Carajasia (Rubiaceae), a new and endangered genus from Carajás mountain range, Pará, Brazil

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Abstract

Carajasia is described as a new genus of Rubiaceae. It is so far known only from the mountain summits of Serra dos Carajás (Pará, Brazil), where it is part of a shrubby vegetation surrounded by tropical rainforest. The new genus belongs to the tribe Spermacoceae and is positioned within it to the Spermacoce clade. Carajasia is unique within the clade in having a very particular combination of characters: flowering branches with two axillary flowers per node, homostylous flowers, corollas with a fringe of moniliform hairs, pubescent styles with distinct stigma lobes, bilobed nectariferous discs covered by triangular papillae, pollen with a double reticulum and fruits with a peculiar type of dehiscence. A detailed description of Carajasia is presented, including observations of the fruit and pollen, along with distribution maps and images of the plant in its habitat. A dichotomous key to distinguish Carajasia from other genera with deeply divided stigmas is provided.

A molecular phylogenetic study was carried out using ITS and ETS sequences to determine the phylogenetic position of the new genus within the Spermacoce clade. The results of the combined analyses demonstrated that Carajasia is sister to Galianthe with moderate to high support. Both genera form a weakly supported clade with Schwendenera. This clade is sister to the other genera of the Spermacoce clade studied in this work. Galianthe and Schwendenera share with Carajasia pollen with a double reticulum, but they are clearly differentiated by suffruticose habit, heterostylous flowers and the pattern of fruit dehiscence. To clarify the phylogenetic position of Carajasia, some morphological characters are discussed based on the molecular results: division of the stigma, pollen types and floral syndrome.

Key words: Galianthe, Spermacoce clade, Spermacoceae, phylogeny, taxonomy, pollen

Introduction

During the last two decades, the delimitation of the tribe Spermacoceae has undergone through considerable changes. Currently, three different concepts are recognized. The first coincides with the classical definition (Robbrecht, 1988), including about 20 genera and is still defended by some scientists on the basis of morphological characters (Terrell & Wunderlin 2002). The two other tribal concepts are mainly based on molecular studies. Bremer (1996) proposed the broadest concept of Spermacoceae, including the former tribes Knoxieae, Triainolepideae, Hedyotideae and Manettieae. Andersson & Rova (1999) redefined and narrowed this concept by recognizing Knoxieae (including Triainolepideae and the ‘Pentas group’ of the tribe Hedyotideae) as a separate tribe. The proposal of Andersson & Rova (1999), often referred to as Spermacoceae s.l., was followed with minor modifications by other Rubiaceae specialists (Dessein 2003; Robbrecht & Manen 2006; Groeninckx et al. 2009), and is also accepted in this paper. Robbrecht & Manen (2006) included 33 genera in Spermacoceae s.l., to which Groeninckx et al. (2009) added other taxa; the tribe now comprises 61 genera with an estimated 1235 species. Several new genera were described in Spermacoceae s.l. based on morphological (Terrell 1987; 2001a, b, Terrell & Lewis, 1990, Terrell & Robinson, 2009, Borhidi 2012, Borhidi & Lozada, 2010, 2011) or combined morphological and molecular evidence (Groeninckx et al., 2010a, b, c). Despite the consensus among specialists about Spermacoceae s.l., morphologically it is difficult to define because no single morphological synapomorphy supports the tribe (Groeninckx et al. 2009).