

Nomenclatural and taxonomic novelties in the tribe Melastomeae (Melastomataceae)

MARCUS FELIPPE OLIVEIRA DA SILVA^{1,2}, PAULO JOSÉ FERNANDES GUIMARÃES^{3*} & FABIÁN A. MICHELANGELI⁴

¹ Programa de Pós-graduação em Botânica, Escola Nacional de Botânica Tropical, JBRJ, Rua Pacheco Leão 2040 Solar da Imperatriz, 22460-036, Rio de Janeiro, RJ, Brazil.

² Secretaria Estadual de Educação, Regional Norte Fluminense, Rua 1º de Maio 9, Centro, 28035-145, Campos dos Goytacazes, RJ, Brazil. marcusfoliveira@gmail.com

³ Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, DIPEQ, Rua Pacheco Leão 915, 22460-030, Rio de Janeiro, RJ, Brazil.

⁴ Institute of Systematic Botany, The New York Botanical Garden, Bronx, NY 10458-5126, USA

*Corresponding author: paulojose.guimaraes@gmail.com

Abstract

The synonymization of *Itatiaia* and *Purpurella pro parte* under *Pleroma* based on morphological and geographical data and molecular evidence is made and the new combination *Pleroma cleistoflora* with its synonyms is provided. For *Purpurella cleistoflora* one of the isotypes from HBG is designed as lectotype. Illustrations, descriptions and commentaries on geographic distribution, conservation and morphological features are given.

Resumo

Com base em dados morfológicos, distribuição geográfica e evidências de estudos moleculares é aqui realizada a sinonimização de *Itatiaia* e *Purpurella pro parte* em *Pleroma* e é fornecida a nova combinação *Pleroma cleistoflora* com seus sinônimos. Para *Purpurella cleistoflora*, um isótipo do HBG é designado como lectótipo. Ilustrações, descrições e comentários sobre distribuição geográfica, conservação e características morfológicas são fornecidos.

Keywords: Brazil, endemic, lectotype, Rio de Janeiro, synonyms

Introduction

Melastomataceae is one of the largest Angiosperm families (Renner 1993, Clausen & Renner 2001) and, although distributed pantropically, the family has a marked concentration of species in the New World (Renner 1993, Almeda 2009). This can be seen in one of the most diverse tribes of this family, Melastomeae Bartling (1830: 329), that is pantropical and has ca. 870 species (Michelangeli *et al.* 2013), with the majority (ca. 570 species) found in South America (Michelangeli *et al.* 2013, Renner 1993).

The species of New World Melastomeae are distributed among 30 genera that vary widely in size. *Tibouchina* Aublet (1775: 445) is the largest genus with 240 species, six others have 20–60 species and eight genera are monotypic (Michelangeli *et al.* 2013). One of these monotypic genera is *Itatiaia* Ule (1909: 234), composed of subshrubs with small leaves and closed buds at anthesis. The genus is endemic to the highlands of Itatiaia National Park in southeastern Brazil, from where its name is derived. Based on morphological and molecular evidence (Michelangeli *et al.* 2013, Guimarães & Michelangeli unpublished data), the New World Melastomeae are not resolved as a monophyletic group. *Itatiaia* plus the Atlantic Forest species of *Tibouchina* should be transferred to two earlier described genera that were previously synonymized under *Tibouchina* (Baillon 1877, Cogniaux 1885, 1891): *Pleroma* D. Don (1823: 293) and *Chaetogastra* DC. (1828: 131).

Moreover, the genus *Itatiaia* has not been extensively studied taxonomically. Since the publication of *Purpurella cleistoflora* Ule (1895: 418), the first taxon related to it, only some (incorrect) nomenclatural alterations were made

(Ule 1896) until the publication of *Itatiaia* and *Itatiaia cleistopetala* (Ule) Ule (1909:235). Therefore, during the preparation of a taxonomic treatment of the tribe Melastomeae for Rio de Janeiro State, Brazil (Guimarães & Oliveira da Silva, in press), the misapplication of names and nomenclatural discrepancies were noticed and corrected. We also take this opportunity as to adjust the position of this monotypic genus based on recent phylogenetic studies.

