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Phylogenetic relationships of *Petunia patagonica* (Solanaceae) revealed by molecular and biogeographical evidence

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Abstract

Petunia patagonica is restricted to the Patagonian region of Argentina and its identity is controversial. The species was described in the genus *Nierembergia*, and subsequently transferred to the genus *Petunia*. However, several morphological characteristics of *P. patagonica* as well as its geographical distribution differ from other *Petunia* species, and it has been repeatedly considered an exception in the genus. Using one nuclear and two cpDNA markers for 22 species representing seven genera of the tribe Petunieae, we analyzed phylogenetic and biogeographic evidence to clarify the phylogenetic position of *P. patagonica*. Our results suggest that *P. patagonica* is not a member of the genus *Petunia* and is closer to *Fabiana imbricata.* In addition, *Calibrachoa* appears basal within the *Petunia*, *Calibrachoa*, and *Fabiana* clades, and *Fabiana* and *Petunia* are sister genera. This result led us to reconstruct an ancestral region for this clade within the subtropical grasslands of South America. Subsequent dispersion to the Patagonian and Andean regions was inferred in the divergence of *Fabiana* and *P. patagonica*. Our work suggests a need for more studies towards a new generic placement. Ancestral area reconstruction suggests that the origin of the *Calibrachoa*, *Fabiana* and *Petunia* lineages was located in the subtropical grasslands of South America, and the colonization of the Andes and Patagonia seems to be divergent and was achieved only for species belonging to the *Fabiana* and *P. patagonica* clades.

Key words: biogeography; *Fabiana*; Patagonia; Petunieae; southern South America; subtropical grasslands; taxonomy

Introduction

Petunia Jussieu (1803: 2015) is widely known due to the common garden petunia, *P.* × *hybrida* (Hook.) Vilmorin (1863: 615), a hybrid that is cultivated worldwide. The genus is characterized by a suite of morphological traits that includes annual or perennial habit, herbs with showy flowers arranged in terminal sympodial units that are always associated with two opposite, leaf-like bracts at each node (a trait shared only with *Calibrachoa* Cervantes (in La Llave & Lexarza; 1825: 3) in the tribe Petunieae of Solanaceae); it shows imbricate aestivation and possesses reticulate-foveolate seeds with wavy anticlinal walls (Stehmann *et al.* 2009). All species of the genus have a chromosome number n = 7 (Watanabe *et al.* 1996), except for *P. patagonica* (Speg.) Millán (1941: 544), which has a chromosome number of n = 9, similar to *Calibrachoa*, *Fabiana* Ruiz & Pavon (1794: 22) and two species of *Nierembergia* Ruiz & Pavon (1794: 23) (Acosta *et al.* 2006). The genus consists of 15 species (including *P. patagonica*) that are distributed throughout subtropical and temperate South America. Most of the species are endemic to southern Brazil, which is where the two principal centers of diversity are located (Stehmann *et al.* 2009). The southern limit of the distribution of the genus is unclear because of one geographically distinct species, *P. patagonica*, which is restricted to the arid steppe with sandy or sandy-stony soils in the provinces of Chubut and Santa Cruz, Argentina. This region is approximately between the 44° and 50° S parallels (Fig. 1) in the Patagonian region of Argentina.

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