

A new species of *Spermacoce* s. str. (Spermacoceae, Rubiaceae) from Eastern Brazil

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Background – The species diversity within the tribe Spermacoceae (Rubiaceae) remains imperfectly known. As part of an ongoing revision of South-American species of the tribe, a new species of the genus *Spermacoce* s. str. is here presented.

Methods – Normal practices of herbarium taxonomy have been applied to study all herbarium material available. Pollen was studied using the acetolysis method.

Key results – *Spermacoce paganuccii* E.L. Cabral & Bacigalupo a new species from Brazil is described and illustrated. The species is endemic of Serra do Orobó from the state of Bahia. Morphologically it is most similar to *Spermacoce glabra* and *S. spiralis*. It differs from *S. glabra* in the diameter of the glomerules, the form and indumentum of the capsules and the habit. The new species is easily distinguished from *S. spiralis* by its indehiscent fruits, the glomerule disposition, the number of bractal leaf and the calyx lobes. Pollen morphology is also analyzed and its relevance is discussed to distinguish the new species from its closest relatives.

Key words – Brazil, pollen morphology, Rubiaceae, *Spermacoce*, systematics.

INTRODUCTION

The genus *Spermacoce* L. belongs to the tribe *Spermacoceae* of the Rubiaceae family. There are divergent opinions regarding the generic delimitation of this genus. Some authors, such as Delprete (2007), Govaerts (1996), and Govaerts et al. (2008), proposed to include the neotropical species of the genus *Borreria* within *Spermacoce*. Other specialists, however, prefer to recognize *Borreria* next to *Spermacoce* s. str. because the phylogenetic analyses are not yet conclusive (Bacigalupo 1993, Bacigalupo & Cabral 2007). These authors place in *Spermacoce* s. str. seven American species, one of them, *Spermacoce tenuior* L., also occurring in other tropical regions. *Spermacoce* s. str. species are characterized by small flowers arranged in glomerules, 2–4-lobate calyces, corolla lobes with a pilose surface at the inside, stamens fixed near the base of the corolla tube or at the interlobular sinuses, short styles with a subcapitate-bilobate stigma, dry indehiscent fruits or dry fruits with septicidal dehiscence in only one carpel, and seeds with a strophiole. In addition, these species have type I pollen grains, i.e. zonocolporate pollen, with long colpi, laterally joined endoapertures forming an endocingulum and a tectate exine with spinules positioned around the ectoapertures (Dessein et al. 2002a, 2002b). The morphological evidence that this group of species forms a monophyletic

group is supported by molecular data, but the relationships with other taxa remain unclear (Dessein 2003).

The species of *Spermacoce* s. str. are found from the northeastern United States to the Rio de la Plata in Argentina with *S. tenuior* also occurring in continental Africa and Madagascar. They often inhabit humid environments such as swamps, edges of canals, rivers and streams, but they are also found in open fields as weeds.

During the study of the species of tribe *Spermacoceae* from the state of Bahia, Brazil, a species of genus *Spermacoce* s. str., still not described, was discovered. It was found to be endemic to the dry forest fragments of Serra de Orobó and the adjacent dry forest areas (Cardoso & Queiróz 2008).

In this work, we present the description and illustration of the new species and the analysis of its pollen morphology.

MATERIAL AND METHODS

The present paper is based on herbarium material of HUEFS. Conventional methods of herbarium taxonomy were used.

Pollen description of the new species of *Spermacoce* is based on samples taken from dried herbarium material (*Queiroz et al.* 10828, HUEFS; *D. Cardoso* 1294, HUEFS). The pollen grains were acetolyzed according to Erdtman (1966).