Materials and methods

The present study was carried out by analyzing the literature (protologues included) and by examination of specimens from HBG, MBM, NY, RB, US, and one photo from F (acronyms according to Thiers 2014). Descriptions are based on the specimens examined. References to the International Code of Nomenclature for algae, fungi and plants (abbreviated as ICN) are provided according to the Melbourne edition (McNeill *et al.* 2012). This study is part of the treatment of the tribe Melastomeae of Rio de Janeiro State, Brazil.

Results and Discussion

Taxonomic history

The genus *Purpurella* was described by Naudin (1850: 301), where he also made the new combinations *Purpurella muricata* (Bonpland 1823:1) Naudin (1850: 301) and *Purpurella reticulata* (A.P. de Candolle 1828:131) Naudin (1850: 301), both Colombian species. A few years later, a new species from Colombia by Triana (1871: 35), and some Brazilian species by Wawra (1882) and Krasser (1893) were added. Later, Ule (1895: 418) validly published *Purpurella cleistoflora*, describing it from a single specimen, *Ule* 3349, deposited in the Berlin herbarium (B). With the exception of *Purpurella cleistoflora*, all other species were later transferred to *Tibouchina* (Baillon 1877, Cogniaux 1885, 1891).

The following year, and based on the same type specimen of the previous publication, Ule (1896: 415) published *Purpurella cleistopetala* Ule, a correction to the name *Purpurella cleistoflora*, since according to him, the specific epithet *cleistoflora* was not appropriate. However, according to Art. 51.1 of the ICN (McNeill *et al.* 2012), a legitimate name must not be rejected merely because it, or its epithet, is inappropriate or disagreeable, or because another is preferable or better known. Therefore, *Purpurella cleistopetala* is a superfluous and illegitimate name, being a homotypic synonym of *Purpurella cleistoflora*.

By analyzing the specimen *Ule* 3349 in a new publication, Ule (1909) considered the morphological characteristics of its corolla (with closed petals at anthesis) and hypanthium (large and hairy) to be sufficient to circumscribe it, as a new genus and a new combination. The new genus, *Itatiaia* (1909: 235), is valid, but the new combination, *Itatiaia cleistopetala*, was based on a later, superfluous and illegitimate name.

Thus, *Itatiaia cleistopetala* is an illegitimate name and, according to Art. 11.4 of the ICN (McNeill *et al.* 2012), the correct name is given by the combination of the final epithet of the earliest legitimate name of the taxon in the same rank, with the correct name of the genus or species to which it is assigned.

Typification of the names

When Ule (1895) published *Purpurella cleistoflora*, he mentioned in the protologue the habitat, provenance and flowering time (“*Habitat in campis ad Serram Itatiaiae; in altitudine 2100–2400 metrum. Floret Februario usque ad Martium.*”) and cited the holotype, *Ule* “n° 3349” (B). He also provided an illustration of the species in Table 32, that is available on Biodiversity Heritage Library website (<http://www.biodiversitylibrary.org/item/132451#page/541/mode/1up>).

The holotype was destroyed during World War II, but a photo negative (F16736) still exists at Field Museum (fieldmuseum.org/explore/our-collections/berlin-negatives). Written on the label is: “*Purpurella cleistoflora* Ule. *n. gen. n. sp.* Original! Rio de Janeiro: Serra do Itatiaia, *Ule* 3349”.

Fortunately, there is a set of specimens of Ule’s “Herbarium Brasiliense” at Herbarium Hamburgense (HBG), where we discovered duplicates of “*Ule* n° 3349.” These specimens are isotypes not cited by Ule (1895) on the protologue of the species, but they can be considered for the purpose of typification of *Purpurella cleistoflora*.

As the holotype deposited in the Berlin herbarium was destroyed, the specimen HBG 522987 deposited in the Hamburg Herbarium must be designed here as a lectotype according to ICN Art. 9.12. (McNeill *et al.* 2012), and the other specimens, registered as HBG 522988 and HBG 522989, must be isolectotypes according to ICN Rec. 9C.1

(McNeill *et al.* 2012).

