

High transmission of paternal plastid DNA in alfalfa plants demonstrated by restriction fragment polymorphic analysis

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A high frequency of paternal plastid transmission occurred in progeny from crosses among normal green alfalfa plants. Plastid transmission was analyzed by hybridization of radiolabeled alfalfa plastid DNA (cpDNA) probes to Southern blots of restriction digests of the progeny DNA. Each probe revealed a specific polymorphism differentiating the parental plastid genomes. Of 212 progeny, 34 were heteroplastidic, with their cpDNAs ranging from predominantly paternal to predominantly maternal. Regrowth of shoots from heteroplasmic plants following removal of top growth revealed the persistence of mixed plastids in a given plant. However, different shoots within a green heteroplasmic plant exhibited paternal, maternal, or mixed cpDNAs. Evidence of maternal nuclear genomic influence on the frequency of paternal plastid transmission was observed in some reciprocal crosses. A few tetraploid F1 progeny were obtained from tetraploid ($2n=4x=32$) *Medicago sativa* ssp. *sativa* x diploid ($2n=2x=16$) *M. sativa* ssp. *falcata* crosses, and resulted from unreduced gametes. Here more than the maternal genome alone apparently functioned in controlling plastid transmission. Considering all crosses, only 5 of 212 progeny cpDNAs lacked evidence of a definitive paternal plastid fragment.