



***Spermacoce spiralis*, a new name for *Diodia assurgens* (Rubiaceae)**

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Background and aims – The identity of *Diodia assurgens* K.Schum. is unclear and the taxon has never been studied in detail since its description. In the present paper we aim to clarify its status and taxonomic position.

Methods – Normal practices of herbarium taxonomy have been applied to study all herbarium material available. Pollen of *Diodia assurgens* and *Diodia* s. str. species was studied using the acetolysis method.

Key results – The comparative morphological study clearly shows that *Diodia assurgens* K.Schum belongs to the genus *Spermacoce* s. str. and that it should be excluded from *Diodia* s. str. The new name *Spermacoce spiralis* Bacigalupo & E.L.Cabral is proposed and a lectotype is designated. The species is also described and illustrated. The palynological characters of *Spermacoce spiralis* agree well with those observed in other species of *Spermacoce* s. str.

Key words – *Diodia*, Rubiaceae, *Spermacoce*, Spermacoceae.

INTRODUCTION

The genus *Diodia* was initially established by Linnaeus (1753) to segregate *D. virginiana* L., a species distributed in southern United States. Some additional taxa were included in the genus after its description, but almost all of them had morphological features different to the type species. Hence, several authors have questioned the generic status of *Diodia* (see Bacigalupo & Cabral 1999 and references there-in).

A new delimitation of *Diodia* s. str. was established by Bacigalupo & Cabral (1999). The characters used to separate the genus were the prostrate stems rooting at the nodes, the few-flowered inflorescences partially hidden by the stipular sheath, the narrow corolla tubes, the filiform styles with two long spreading lobes and the indehiscent fruits.

The authors restricted *Diodia* to five American species growing in swampy places. The remaining species were transferred to the genera *Galianthe* Griseb., subg. *Ebelia* (Rchb.) E.L.Cabral & Bacigalupo (Cabral & Bacigalupo 1997, Pire 1997), *Borreria* G.Mey. subg. *dasycephala* (DC.) Bacigalupo & E.L.Cabral (Bacigalupo & Cabral 1996) and *Diodella* Small (Delprete 2004, Cabral & Bacigalupo 2006).

Within *Diodia* s.l. presented in Flora Brasiliensis (1889a), *Diodia assurgens* K.Schum. is described. This taxon was proposed by Schumann (1889a) to accommodate *Spermacoce assurgens* sensu Nees & Martius (1824), not *Spermacoce*

coce assurgens Ruiz & Pavon (1798) since this is a different species (see also Schumann 1889b).

Diodia assurgens has a particular inflorescence, which is apical, spiciform or pseudoracemose, with a pair of opposite glomerules on each node, and with the peculiarity that only one glomerule is accompanied by a bract leaf. In the apical view, the bract leaves form a spiral throughout the inflorescence. The glomerules of the apical nodes continue growing in two horizontal, cymose and opposite axes. One of them grows briefly, while the other grows longer, reaching or even surpassing the opposite face of the shoot. The growing of the latter glomerule occurs in an opposite clockwise direction and determines the spiral arrangement of the bract leaves (fig. 2).

Morphological analysis, including pollen study, of specimens from Bahia and Rio de Janeiro states show that *Diodia assurgens* K.Schum. belongs to the genus *Spermacoce* s. str. A substitute name is provided accompanied by a detailed description and illustration.

MATERIAL AND METHODS

The present paper is based on herbarium material of BR, CTES, HUEFS, G, NY, R, SI, US. Conventional methods of herbarium taxonomy were used.



Figure 1 – Photographs of *Spermacoce spiralis*: A, top view of branch with glomerules; B, side view of glomerule. Photo from Jardim 5349.