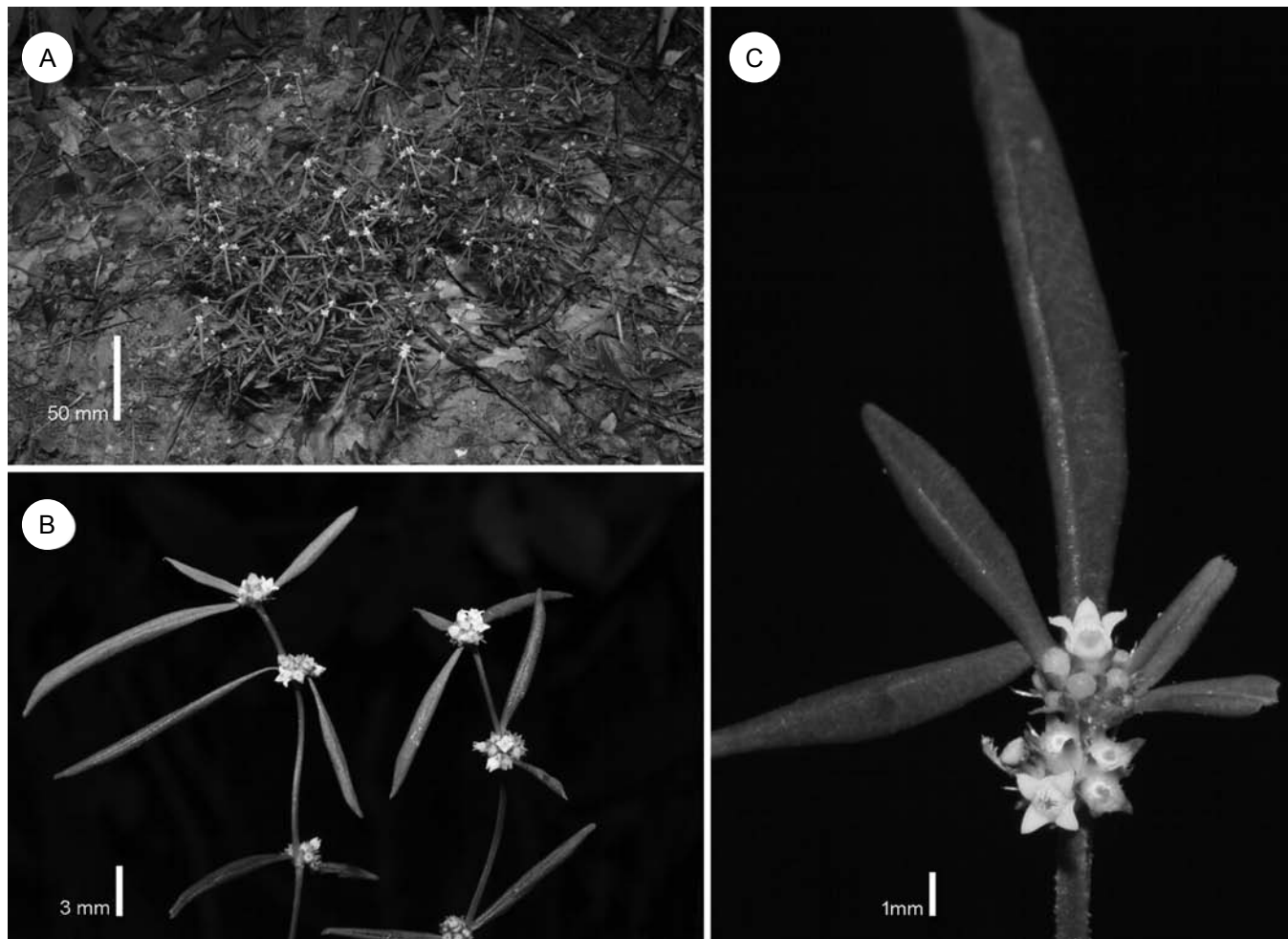


Figure 1 – Photographs of *Spermacoce paganuccii*: A, habit; B, top view of branch with glomerules; C, side view of glomerule. Photographs taken by Domingo Cardoso.