The specimen 522989 from HBG is marked as collected in June 1896. The publication of the basionym is from April. If this is the true collection date, then this specimen can't be considered a type. However, it is unclear if this label was added later in error or if the same collection number was given to a later collected plant.

All names published later—*Purpurella cleistopetala* and *Itatiaia cleistopetala* were based on the same type of *Purpurella cleistoflora* (Ule 3349), and are therefore homotypic synonyms of it.

Taxonomic Treatment based on Phylogenetic studies of Melastomeae

Species of *Tibouchina sensu lato* are divided into four clades that are well supported by molecular evidence (nuclear and chloroplast sequences) and morphological data, as well as by geographic distribution (Michelangeli *et al.* 2013).

These results support the view that some Atlantic Forest species of *Tibouchina* and the monotypic *Itatiaia* are better placed under *Pleroma*, an earlier described genus that is characterized by having a hairy hypanthium, stamens with well-developed pedoconnectives, purple or pink anthers, connectives glabrous or with glandular trichomes and caducous calyx lobes in fruit.

To properly place *Itatiaia* into a phylogenetic context, *Itatiaia* and *Purpurella pro parte* are here placed in synonymy under *Pleroma* and the new combination *Pleroma cleistoflora* (Ule) P.J.F. Guim., Oliveira da Silva & Michelangeli is also made. The remaining *Purpurella* species will be transferred to *Pleroma* and *Chaetogastra* (Guimarães & Michelangeli, unpublished data). A taxonomic key for the Brazilian core Melastomeae is provided below:

Key to *Tibouchina sensu stricto* and allied genera from Brazil—Core Melastomeae

1. Hypanthium and stem internodes covered by scales *Tibouchina*
1. Hypanthium and stem internodes covered by hairs 2
2. Stamens extremely dimorphic in color and shape; large stamens with connective much prolonged and ventrally with a pair of filiform lobes; small stamens with connective not prolonged and with short, thick ventral lobes *Desmoscelis*
2. Stamens similar in color and slightly dimorphic in shape, in varying degrees; connective appendages usually present and similar in the two cycles of stamens 3
3. Anthers purple to lilac, rarely cream or white, with well-developed pedoconnectives; often filaments hairy and anther connectives with gland-tipped hairs; caducous calyx in fruit *Pleroma*
3. Anthers all or partly yellow and many with reduced pedoconnectives; filament and anther connectives glabrous; persistent calyx in fruit *Chaetogastra*

Pleroma D. Don (1823: 293–295).

= *Purpurella* Naudin (1849: 301–302) *pro parte* [*sensu* Triana (1871: 35)], *syn. nov.*

= *Itatiaia* Ule (1909: 234–235), *syn. nov.*

Shrubs, subshrubs erect, rarely prostrate or trees covered with trichomes, sometimes gland-tipped or sessile, glutinous glands. Leaves opposite or rarely verticillate, blades of a pair essentially equal in size, petiolate or rarely sessile, margin entire, papery to coriaceous, variously pubescent, glutinous or nearly glabrous, 3–5–7(–9–11)-nerved. Inflorescence terminal anthotelic frondobracteose, thyrsoid or some modification of this structure in which the main and at least some lateral axes have nodes distal to the first pair of leaves on a branch axis or solitary terminal flowers; bracteoles 2(–4–6), free, variously pubescent, concave or plane, rare in calyptra, persistent or early deciduous, often enveloping floral buds and smaller than the mature hypanthium. Flowers perigynous; hypanthium campanulate to urceolate, mostly copiously pubescent externally, rarely glabrous; calyx lobes (4–)5, deciduous or rarely persistent; petals (4–)5, purple to lilac, rarely white, distended at anthesis, rarely campanulate or globose, but not forming a tube as in like *Brachyotum*; stamens (8–)10, isomorphic, or weakly to moderately dimorphic or rarely strongly dimorphic, anthers 2-thecae, ventrally channeled, arcuate, apical pore ventrally inclined, rarely a short anther with a large pore, pedoconnectives variously prolonged and modified ventrally at filament insertion, facing upwards or with a pair of bilobed appendages or less commonly flat, covered by stalked glands or glabrous. Ovary superior or semi-inferior, apical portion with hairs or gland-tipped, 5-locular placentation axile; style glabrous or pilose, hooked or incurved apically, typically bent towards side opposite stamens. Capsule dry, semi-woody, loculicidal; seeds numerous, cochleate to elongate-cochleate and tuberculate, with a terminal hilum.

