

1 **Typification and reestablishment of the Linnaean name *Dalechampia***  
2 ***colorata* L. f. (Euphorbiaceae)**

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15  
16 Short title: *Dalechampia colorata* typification  
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48 **Abstract** Revisionary studies of *Dalechampia* sect. *Dalechampia* have revealed the  
 49 need to lectotypify *D. colorata* and that it represents a distinct species rather than a  
 50 synonym of *D. tiliifolia*. *Dalechampia karsteniana* is interpreted to be a synonym of *D.*  
 51 *colorata*.

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53 **Keywords** Dalechampiinae; Plukenetieae; nomenclature; taxonomy

54

## 55 ■ INTRODUCTION

56

57 *Dalechampia* L. is the only genus in subtribe Dalechampiinae (Plukenetieae,  
 58 Euphorbiaceae). The morphology of the inflorescences is unique in the Euphorbiaceae  
 59 as they are pseudanthial and each comprises two involucre bracts, a staminate  
 60 pleiochasium with four to almost 50 staminate flowers and 1–3 pistillate flowers (Pax &  
 61 Hoffman, 1919; Webster & Armbruster, 1991; Pereira-Silva & al., 2016). The genus is  
 62 pantropical and contains about 130 species, with a center of diversity in tropical South  
 63 America (Armbruster & al., 1993). Brazil hosts more than 70 species and is considered  
 64 the be the most species-rich area for the genus (Webster, 1994; Maya-Lastra & al.,  
 65 2015).

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67 Webster & Armbruster (1991) published the most recent systematic treatment of  
 68 neotropical *Dalechampia*. In that, work the authors proposed an infrageneric  
 69 classification that recognized six sections: *D. sect. Coriaceae* Pax & K. Hoffm., *D. sect.*  
 70 *Cremophyllum* Baill., *D. sect. Dalechampia*, *D. sect. Dioscoreifoliae* Pax & K. Hoffm.,  
 71 *D. sect. Rhopalostylis* Pax & K. Hoffm. and *D. sect. Tiliifoliae* G.L. Webster &  
 72 Armbruster (see also Armbruster, 1988). As part of research into *D. sect. Dalechampia*  
 73 carried out by the first author, all names were investigated and their typification  
 74 evaluated. During this process we discovered that *D. colorata*, which was described by  
 75 Linnaeus filius (1782) had not be typified. Here we present the typification of this name  
 76 and address its status as a distinct species rather than a synonym of *D. tiliifolia*. In  
 77 addition, *D. karsteniana* is interpreted as synonymous with *D. colorata*.

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## 78 MATERIALS AND METHODS

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80 This study was based on literature review, observations of specimens in the field,  
 81 analyses of approximately 70 specimens, including most types and historical collections  
 82 belonging to following herbaria (see Appendix): BHCB, EAC, ESA, G, HVASF, IPA,  
 83 INPA, K, LINN, P, PEUFR, SP, TEPB and UB (acronyms from Thiers 2017). We also  
 84 analyzed the contemporaneous illustrations associated with the *Mutis* expedition (image  
 85 available at

86

86 <http://www.rjb.csic.es/icones/mutis/paginas/laminadibujo.php?lamina=4650>).

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87 Morphological data were obtained from observations of dried material under a

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88 stereomicroscope (Leica EZ4), as well as from flowers and fruits fixed in alcohol.

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89 Descriptive terminology follows Webster & Armbruster (1991).