Pollen description of the *Diodia assurgens* is based on samples taken from dried herbarium material (*Blanchet* 3981 (G); *Harley et al.* 17819 (SI, HUEFS); *Saldanha* 7344 (R)). The pollen grains were acetolyzed according to Erdtman (1966). Grains for light microscope (LM) studies were mounted in glycerin jelly. They are deposited at the Palynological Laboratory of the Universidad Nacional del Nordeste (PAL-CTES). The photographs were taken with a digital camera Canon Power Shot A640 incorporated to a microscope Zeiss Axioplan. For SEM, acetolyzed pollen grains sputter-coated with gold were used, which were examined and photographed with a Jeol 5800 LV Scanning Electron Microscope of the Universidad Nacional del Nordeste. The terminology follows Erdtman (1966) and Punt et al. (2007).

RESULTS AND DISCUSSION

Taxonomy

Spermacoce spiralis Bacigalupo & E.L.Cabral, nom. nov.

Replaced synonym: *Diodia assurgens* K.Schum., in Martius, *Fl. Bras.* 6 (6): 22. 1889 (Schumann 1889a). – *Spermacoce assurgens* sensu Nees & Mart. (Nees von Esenbeck & Martius 1824: 11), non Ruiz et Pavon (Ruiz & Pavon 1798: 60). – Type: Brazil: Bahia: fluss Ilheus, Dec. 1816, M. Wied 86 (lecto-: BR 659073, designated here; isolecto-: BR 658942).

Subshrub, erect to scandent, 0.30–1 m tall; stems tetragonal with angles narrowly winged, border pimpled and turned backwards. Leaves sessile; leaf blades 6–12.3 × 1.5–3.5 cm, elliptic, acute at the apex, attenuate at the base, glabrous above, minutely scabrous on the veins and variably pimpled over the rest of the blade. Stipules fimbriate; stipular sheath glabrous with five to seven glabrous bristles, to c. 9 mm long. Inflorescences terminal spiciform or pseudoraceme with two glomerules at each floriferous node, but only one glomerule is associated with a unique bractal leaf, bracts are spiral throughout the inflorescences; basal bractal leaf 6–11 × 1.5–3.5 cm, gradually smaller in the upper nodes until 3–8.3 × 0.5–2.4 cm. Flowers 4-merous, isostylous; calyx

4-lobate, lobes triangular 0.7–1 mm long, with intercalary teeth; corolla white, 1–1.3 mm long, with lobes longer than corolla tube, urceolate, with moniliform hairs at the inside of the lobes; stamens attached at the corolla throat; filaments c. 2 mm; anthers elliptic 0.3–0.5 mm long; disc entire, style 0.3 mm long, bicapitate. Fruits dry, puberulous, 1.5–2 mm, crowned by the calyx lobes. Seeds c. 1 mm long, seed coat surface scrobiculate. Figs 1 & 2.

Distribution – Brazil, in Eastern of Bahia and central area of Rio de Janeiro.

Notes on typification – In the protologue of the species, three specimens are cited (Schumann 1889: 23): “Habitat in provincia Bahia ad viam Ilheoticam: princ. *Neuwied* n. 86; in umbrosis prope Castel nuovo ejusdem prov. *Riedel* n. 730, floret Aprili; in Guiana Gallica: *Poiteau*”. The *Poiteau* specimens were not found, but *Neuwied* 86 (= *Wied* 86) and *Riedel* 730 were located in the BR herbarium. The *Riedel* 730 collection is named *Diodia ilheotica* by Schumann, determined in the framework of Flora Brasiliensis. The *Neuwied* collection comprises two sheets. Both are named by K. Schumann as *Diodia ilheotica*. One of the sheets (BR 659073) is renamed as *Diodia assurgens* with clear reference to the Flora treatment by Schumann. Therefore, we choose this last sheet as lectotype for the species.

Etymology – The specific epithet chosen for *Spermacoce spiralis* refers to the spiral disposition of the bractal leaves in apical view.

Notes on distribution – Schumann (1889a) cites this species for Brazil (Bahia) and French Guiana, but no material has been found from the latter country.