Grains for light microscope (LM) studies were mounted in glycerin jelly. They are deposited at the Palynological Laboratory of the Universidad Nacional del Nordeste (PALCTES). The photographs were taken with a digital camera Canon Power Shot A640 incorporated to a microscope Zeiss Axioplan. For SEM, acetolysed 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 paganuccii E.L.Cabral & Bacigalupo **sp. nov.**

Affinis *Spermacoce glabra* et *S. spiralis* sed ab *S. glabra* habitu differt, planta erecta versus decumbens, vagina stipularis cum 5–9 laciniis versus 5–6 laciniis, laciniis 1–8 mm longis versus laciniis 1–3.5 mm longis, glomerulis floralibus 5–10 mm latis versus 2–3 mm latis, capsula subturbinata et complanata glabra versus capsula subglobosa puberula. Ab

S. spiralis capsula differt, dehiscenti versus indehiscenti, glomerulis floralibus 2 oppositis cum 1 bractea versus unilateralibus cum 2 bracteis, calyce 2-lobulato versus 4-lobulato. – Type: Brazil: Bahia, Itaberaba, ARIE Serra do Orobó, Fazenda Leão dos Brejos, floresta estacional semidecidual, 12°25'10.1"S 40°30'59.2"W, alt. 270 m, 16 Aug. 2008, *Queiroz, Cabral & Cardoso* 13684 (holo-: HUEFS; iso-: CTES).

Subshrub, decumbent, much branched, 30–60 cm tall; stems quadrangular, puberulous. **Leaves** sessile; leaf blades 2.3–4.2 × 0.3–0.7 cm, oblanceolate; base decurrent; apex acute, softly discolor; margin scaberulous, puberulous; secondary veins 3–4 at each side of the mid-vein, obscure. **Stipules** 2–2.5 mm long, interpetiolar, forming a sheath, puberulous, with mammeliform teeth on the angles; edge with 5–6 bristles, 1–3.5 mm long, colleter-tipped. **Inflorescences** glomerulous, unilateral, 3–5 axillary, 2–3 mm wide, subtended by 2 bracts. **Flowers** 4-merous; calyx 4-lobate, triangular, 0.25–0.40 mm long; corolla white, 1.3–1.5 mm long, tube shorter than the lobes, inner side beset with dense moniliform hairs around the lobe's base. **Stamens** subsessile, attached near of the corolla tube base; anthers 0.41–0.46 mm long. **Hypanthium** 0.6–1 mm long, puberulous; style short, c. 0.1 mm long; stigma bilobate; nectary disc entire. **Fruits** dry, in-