Features: *Pleroma* D. Don comprises approximately 170–180 species (Fraga & Guimarães 2014; P. J. F. Guimarães & F. A. Michelangeli, unpubl. data) with a concentration of species in southeastern Brazil, in the Mata Atlântica biome

and also in the Cerrado, rarely in the Caatinga. Only five species occur outside of Brazil, reaching northwestern and western South America.

Habitat: Forests and forest edges, banks of rivers and streams, high altitude grasslands, fields, rocky slopes on outcrops and shrubby restinga, from sea level to an elevation of 2,650 m.

Pleroma cleistoflora (Ule) P.J.F. Guim., Oliveira da Silva & Michelangeli, *comb. nov.* (Figs. 1, 2)

Basionym: *Purpurella cleistoflora* Ule (1895: 418–419). Type:—BRAZIL. Rio de Janeiro: “Serra do Itatiaia” (in the label), “habitat in campis ad Serram Itatiaiae, in altitudine 2100–2400 metrum” (in the protologue), *E.H.G. Ule 3349* (Holotype B†, photo F!, Lectotype HBG [522987], here designated, Isolectotypes: HBG [522988, 522989?]).

Homotypic synonyms:—*Purpurella cleistopetala* Ule (1896: 169) *nom. superfl. et illeg.*; *Itatiaia cleistopetala* (Ule) Ule (1908: 235) *nom. illeg.*

Subshrubs, prostrate; branches sub-tetragonal, not angled, covered with pilose and appressed-strigose hairs, as the stem, petioles and pedicels. Leaves opposite, flat; petioles 1–2 mm long; blade 3–6 × 2–5 mm, oval, oval to elliptic, base rounded to truncate, apex acute to acuminate, margin ciliate, adaxial surface glabrous or sparsely pilose, abaxial surface glabrous to pilose, 3-nerved, veins confluent at the base. Inflorescence reduced to one terminal flower; pedicels ca. 0.5 mm long; bracteoles 2, 4–5 × 0.8–1.2 mm, flat, lanceolate, apex acute, margin ciliate, caducous after anthesis; Flowers 4-merous, hypanthium 2.5–3 mm long, campanulate, moderately covered with strigose hairs and sparsely covered with basal glandular trichomes; calyx lobes lanceolate, apex acute, caducous in fruit; corolla globose; petals 8–10 × 5–6 mm, white, obovate; stamens 8, isomorphic, filaments 2.5–3 mm long, white, glabrous, connective not prolonged, ventral appendage bicalcarate, 1–1.5 mm long, thecae 1–1.5 mm long, purple, linear, apex truncate. Ovary basal half adhered to hypanthium; style 5–6 mm long, glabrous. Capsule 4–5 mm long; seeds cochleate.