Representative specimens examined – Brazil: Bahia: Castelnovo, Apr. 1822, L. *Riedel* 730; Parque National de Monte Pascoal, 22 Mar. 1968, S. G. da Vinha & T. S. Santos 103 (CTES, SI, US); 15°15'35"S 40°34'29"W, 25 Mar. 1996, W. Thomas et al. 11164 (CTES, NY); 16°52'02"S 39°24'54"W, 17 Jul. 1997, W. Thomas et al. 11593 (SI); km 3 da Rodovia Uruçua/Taboquinhas, plantação de cacau, 19 Jun. 1972, T. S. dos Santos 2315 (US); Rio do Meio, en-

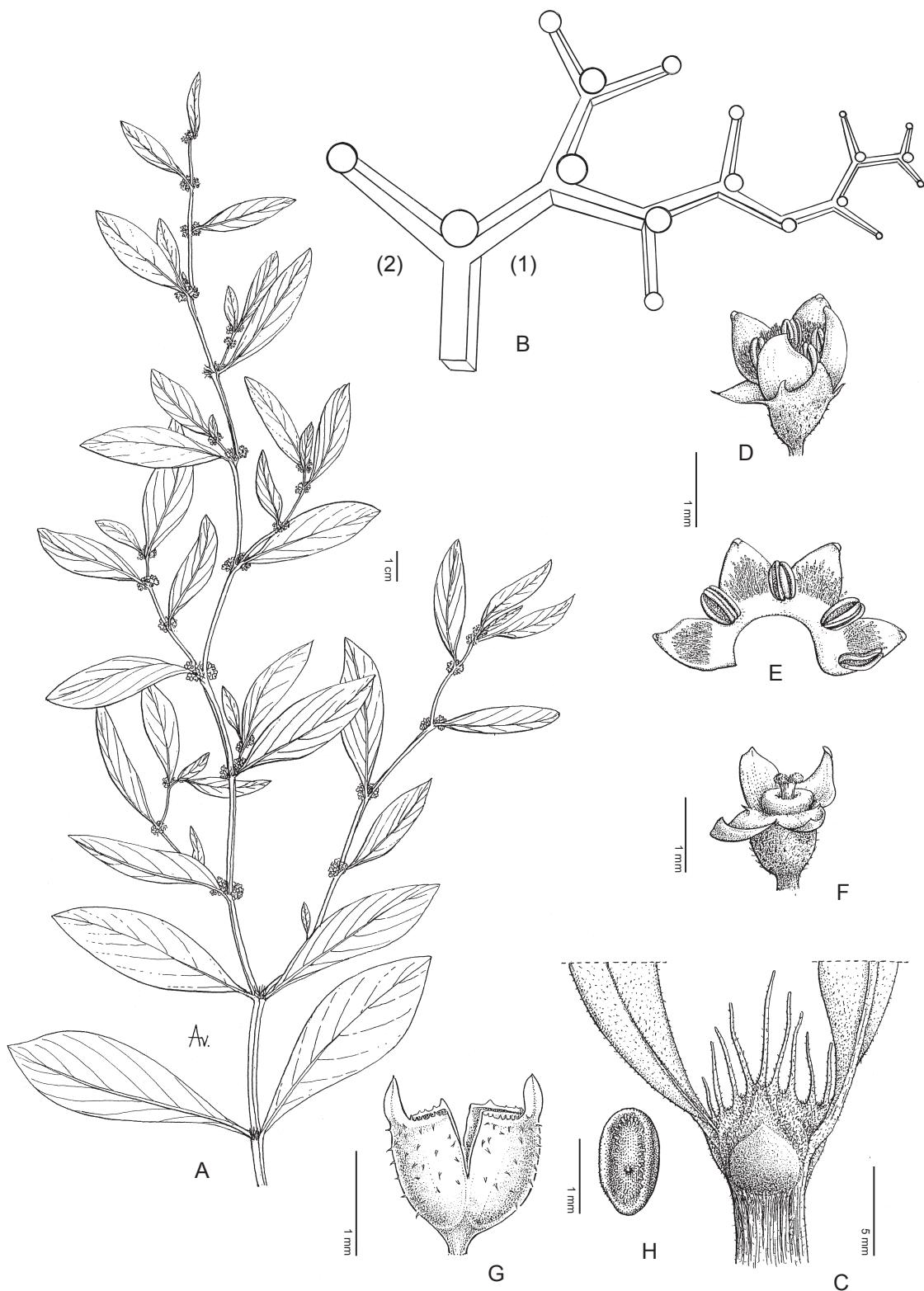


Figure 2 – *Spermacoce spiralis*: A, habit; B, inflorescence branching pattern showing the development of one of branch (1), the opposite branch (2) is similar, but shorter and is not drawn; C, stipular sheath (with nine bristles); D, flower; E, flower in anthesis; F, hypanthium, disc and short style; G, dehiscent fruit; H, ventral view of seed (A-H, Harley 17819).