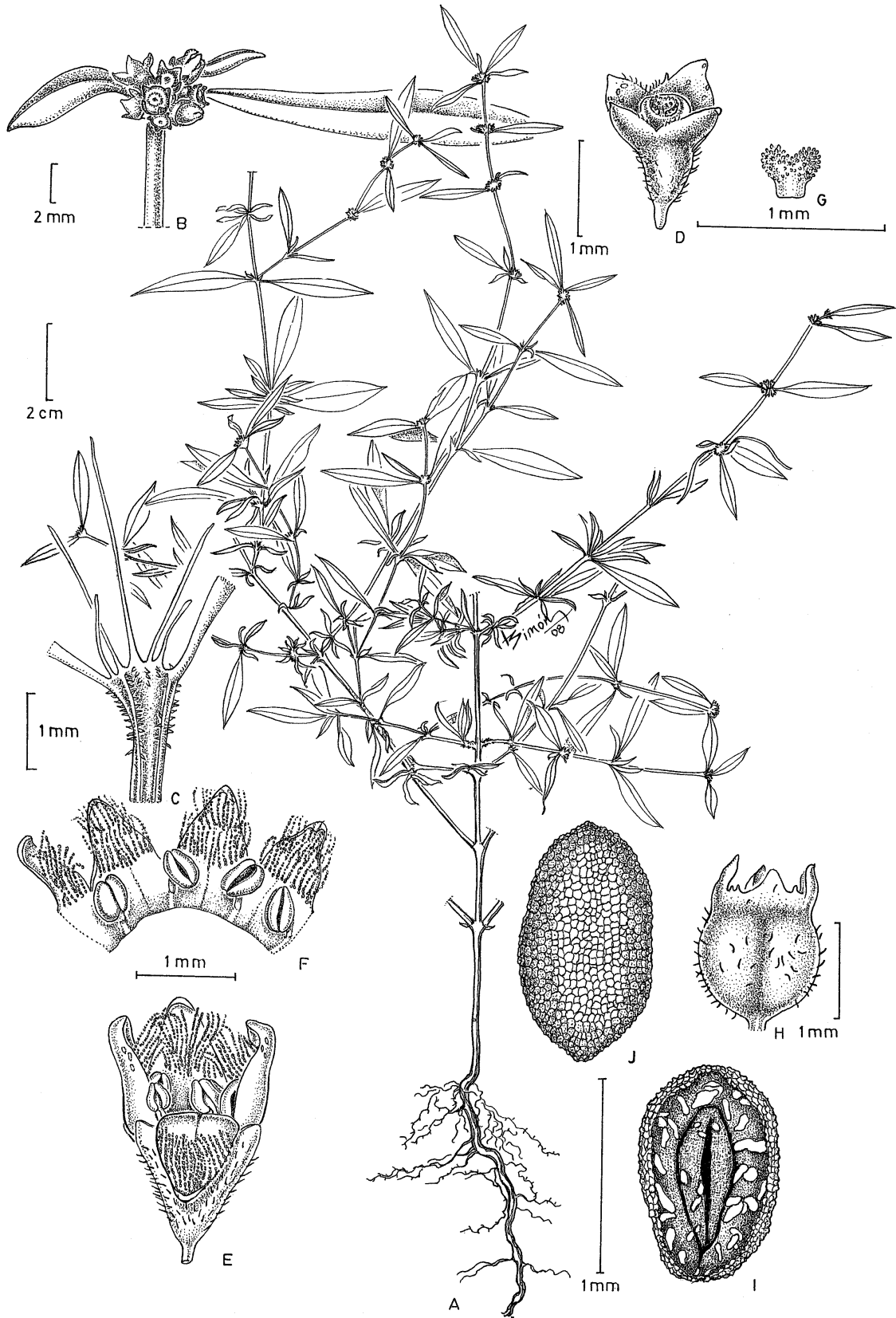


Figure 2 – *Spermacoce paganuccii*: A, habit; B, glomerule (with two bractal leaves); C, stipular sheath with 5 bristles; D, hypanthium, 4-lobate calyx, nectar disc and short style; E, flower in anthesis; F, opened corolla; G, style and glandular bilobate stigma; H, indehiscent fruit; I, ventral view of seed; J, dorsal view of seed (based on material of Cardoso 1294; Queiroz *et al.* 13684). Drawn by L. Simon.

**Key of pollen characters to differentiate *S. paganuccii*
from its closest relatives**

- 1. Exine with spinules distributed more or less uniformly in the mesocolpi; grains 7–9-zonocolporate ...
.....*S. paganuccii*
- 1. Exine with spinules located around the ectocolpi constituting a fringe of 2 to 3 μm wide; grains
6–10-zonocolporate grains.....2
- 2. Grains 6–7-zonocolporate; exine not perforated.....*S. glabra*
- 2. Grains 6–10-zonocolporate; exine perforate.....*S. spiralis*