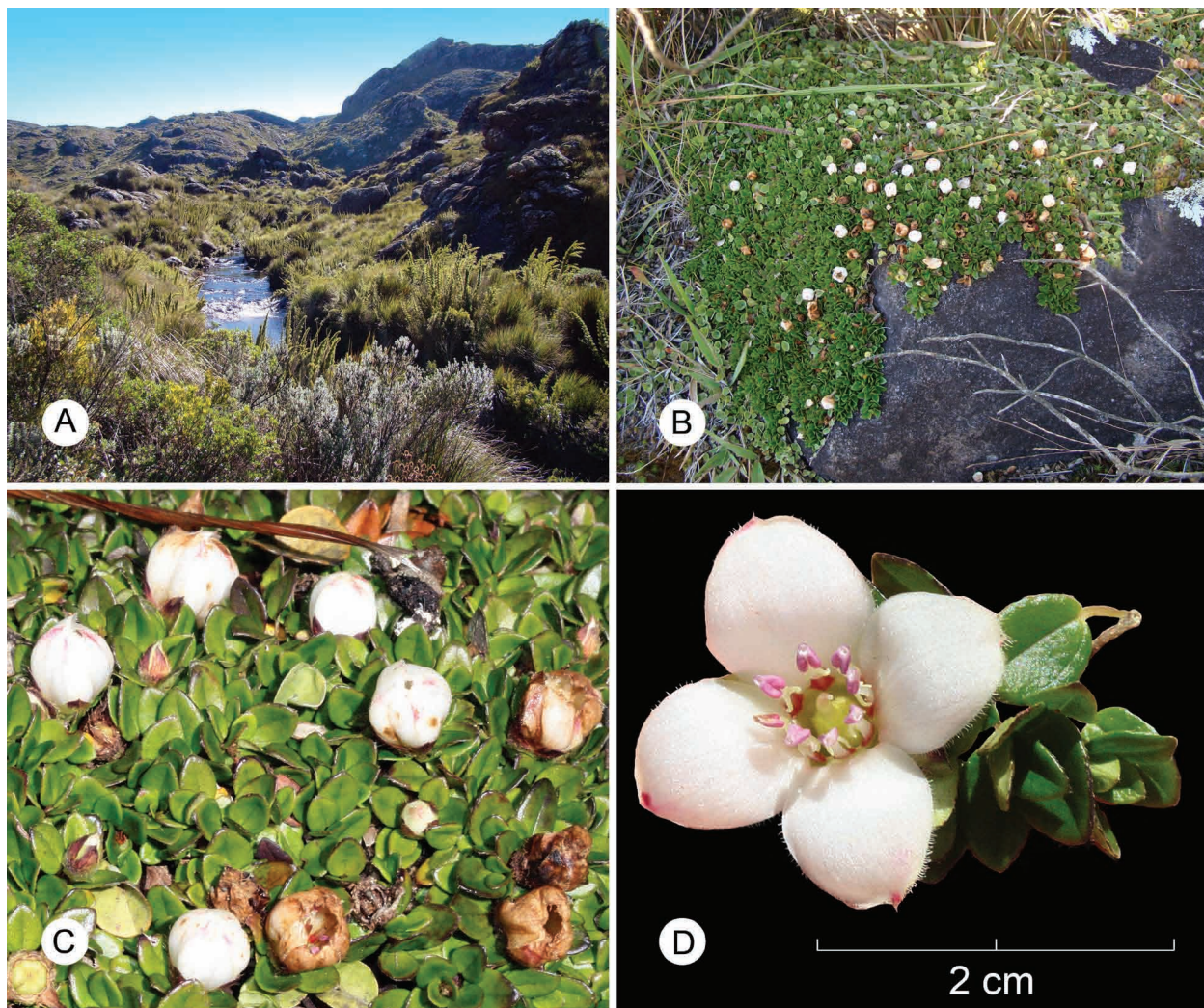


FIGURE 1. *Pleroma cleistoflora*. A. habitat in the Itatiaia highlands. B. Subprostrate habit. C. Closed buds with white petals and leaves. D. Opened flower (manually). Photos by M.O. Pellegrini.