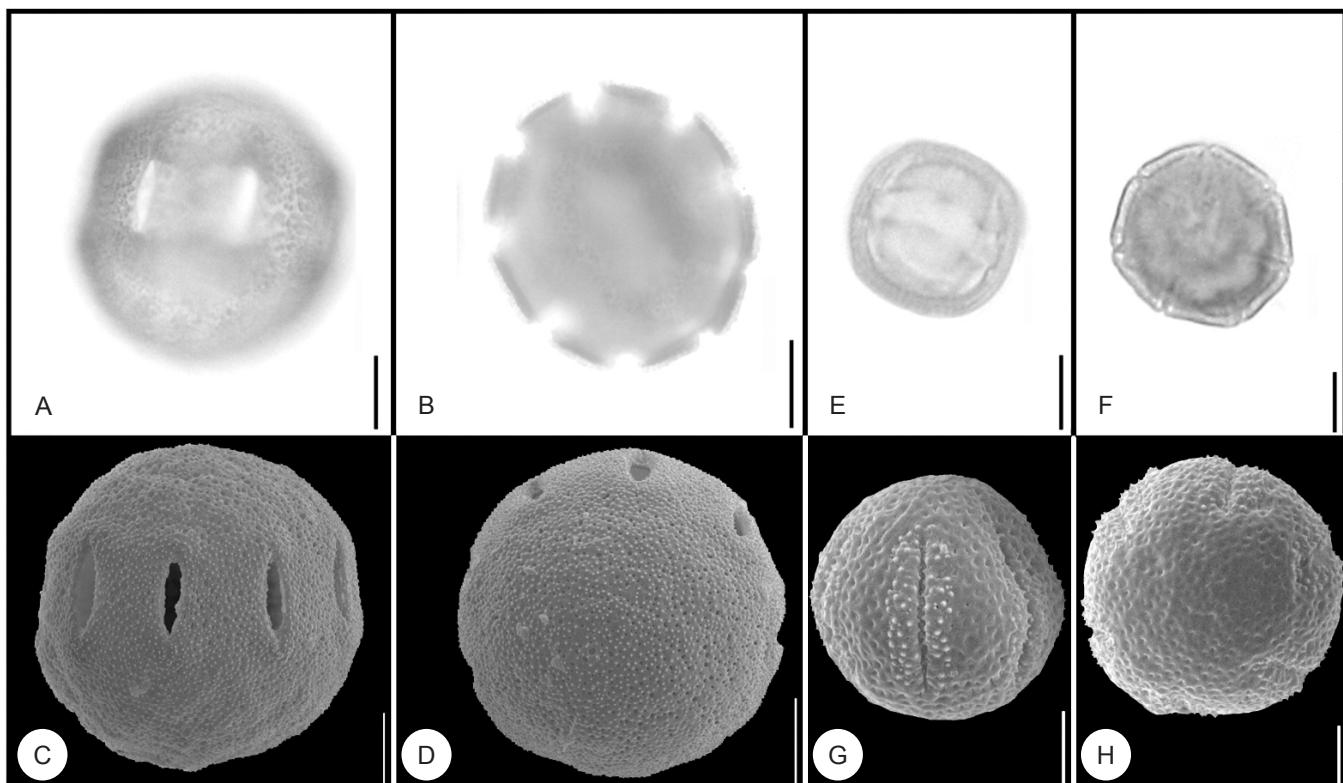


Figure 3 – Comparative table of pollen grains of genera *Diodia* s. str. and *Spermacoce* s. str.: A–D, *Diodia kuntzei*; E–H, *Spermacoce spiralis*; A, B, E, F, observations under light microscopy (LM); C, D, G, H, observations under the scanning electron microscopy (SEM); A, equatorial view of pollen grain; B, polar view of 9-colporate pollen grain; C, equatorial view of pollen grain; D, polar view of pollen grain; E, equatorial view of pollen grain; F, polar view of 7-colporate pollen grain; G, equatorial view of pollen grain; H, polar view of 6-colporate pollen grain. (A–D, Cabaña Fader 23; E–F, Harley et al. 17819, Saldanha 7344). Scale bars: A–D = 10 µm; E–F = 5 µm.

trada a Aurelino Leal, 13 Jan. 1971, T.S. dos Santos 1314 (US); 16°53'S 39°25'W, 2 Jan. 1977, R. Harley et al. 17819 (CTES, HUEFS, K, SI); Moritiba, Blanchet 3988 (G); ibid., Blanchet 3981(G); Mun. De Cairu, J. Jardim et al. 5349 (CEPEC); Mun. Itacaré, J. Jomar 5358 (CEPEC); Porto Seguro: Parque Nac. Monte Pascoal, 3 Km, S of entrance along road on N side park, 6 Feb. 1999, W. Thomas et al. 12031 (SI). **Rio de Janeiro:** Serra dos Órgãos, 21–31 Mar. 1883, J. de Saldanha 7344 (R); estrada Cachoeira de Macacu–Nova Friburgo, 29 Apr. 1972, D. Sucre & T. Soderstrom 9046 (RB, US); Teresópolis, 16 Mar. 1939, A. Carvalho s.n. (IAC 3468).

Pollen morphology

