

## **The closest relatives of cacti**

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Recent molecular and morphological systematic investigations indicate that the traditional family Portulacaceae consists of three distinct lineages that include Cactaceae, Didiereaceae, and Hectorellaceae. Sequence data from the chloroplast genome reveal that the cacti are most closely related to the tribe Anacampseroteae (i.e. *Anacampseros*, *Avonia*, *Grahamia*), *Portulaca* and *Talinum* of the family Portulacaceae. Information from the *matK* and *ndhF* genes favour a sister-group relationship between Cactaceae and Anacampseroteae. This clade, together with *Portulaca*, is well characterized by the presence of axillary hairs or scales. Relationships within Anacampseroteae are characterized by a grade of five species of *Grahamia* s.lat. from North and South America. *Grahamia australiana* is found to be sister to the genera *Anacampseros* and *Avonia*. Vegetative characteristics evaluated in the light of the reconstructed phylogenetic relationships reveal an evolutionary transition from woody subshrubs to dwarf perennial and highly leaf-succulent herbs. Furthermore, a comparison between Anacampseroteae and Cactaceae illustrates the strikingly different evolutionary pathways in the morphological and biogeographical diversification of the two sister-groups.