markers (i.e. RFLP, microsatellite and AFLP) combined with evaluations of morphological characteristics and resistance to leaf rust were applied to verify the occurrence of gene transfer from the donor species into *C. arabica*, and to estimate the amount of introgression present in BC₁ individuals. While a high amount of introgression was observed in the progenies derived from the tetraploid interspecific hybrids, the BC₁ individuals generated from the triploid interspecific hybrids exhibited contrasted situations. The different results will be discussed in relation to the mechanism of introgression into *C. arabica* and the efficient use of genetic resources in arabica breeding.