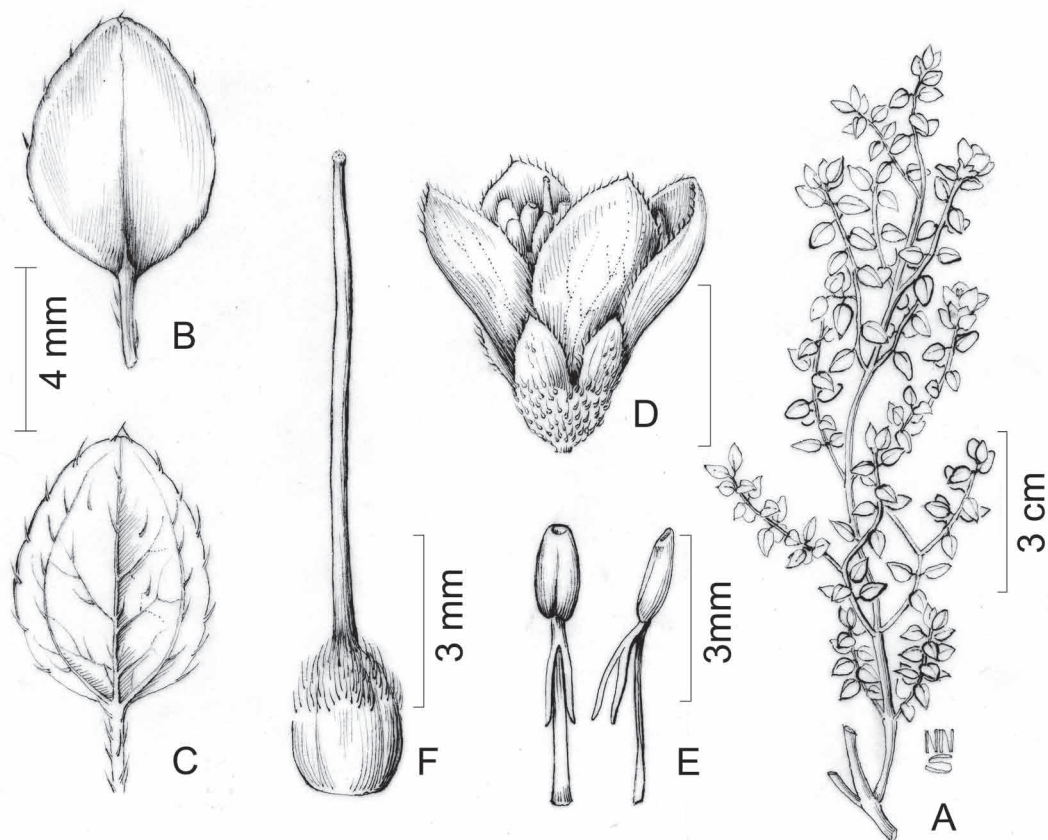


FIGURE 2. *Pleroma cleistoflora*. A. Habit, B. adaxial leaf surface. C. abaxial leaf surface. D. Opened flower (manually). E. Stamens, front and lateral views. F. Ovary crowded with setose hairs, style and stigma.

Features: *Pleroma cleistoflora* is a prostrate subshrub with many adventitious roots, that can be recognized by its 4-merous, closed flowers at anthesis, and stamens with ventral bicalcarate appendages equal in size to the thecae. The other representatives of *Pleroma* usually have ventral appendages that are smaller than the thecae.

Habitat and distribution:—*Pleroma cleistoflora* is endemic to southeastern Brazil. It occurs on moist soils and shaded places in a few localities on the highlands of Itatiaia National Park, between 2,200–2,430 m elevation, in an area of approximately 10 km² (Pinheiro 2013), along the border between Rio de Janeiro and Minas Gerais States (Baumgratz 2014). As a result of its restricted area of occurrence, it is probably endangered; however, a paper including considerations on its geographic distribution patterns and conservation strategies is in preparation (Felipe Pinheiro, pers. comm.)

Phenology:—This species has been collected with flowers and fruits from November to May. Although a single experiment has verified the presence of nectar in flowers (Pinheiro 2013), no other study was conducted to confirm the occurrence of cleistogamy, seed dispersal or vegetative propagation.