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### 91 **Typification of *Dalechampia colorata***

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93 Linnaeus (1753) described *Dalechampia* for a single species, *D. scandens*, that had  
 94 been collected in Martinique. Later, Linnaeus filius (1782) described *D. colorata* based  
 95 on an unnumbered José Celestino Mutis specimen collected in Colombia. In the

96 protologue, Linnaeus filius (1782, p. 421) characterized *D. colorata* with a short  
 97 diagnosis “DALECHAMPIA foliis integerrimis”, “Similis *D. scandenti*, sed folia  
 98 quidem triloba, verum integerrima, minusque profund divisa, nec serrata” and  
 99 “Involucrum magis oblongum, petalodes f. coloratum, nee basi cordatum aut viride”  
 100 (DALECHAMPIA "entire leaves, like *D. scandens*, but leaves are indeed 3-lobed,  
 101 entire, and less divided or serrate" and "the involuclal bracts more oblong, petaloid,  
 102 colored, not with cordate base or green"). In addition, the locality cited was *Nova*  
 103 *Granada*, which likely corresponds to modern Colombia, as Mutis was based in Bogotá  
 104 (Mendoza, 1909).

105 According to Linnaeus filius (1782), *Dalechampia colorata* was similar to *D.*  
 106 *scandens* and characterized by three lobed leaves and three lobed involuclal bracts.  
 107 However, Webster & Armbruster (1991) reduced *D. colorata* into synonymy with *D.*  
 108 *tiliifolia* Lam., which was included in *D.* sect. *Tiliifoliae*. The latter section is  
 109 circumscribed to comprise species with simple, chartaceous leaves that are either lobed  
 110 or unlobed, involuclal bracts over one cm long, staminate involucels that are two-  
 111 lipped, with four lobes (3+1) and connate at the base, resiniferous bractlets that are  
 112 lacerate or distally toothed, 8–12 staminate flowers, and styles that have a distinctly  
 113 dilated tip (Webster & Armbruster, 1991). More recently however, Govaerts & al.  
 114 (2016) have treated *D. colorata* as a synonym of *D. scandens*, probably due to  
 115 superficial similarities including the three lobed leaves and three lobed involuclal bracts  
 116 previously noted by Linnaeus filius (1782), the synonymy published by Pax & Hoffman  
 117 (1919), and taxonomic notes on the Mutis specimen published by Blanco Fernández de  
 118 Caleyá & del Valle Stervinou (2009).

119 Webster & Armbruster (1991) cited a specimen collected by Mutis (*Mutis 4128*) at  
 120 US (US00096457) as belonging to the type collection of *Dalechampia colorata*. The US  
 121 specimen is labelled *D. colorata* and was apparently collected in the correct geographic  
 122 region. In the Real Jardín Botánico (MA), which houses the largest part of *Mutis*'s  
 123 collection from the Royal Botanic Expedition of the “Virreinato de Nueva Granada  
 124 (Colombia, Ecuador and Venezuela)”  
 125 (<http://www.rjb.csic.es/jardinbotanico/jardin/index.php?Cab=109&SubCab=187&len=es&Pag=195#mutis>), there are also two specimens. These bear the inscription mentioned  
 126 in the protologue of *D. colorata* (e.g. indicating that the specimens were collected  
 127 during the same expedition in Nueva Granada by Mutis). Both the specimens at MA and  
 128 the specimen at US however, do not match the original description (see Table 1).  
 129 Specifically they conflict the protologue of *D. tiliifolia* in having entire to moderately 3-  
 130 dentate involuclal bracts and vellutinous indument. Given the conflict with the  
 131 protologue, these specimens cannot serve as the type and in fact, they correspond to *D.*  
 132 *tiliifolia*.  
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134 As part of our search for additional original material we located an unnumbered  
 135 Mutis collection from Nova Granada that is morphologically compatible with  
 136 protologue of *Dalechampia colorata* in the Linnaean Herbarium (LINN). This material  
 137 comprises two sheets labelled probably by Linnaeus filius “*Dalechampia colorata*”  
 138 (LINN 1138–1 and LINN 1138–2), and both have a narrowly triangular involuclal  
 139 stipule. One of the specimens (LINN 1138–2) bares the handwritten number 41; this  
 140 number was not mentioned in the protologue and it is not clear whether was added later  
 141 by a curator or researcher. Here we select LINN 1138–2 as the lectotype because it  
 142 includes reproductive material, and perfectly matches the original description of the

143 taxon in having three-lobed leaves, and three-lobed and oblong involucral bracts, that  
 144 are magenta not with cordate base.