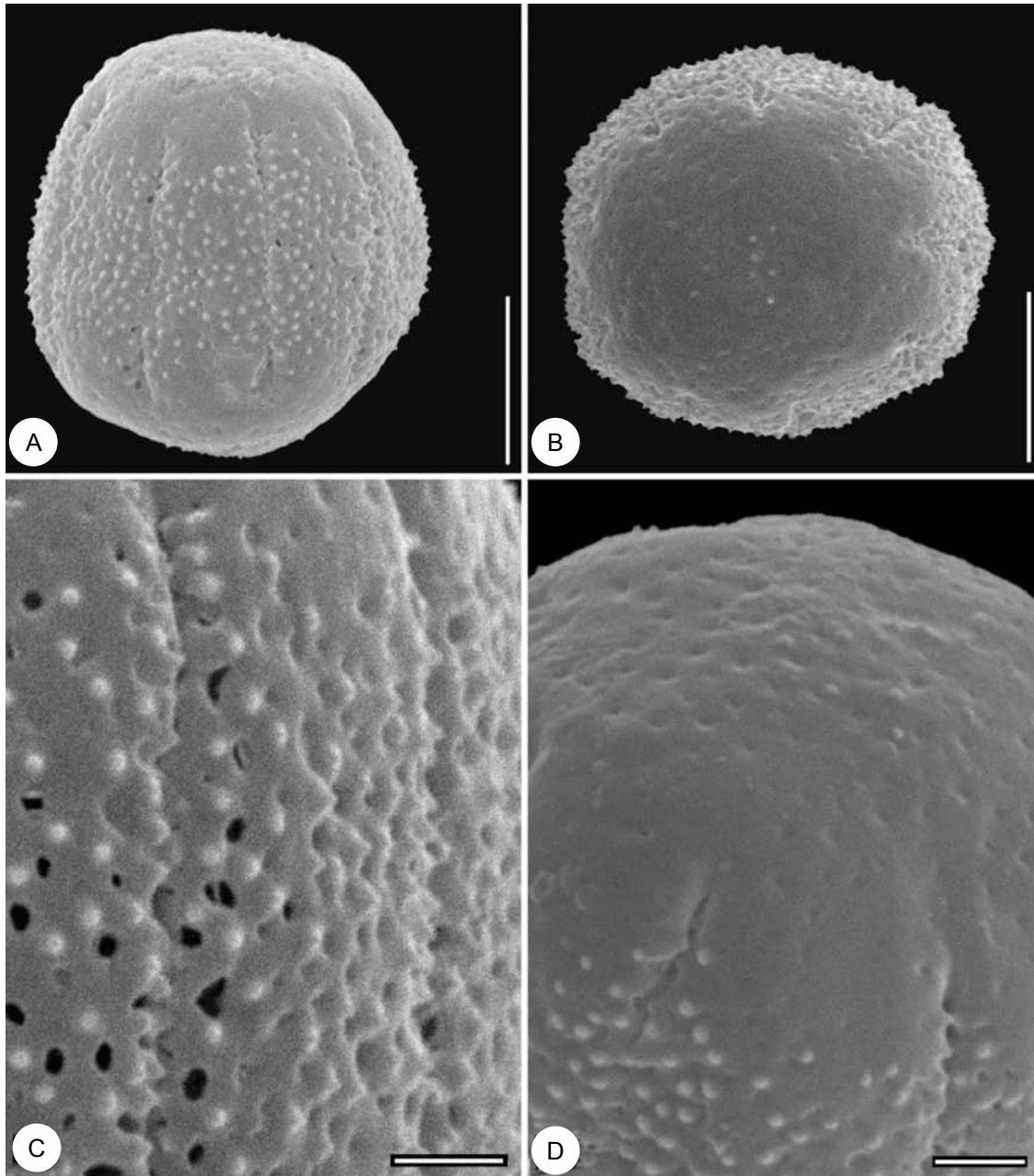


Figure 3 – Pollen morphology of *Spermacoce paganuccii* (observations under SEM): A, equatorial view of pollen grain; B, polar view of 9-colporate pollen grain; C, detail of mesocolpium; D, detail of apocolpium in subequatorial view (from *Queiroz et al.* 10828; *Cardoso* 1294). Scale bars: A–B = 5 μm , C–D = 1 μm .