Additional specimens examined:—BRAZIL. Rio de Janeiro: Resende, Parque Nacional do Itatiaia: Planalto, ao longo da trilha entre o abrigo Rebouças e o Pico das Agulhas Negras, 2430 m, 7 May 2009, *J.F. Baumgratz et. al.* 1141 (RB). Idem, trilha para Pedra Furada, às margens da trilha, 11 February 1990, *L. Sylvestre* 299 (RB). Idem, abrigo Rebouças, 30 December 1966, *H. E. Strang* 826 (MBM, NY). Idem, entre abrigo Masena e Macieira, 14 January 1961, *H. E. Strang* 246 (NY). Idem, 28 November 1952, *F. Markgraf & A.C. Brade* 21275 (RB). Idem, 28 November 1952, *C. Raben* 21275 (NY). Idem, Planalto, 21 February 1948, *A.C. Brade* 18900 (RB). Idem, Planalto, Pedra Assentada, 8 February 1945, *A.C. Brade* 17415 (RB). Idem, ribeirão das flores, 22 November 1938, *F. Markgraf* 3718 (RB). Idem, ribeirão das flores, 26 February 1936, *A.C. Brade* 15149 (RB). Idem, 2,300 m, 28 December 1934, *Pilger & Brade s.n.* (RB 29929). Idem, 2,000–2,300 m, 5 January 1929 *L. B. Smith* 1689 (NY, US). Idem, 2,000–2,300 m, 11 December 1928, *L. B. Smith* 1481 (NY, US). Idem, estrada de Registro para o Planalto, *s.d.*, *S.V. de Andrade* 612 (RB).

Acknowledgements

Marcus Felipe Oliveira da Silva acknowledges CAPES-JBRJ for the scholarship granted and Secretaria Estadual de Educação do Estado do Rio de Janeiro- SEEDUC-RJ for the license granted for his PhD studies; Paulo José Fernandes Guimarães thanks CNPq for financial support (REFLORA CNPq, grant 563541/2010-5). Fabián Armando Michelangeli research is partially supported by the National Science Foundation (NSF DEB-1343612 and DEB-1140409). The authors are also grateful to the staff of the herbaria visited; to the staff of the Herbarium Hamburgense for sending images of the types; to Natanael Nascimento for the line drawings; to Felipe Machado Pinheiro for sharing information not yet published; to Patricia da Rosa, Felipe Machado Pinheiro and Marco Octávio de Oliveira Pellegrini for the photographs; to Dr. Jeferson Prado, Dr. Jorge Fontella-Pereira and Dr. Marcelo Dias Machado Vianna-Filho for their valuable comments; to Cynthia Sothers for the English revision. We also greatly appreciate the critical comments from Renato Goldenberg and two anonymous reviewers.