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146 **Taxonomic Status of *Dalechampia colorata***

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148 Based on our examination of the the lectotype of *Dalechampia colorata* it  
 149 represents a species morphologically distinct from both *D. scandens* and *D. tiliifolia*.  
 150 *Dalechampia colorata* is characterized by three-lobed leaves, a narrowly triangular  
 151 bracteal stipule, magenta involucral bracts, a four and free staminate involucel, pink  
 152 staminate sepals, a peltate stigma, six laciniate pistillate sepals with three lobes,  
 153 bractlets of resiniferous glands that are deeply fimbriate and a velutinous ovary. In  
 154 Colombia, this species is popular known as “Flor de mariposa” or “Butterfly flower”  
 155 (Pax & Hoffmann, 1919). A tabular summary of the differences between the species and  
 156 the taxa with which has previously been considered a synonym is presented in Table 1.

157 *Dalechampia colorata*, *D. scandens* and *D. tiliifolia* all have three-lobed leaves (*D.*  
 158 *tiliifolia* can vary from three-lobed to entire leaves on the same specimen) and green  
 159 stigmas. However, *D. colorata* differs from the other two species in multiple  
 160 morphological aspects such as the color, shape of the bracts, number of the main veins  
 161 and surface texture of the involucral bracts. The pseudanthium of *D. colorata* is  
 162 magenta (vs. cream-colored in *D. scandens* and pale greenish in *D. tiliifolia*). Its  
 163 involucral stipules are narrowly triangular (vs. lanceolate in *D. scandens*, and linear in  
 164 *D. tiliifolia*). The number of the main veins at the bract base is seven in *D. colorata* (vs.  
 165 five in *D. scandens* and seven to eight in *D. tiliifolia*). The involucral bracts of *D.*  
 166 *colorata* have the surface glabrous and sparsely pubescent on the veins, while in *D.*  
 167 *scandens* is villous and in *D. tiliifolia* it is velutinous. *Dalechampia colorata* have four  
 168 separated staminate involucellar bracts. However, *D. scandens* and *D. tiliifolia* have  
 169 connate and 2-lipped staminate involucellar bracts. Another difference when we  
 170 comparing the staminate flowers of the three species refers to the sepals colour.  
 171 *Dalechampia scandens* and *D. tiliifolia* present pale green sepals while in *D. colorata* it  
 172 is pink. Considering the pistillate flowers, *D. colorata* is distinguished from the other  
 173 two species by the shape of stigma, number and margin of the sepals, and presence of  
 174 glandular trichomes. *Dalechampia colorata* have peltate stigma (vs. moderately  
 175 crateriform in *D. scandens* and crateriform to discoid in *D. tiliifolia*), six pistillate sepals  
 176 (vs. 8–12 in *D. scandens* and 10–12 in *D. tiliifolia*) that are 3–5 parted and laciniate, and  
 177 glandular trichomes in pistillate sepals are absent (vs. present in *D. scandens* and *D.*  
 178 *tiliifolia*). Finally, the ovary of *D. colorata* is velutinous (vs. pubescent in *D. scandens*  
 179 and hispid-hirsute in *D. tiliifolia*) (see Table 1). Additionally, *D. colorata* may be  
 180 distinguished from the other two species by different times of bract abscission.

181 *Dalechampia colorata* bracts are early-deciduous (prior to fruit development) as  
 182 opposed to late-deciduous (after fruit development) in both *D. scandens* and *D. tiliifolia*.

