

## Phylogenetic relationships in the genus *Parodia* Spegazzini (Cactaceae-Notocactaeae)

*Marlon Machado, Urs Eggli & Reto Nyffeler*

*Institut für systematische Botanik der Universität Zürich, Zollikerstrasse 107, CH-8008 Zürich, Switzerland.*

*Parodia* Spegazzini comprises about 60 to 70 species of globular to rarely subcolumnar cacti with their occurrence in the eastern portion of central South America. Its current circumscription includes the genera *Brasilicactus* Backeberg, *Brasiliparodia* F.Ritter, *Eriocactus* Backeberg, *Notocactus* (K.Schumann) Fric and *Wigginsia* D.M.Porter. These subgroups are easily differentiable but the relationships between them are not well resolved, in spite of several hypotheses of relationships having been proposed with basis on morphology. In this study we investigated the phylogenetic relationships among 32 exemplars representing all the subgroups of *Parodia* s.l. with the use of nine nuclear and plastid molecular markers (ITS—internal transcriber spacer, gene *matK*, intergenic spacers *trnS-trnfM* and *trnL-trnF*, introns *rpl16*, *rps16*, *trnL-trnF*, and *trnK-matK*). The monophyly of *Parodia* s.l. was tested with the inclusion of five species from other genera of tribe Notocactaeae. Four species from tribes Cereeae and Trichocereae were added as secondary outgroups. The data-matrix with the aligned sequences was 7814 characters long, 875 of these being informative. We analyzed the data-matrix with cladistic and bayesian inference methods. The different analyses resulted in well-resolved consensus trees with similar topology and high support for bootstrap and Bayesian posterior probabilities for the majority of the clades. *Parodia* s.l. is a monophyletic group, with (*Brasilicactus* + *Brasiliparodia*) and *Eriocactus* being identified as the earliest diverging lineages within the genus. The three subgenera of *Parodia* s.s. do not form a monophyletic unit, being intertwined with the *Notocactus* s.s. and *Wigginsia* lineages. The subgroup *Notocactus* s.s. proved to be polyphyletic, with the species placed in series *Paucispini* forming a lineage distinct from the remainder of *Notocactus* s.s. The results obtained are in disagreement with all the hypotheses of relationships previously proposed for this group, demonstrating the need of a revision of the infrageneric classification of *Parodia*.