Literature Cited

- Almeda, F. (2009) Melastomataceae. In: Davidse, G., Sousa-Sánchez, M., Knapp, S. & Chiang, F. (Eds.) *Flora Mesoamericana* 4(1): 164–338.
- Aublet, J.B.C.F. (1775) *Histoire des plantes de la Guiane Française* – Tome I. Didot, Libraire de la Faculté de Médecine, London, pp. 402–455.
- Baillon, H. (1877) Nouvelles observations sur les Melastomacées. In: Recueil d'observations botaniques. *Adansonia* 12: 70–97.
- Bartling, F.G. (1830) *Ordines naturales plantarum eorumque characteres et affinitates; adjecta generum enumeratione*. Dieterich, Göttingen, 498 pp.
- Baumgratz, J.F.A. (2014) *Itatiaia In: Lista de Espécies da Flora do Brasil*. Jardim Botânico do Rio de Janeiro. Available from: <http://floradobrasil.jbrj.gov.br/jabot/floradobrasil/FB9490>. (accessed 26 Mar. 2014).
- Bonpland, A. (1823) *Rhexies*. In: Humboldt, A. & Bonpland, A. (Eds.) *Voyage de Humboldt & Bonpland, Monographie de Melastomacées* 6(2): 1–158.
- Candolle, A.P. de (1828) Melastomaceae In: *Prodromus Systematis Naturalis Regni Vegetabilis, Sive Enumeratio Contracta Ordinum, Generum, Specierumque Plantarum Huic Usque Cognitarum, Juxta Methodi Naturalis Normas Digesta* 3: 99–202.
- Clausing, G. & Renner, S.S. (2001) Molecular phylogenetics of Melastomataceae and Memecylaceae: implications for character evolution. *American Journal of Botany* 88: 486–498.
<http://dx.doi.org/10.2307/2657114>
- Cogniaux, A.C. (1885) Melastomaceae. In: Martius, C.F.P., Eichler, A.G. & Urban, I. (Eds.) *Flora Brasiliensis*, vol. 14. Munich: Lipsiae, Frid. Fleischer, pp. 1–655.
- Cogniaux, A.C. (1891) Melastomaceae. In: De Candolle, A.L.P.P. & De Candolle, A.C.P. (Eds.) *Monographiae Phanerogamarum* 7. G. Masson, Paris, pp. 1–1256.
- Don, D. (1823) *Pleroma*. In: An Illustration of the natural family of plants called Melastomataceae. *Memoirs of the Wernerian Natural History Society* 4: 293–296.
- Fraga, C.N. & Guimarães, P.J.F. (2014) Two new species of *Pleroma* (Melastomataceae) from Espírito Santo, Brazil. *Phytotaxa* 166(1): 77–84.
<http://dx.doi.org/10.11646/phytotaxa.166.1.5>
- Guimarães, P.J.F. & Oliveira da Silva, M.F. (in press) *Aciotis, Acisanthera, Marcetia e Pterolepis* (Melastomeae-Melastomataceae) no Estado do Rio de Janeiro. *Rodriguésia*.
- Krasser, F. (1893) Melastomataceae. In: Engler, A. & Prantl, K. (Eds.) *Die Naturlinchen Pflanzenfamilien* 3(7): 130–199.
- McNeill, J., Barrie, F.R., Buck, W.R., Demoulin, V., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Marhold, K., Prado, J., Prud'homme Van Reine, W.F., Smith, J.F., Wiersema, J.H., Turland N.J. (2012) International Code of Nomenclature for algae, fungi, and plants (Melbourne Code): Adopted by the Eighteenth International Botanical Congress, Melbourne, Australia, July 2011. *Regnum Vegetabile* 154: 1–274.
- Michelangeli, F., Guimarães, P.J.F., Penneys, D.S., Almeda, F., & Kriebel, R. (2013) Phylogenetic relationships and distribution of new world Melastomeae (Melastomataceae). *Botanical Journal of the Linnean Society* 171: 38–60.
<http://dx.doi.org/10.1111/j.1095-8339.2012.01295.x>
- Naudin, C. (1850) XXXII. *Purpurella* In: Melastomatacearum. Quae in Musaeo parisiensi continentur. Monographicae descriptionis et secundum affinitates distributionis tentamen. (Sequentia). *Annales des Sciences Naturelles; Botanique* ser. 3: 301–302.

- Pinheiro, F.M. (2013) *Espécies raras e endêmicas de Melastomataceae no Estado do Rio de Janeiro: padrões de distribuição geográfica e estratégias de conservação*. Msc. Thesis. Escola Nacional de Botânica Tropical. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. 131 pp.
- Renner, S.S. (1993) Phylogeny and classification of the Melastomataceae and Memecylaceae. *Nordic Journal of Botany* 13: 519–540.
- Thiers, B. (2014) *Index herbariorum: a global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from <http://sweetgum.nybg.org/ih/>. (accessed 22 February 2014).
- Triana, J. (1871) Les Melastomatacées. *Transactions of the Linnean Society of London, Botany* 28(1): 1–188.
- Ule, E. (1895) Ueber die Blütheneinrichtungen von *Purpurella cleistoflora*, eine neuer Melastomacee. *Berichte der Deutschen Botanischen Gesellschaft* 13: 415–420.
- Ule, E. (1896) Weiteres zur Blütheneinrichtung von *Purpurella cleistopetala* und Verwandten. *Berichte der Deutschen Botanischen Gesellschaft* 14: 169–178.
- Ule, E. (1909) Beiträge zur Flora von Bahia. I. Unter Mitwirkung einiger Autoren. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* 42: 234–235.
- Wawra, H. (1882) Neue Pflanzenarten, gesammelt auf den Reizen der Prinzen von Sachsen-Coburg und beschrieben von Dr. H. Wawra. *Oesterreichische Botanische Zeitschrift* 32(2): 37–39.