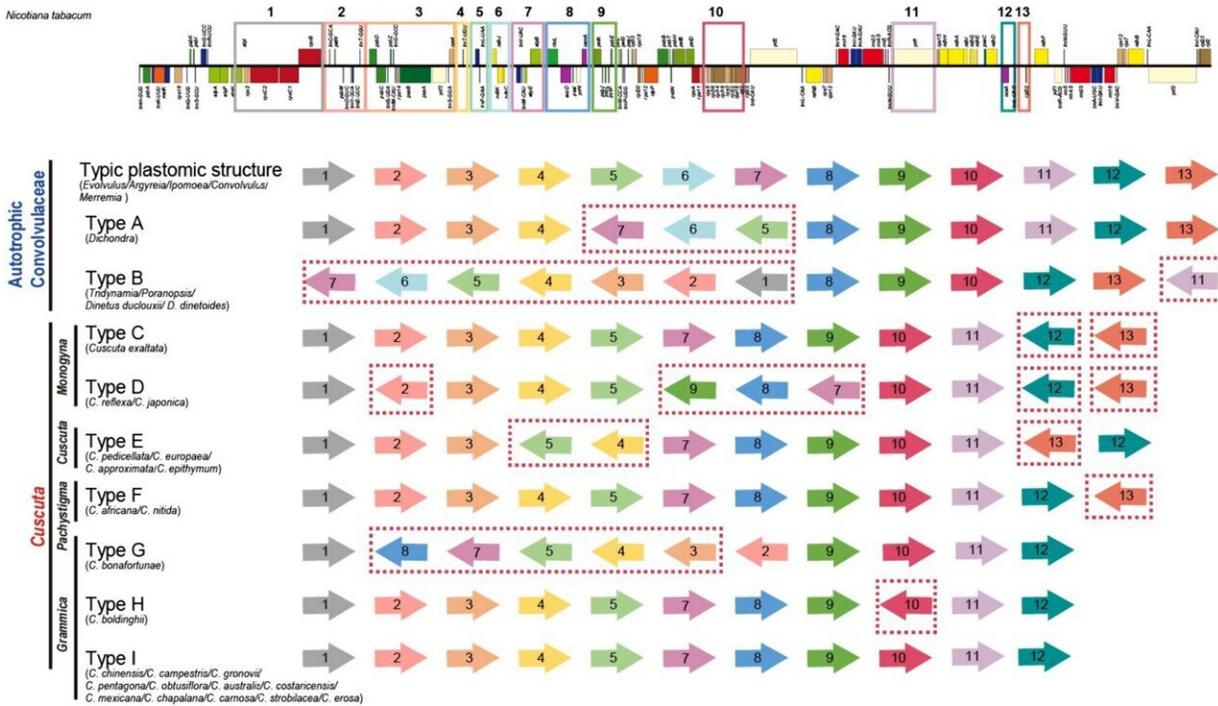


Parasitic habit drives plastid genome structural variation and gene loss in *Cuscuta* species

May 10 2024, by Zhang Nannan

Typic plastomic structure



The physical plastome map of structural rearrangements among Convolvulaceae. The plastome of *Nicotiana tabacum* is depicted as a line, and genes are depicted by boxes. Among Convolvulaceae, the syntenic regions are highlighted by different colored arrows. The direction of the arrow means the same or reversal directions of the reference plastome of *N. tabacum*. Credit: *Plant Molecular Biology* (2024). DOI: 10.1007/s11103-024-01440-1

Hemiparasites obtain nutrients and inorganic salts from host plants through haustoria, a habit that has evolved independently at least 12 times in angiosperms. *Cuscuta* represents one of the 12 angiosperm orders that have independently evolved from autotrophs to parasites.

Morphologically, *Cuscuta* species are stem-hippophores, with roots and leaves completely degenerated or very weakly photosynthetically active or lost. Loss of plastid genes and genome functional [degeneration](#) have been reported several times in *Cuscuta*. However, the evolutionary links between its gene and genome functional degeneration and [evolution](#) have not yet been clarified.

Researchers from the Xishuangbanna Tropical Botanical Garden (XTBG) of the Chinese Academy of Sciences and their collaborators conducted de novo assembly of 29 new plastomes including 20 samples from seven *Cuscuta* species and nine autotrophic species of Convolvulaceae.

They deciphered the mechanism of plastome evolution in *Cuscuta* and its autotrophic plant relatives of Cuscutaceae. Their [study](#) is published in *Plant Molecular Biology*.

The results showed that that the structural variation of plastomes in Convolvulaceae was diverse, with nine types of structural rearrangements and six types of inverted repeat (IR) border expansion-contraction. The structural variations were closely related to the parasitic lifeform transition and may have exacerbated by IR border expansion-contraction and large repeat fragments.

In addition, plastome degeneration of *Cuscuta* species was progressive, with massive gene loss occurring only in three species from the Ceratophorae group of *Grammica* subgenus.

Overall, the parasitic habit of *Cuscuta* promoted the exposure of plastome genes to relaxed selective constraints, and the accumulation of microvariations in a large number of plastome [genes](#) led to plastome degeneration.

"Our study provides new evidence for a better understanding of plastome evolution, variation, and reduction in the genus *Cuscuta*," said Yu Wenbin of XTBG.

More information: Li-Qiong Chen et al, Variations and reduction of plastome are associated with the evolution of parasitism in Convolvulaceae, *Plant Molecular Biology* (2024). [DOI: 10.1007/s11103-024-01440-1](#)

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