Spermacoce spiralis has small, oblate-spheroidal to prolate-spheroidal, 6–7-zonocolporate pollen grains with a tectate and spinulate sexine. The colpi are long and narrow 10.8–12.2 µm × 1.63–2.04 µm (ECA/P = 0.69–0.71) and the endoapertures are laterally fused forming an endocingulum. The spinules are restricted to a zone of 2–3 µm wide around the ectoapertures (fig. 3).

The pollen grains of *Spermacoce spiralis* are similar to the pollen grains of other *Spermacoce* s. str. species (e.g. *S. glabra* Michx., *S. tenuior* L.). They differ clearly from the pollen grains of the *Diodia* s. str. species. Pollen of *Diodia kuntzei* K.Schum., *D. saponariifolia* Cham. & Schldl. and *D. virginiana* L. are medium to large, have a tectate-perforate sexine, with short ectocolpi (ECA/P = 0.25–0.33) and

the endoapertures, laterally fused to form an endocingulum, are almost as wide as the length of the colpi (Cabaña Fader & Cabral, unpubl. data). Hence, the comparative analysis of the exomorphological and palynological characters of the genera *Diodia* and *Spermacoce* s. str., confirms that *Spermacoce spiralis* is best placed within *Spermacoce* s. str. For a discussion about the relationships between *S. spiralis* and related species see Cabral et al. (2010).

The following key of pollen morphological characters allows distinguishing the genus *Diodia* from *Spermacoce*:

1. Pollen grains medium to large, colpi short and endoaperture laterally joined forming an endocingulum almost as wide as the length of the colpi..... *Diodia* s. str.
1. Pollen grains small, colpi long and endoapertures joined forming an endocingulum with well-defined boundary *Spermacoce* s. str.

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