 Key to distinguish *S. paganuccii* from its closest relatives

1. Fruits indehiscent; glomerules solitary per node, subtended by 2 bractal leaves.....2
 1. Fruits with one mericarp dehiscent at the apex; glomerules 2 per node, opposite, only one of them with a bracteal leaf.....*S. spiralis*
 2. Decumbent subshrub; glomerules 2–3 mm wide; fruits subglobose, 1.2–1.3 mm long, puberulous.....*S. paganuccii*
 2. Erect subshrub; glomerules 5–10 mm wide; fruits subturbinate, complanate vertically, 1.5–2.5 mm long, glabrous.....*S. glabra*
-

dehiscent, 1.2–1.3 mm long, subglobose, puberulous. **Seeds** plane-convex, 1.3–1.5 mm long; ventral surface with wide groove, covered by hyaline strophiole, with many raphides; dorsal surface regularly reticulate-foveate. Figs 1 & 2.

Distribution – Brazil, in central Bahia State, in the municipalities of Ruy Barbosa and Itaberaba, apparently restricted to Serra do Orobó mountain range.

Phenology – Flowering and fruiting from June to September.

Habitat – Grows in the semi-deciduous forests of Serra do Orobó, at an altitude ranging between 398 and 638 m. According to Cardoso and Queiroz, (2008), this area is located within the Caatinga domain of northeastern Brazil with a semiarid climate. The region shows great species diversity with numerous endemics, several of them recently described.

Paratypes – **Brazil:** Bahia, Itaberaba: ARIE Serra do Orobó, Fazenda Leão dos Brejos, 12°23'16"S 40°32'13"W, floresta estacional semidecidual, alt. 638 m, 23 Apr. 2006, *Cardoso & Messias* 1294 23-4-2006 (HUEFS); *ibidem*, 16 Jun. 2007, *Cardoso et al.* 12265 (HUEFS); Ruy Barbosa: Serra do Orobó, caminho para o pátio das orquídeas, 12°18'10"S 40°29'14"W, floresta estacional semidecidual, alt. 550 m, 20 Aug. 2005, *Queiroz et al.* 10828 (HUEFS).

Etymology – This species is dedicated to the Brazilian Botanist Luciano Paganucci de Queiroz who has contributed with his collections to the study of the Rubiaceae from Brazil.

Notes – *Spermacoce paganuccii*, endemic of Serra do Orobó, Bahia, Brazil is related to *S. glabra* and *S. spiralis*. The last species lives in Brazil, restricted to the Atlantic forest, in the Eastern of Bahia and Rio de Janeiro (Bacigalupo et al. 2010). *Spermacoce glabra* is widely distributed in America, found in the United States, Santo Domingo, Colombia, Venezuela, Ecuador, Perú, Paraguay, Uruguay, Bolivia and Argentina. In this work, we follow the concept of *Spermacoce glabra* as proposed by Bacigalupo and Cabral (2007). We consider that variation in style, seeds and fruits are not sufficiently clear to allow an infraspecific classification as previously proposed by Bacigalupo (1972).

Pollen morphology

Pollen grains of *Spermacoce paganuccii* are small, prolate-spheroidal or oblate-spheroidal, 7–9-zonocolporate grains. In polar view, the outline is circular. The ectocolpi measures 12.2–13.6 μm \times 1.36–2.04 μm (ECA/P = 0.69–0.76) and the endoapertures are laterally fused to form an endocingulum.

Exine thickness varies from 1.36 to 2.72 μm , the sexine is as tick as the nexine. The tectum is tectate-perforate, spinulate in the mesocolpi and psilate in apocolpi. The perforations are subcircular to elongated and variable in size, 0.96–4.5 μm \times 0.76–2.3 μm . The spinules are conical, 0.17–0.39 μm long and 0.31–0.54 μm wide at the base; they are distributed more or less uniformly in the mesocolpi and almost absent from the apocolpium. Fig. 3.

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