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Two new species of *Borreria* (Spermacoceae, Rubiaceae) from the states of Goiás and Minas Gerais, Brazil

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Abstract

Two new species of *Borreria* from Goiás and Minas Gerais are described and illustrated. *Borreria minensis* was found in "campos rupestres" formation, between 1100 and 1600 m elevation, and is endemic to Minas Gerais, while B*orreria psyllocarpoides* was found in the "cerrado" vegetation, at the border of Goiás and Minas Gerais. Electron microphotographs of the seeds and pollen grains, and a distribution map of the two new species are also provided.

Key words: Pollen grains, seeds, subsection *Borreria*, taxonomy

Introduction

Borreria Meyer (1818: 79) occurs in tropical and subtropical regions of the world, and its, with ca. 100 species, the largest genus of tribe Spermacoceae (Rubiaceae). The generic delimitation of *Borreria* is controversial. Species in the Paleotropics have all been relegated under synonym of *Spermacoce* Linnaeus (1753: 102) (Verdcourt 1976, Sivarajan *et al.* 1987, Dessein 2002, 2003a, Harwood & Dessein 2005). In the Neotropics, instead, opinions regarding the generic delimitation are divergent. Delprete and collaborators have applied the paleotropical concept of *Spermacoce* to all Neotropical species in floristic treatments of the genus in specific South American areas (Delprete 2007, 2010; Delprete *et al.* 2005; Delprete & Cortés 2006). In contrast, other studies on American species recognized both taxa as separated and maintained *Borreria* based on inflorescence, pollen, fruit, and seed characters (Bacigalupo & Cabral 1996, 2007, Bacigalupo *et al.* 2010, Cabral *et al.* 2010, 2011, 2012a, 2012b, Miguel & Cabral 2013, Salas *et al.* 2011). Additionally, molecular phylogenetic relationship between *Borreria* and *Spermacoce* are still unresolved. Molecular work by Kårehed *et al.* (2008) using chloroplast and nuclear genes weakly supports the concept of relegating *Borreria* under *Spermacoce*, but the last one is paraphyletic. Several morphologically well-defined genera are in fact intermingled with *Spermacoce* species, including i.e. *Diodia* Linnaeus (1753: 104), *Mitracarpus* Zuccarini (1827: 210), *Richardia* Linnaeus (1753: 330) and *Psyllocarpus* Martius & Zuccarini (1824: 130). Moreover, this and other currently available studies include few representative species of the Neotropical flora (only nine American species of *Borreria* in Dessein 2003b; five species in Kårehed *et al.* 2008; four species in Groeninckx *et al.* 2009). In all these studies, phylogenetic relationships of American species of *Borreria* and *Spermacoce* are unclear. Therefore, because more comprehensive molecular studies and a revision of American species of *Borreria* and *Spermacoce* are necessary to disentangle relationships among these two genera, in this paper, we consider both genera as separate, following previous work in our research group (Bacigalupo & Cabral 1996; Cabral *et al.* 2011, 2012a, 2012b; Miguel & Cabral 2013; Salas *et al.* 2011).

For Brazil, 69 species of *Borreria* have been recorded, 26 of which occur in the state of Minas Gerais (Cabral & Salas 2014). The two new species described below are subshrubs characterized by corollas four lobed, exerted stamens and style, bilobed stigma, pantoporate pollen grains, septicidal capsules (dehiscent from the apex) with both cocci dehiscent, and ventrally sulcate seeds. Some of these features also characterize the subsection *Borreria* (Bacigalupo & Cabral 1996). *Borreria psyllocarpoides* is known from both sides of the border between the states of Goiás and Minas

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