

The genus *Pereskia* and the early evolution of Cactaceae

Erika Edwards

Dept. of Ecology & Evolutionary Biology, Brown University, Providence, Rhode Island (USA)

Pereskia (Cactaceae) comprises 17 species of leafy shrubs and trees that form a paraphyletic grade at the base of the cactus lineage, and are often interpreted as our best extant representatives of ancestral cacti. It has been assumed that *Pereskia* water relations are unlike those of a leafless, stem-succulent cactus, as *Pereskia* species lack the anatomical specializations and CAM photosynthesis that are associated with the high water storage capacity and photosynthetic water use efficiency (WUE) exhibited by the core cacti. We measured several important water relations parameters (e.g., WUE, stem xylem hydraulic conductivity, Huber Value, and leaf water potential) from field populations of 7 species of *Pereskia* representing all three major *Pereskia* clades. The data suggest that *Pereskia* species exhibit a typical cactus-like ecological water use “strategy”: they maintain high photosynthetic tissue water potential while living in severely water-limited environments by supporting transpiring leaves with an efficient and reliable water delivery system, and by only opening stomata when transpirational demand is reduced. The basal placement of *Pereskia* within Cactaceae indicates that this ecological strategy was established very early during cactus evolution, and may have enabled the later development of the anatomical specializations that characterize the core cacti.