

The closest relatives of cacti: insights from molecular phylogenetic analyses

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Recent molecular and morphological systematic investigations have revealed that the cacti are most closely related to the tribe Anacampseroteae (*Amacampseros*, *Avonia*, *Grahamia*), *Portulaca* and *Talinum* of the family Portulacaceae (ACPT clade of suborder Portulacineae). A combined analysis of *ndhF*, *matK*, and *nad1* sequence data from the chloroplast and the mitochondrial genomes indicates that the tribe Anacampseroteae is the sister-group of the family Cactaceae. This clade, together with *Portulaca*, is well characterized by the presence of axillary hairs or scales. The genus *Talinella*, whose relationships remained unclear until very recently due to its fleshy fruits, is found to be nested within *Talinum* with high statistical support.

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*. A comparison of vegetative characteristics indicates an evolutionary transition from woody subshrubs to dwarf perennial and highly leaf-succulent herbs during the diversification of Anacampseroteae. The diversification of cacti, in contrast, is marked by a basal split between a clade of eight *Pereskia* species, centered around the Caribbean basin, and all other Cactaceae (i.e. about 1800 species). This finding is shedding light onto the early evolution of stem-succulence in cacti: the development of stem stomata and delayed bark formation preceded the transition of the stem cortex into a specialized photosynthetic tissue system.