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Comparative analysis of plastid genomes of non-photosynthetic Ericaceae and their photosynthetic relatives

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Abstract

Although plastid genomes of flowering plants are typically highly conserved regarding their size, gene content and order, there are some exceptions. Ericaceae, a large and diverse family of flowering plants, warrants special attention within the context of plastid genome evolution because it includes both non-photosynthetic and photosynthetic species with rearranged plastomes and putative losses of "essential" genes. We characterized plastid genomes of three species of Ericaceae, non-photosynthetic Monotropa uniflora and Hypopitys monotropa and photosynthetic Pyrola rotundifolia, using high-throughput sequencing. As expected for non-photosynthetic plants, M. uniflora and H. monotropa have small plastid genomes (46 kb and 35 kb, respectively) lacking genes related to photosynthesis, whereas P. rotundifolia has a larger genome (169 kb) with a gene set similar to other photosynthetic plants. The examined genomes contain an unusually high number of repeats and translocations. Comparative analysis of the expanded set of Ericaceae plastomes suggests that the genes clpP and accD that are present in the plastid genomes of almost all plants have not been lost in this family (as was previously thought) but rather persist in these genomes in unusual forms. Also we found a new gene in P. rotundifolia that emerged as a result of duplication of rps4 gene.

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