183 Once we recognized that the lectotype of *Dalechampia colorata* represented a  
 184 distinct species, we carried out a search of the accepted species of *Dalechampia* to  
 185 determine whether it matched any currently recognized taxon. Our search revealed that  
 186 the lectotype was conspecific with type of *D. karsteniana* Pax & Hoffm. Both types  
 187 have narrowly triangular bracteal stipules, green and peltate stigmas, six pistillate  
 188 sepals, velutinous ovaries, pink staminate sepals, four free staminate bracts, and deeply  
 189 fimbriate bractlets in the resiniferous gland. As *D. karsteniana* is a much younger name,  
 190 it is treated as a junior synonym of *D. colorata* here. Below we typify *D. colorata*, place

191 *D. karsteniana* in synonymy and provide a description of *D. colorata* based on the  
 192 specimens examined (Appendix).

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194 ***Dalechampia colorata*** L. f. Suppl. Pl. 421. 1782 – **Lectotype (designated here):**  
 195 Colombia, Nova Granada. *J.C. Mutis s.n.* (LINN 1138-2!; isolectotype LINN 1138-1!).  
 196 — Figure 1.

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198 = *Dalechampia karsteniana* Pax & K. Hoffm. in Engler, Pflanzenr. 4. 147 XII (Heft  
 199 68): 30. 1919 – Lectotype (designated by Webster & Armbruster 1991: 155): Colombia,  
 200 Bogota, Nueva Granada, between Mesa and Magdalena, 800 m, 1851–1857, *J. Triana*  
 201 3557 (P 00587443!); isolectotypes (G 00237307!, K!). **syn. nov.**

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203 Description. – Twining vines, branches villous. Leaves alternate, simple, 3-lobed,  
 204 membranacea to chartaceous; petiole 2–2.5 cm long, densely pubescent; petiolar stipule  
 205 3–5 × 1 cm, lance-ovate, base truncate, margin entire, glabrescent, associate to glands at  
 206 base. Lobes of the leaves 6.5–10 × 5.5–8 cm, ovate to elliptical, base cordate, apex  
 207 acute, margin entire to slightly sinuate, adaxial surface hispid and abaxial surface  
 208 pubescent, sparsely glandular trichomes, primary veins 5; stipels 2–3 × 0.5 mm, linear,  
 209 pubescent, associated with glands at the base and one glandular trichome at the apex.  
 210 Pseudanthium, axillary, 5–9 cm long; peduncle ca. 7 cm long, villous, involucre bracts  
 211 4–4.5 cm long, 3-lobed, rarely 4 to unlobed, magenta, base slightly attenuate to  
 212 rounded, lobes with apex acute, margin sinuate to entire, glabrous and sparsely  
 213 pubescent on the veins, stipitate glandular trichomes absent, primary veins 7; involucre  
 214 stipule at base of bract 8–10 × 3 mm, narrowly triangular, base truncate, apex acute,  
 215 margin entire, ciliate, adaxial and abaxial glabrescent surfaces. Staminate pleiochasium  
 216 of 4 free bracts, decussate and concave, with ca. 6 flowers, sessile; staminate bracts very  
 217 widely ovate, 5–7 × 5–7 mm, glabrescent, margin ciliate; gland composed of numerous  
 218 resiniferous bractlets, 3–4 × 1–2 mm, margin deeply fimbriate. Staminate flowers 2–3  
 219 mm long; sepals 4, lanceolate, ca. 2 × 2 mm, pink; stamens 27–35. Pistillate cymule 3-  
 220 flowered, sessile; pistillate bracteole 1, depressed ovate, ca. 5 × 8 mm, entire,  
 221 moderately ciliate. Pistillate flowers 4–9 mm long, sessile; sepals ca. 6, 1–2 × 1 mm, 3-  
 222 5 parted and lacinate velutinous, stipitate glandular trichomes absent; ovary ca. 2 × 2  
 223 mm, velutinous, stylar column 4–9 × 0.5 mm, stigma peltate, green. Fruit a capsule, 4-  
 224 10 × 6–10 mm, 3-lobed, dark brown, velutinous, sepals accrescent, 3–7 mm long. Seeds  
 225 not seen.

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**Table 1.** Comparison of the type of *D. colorata* to *D. karsteniana* and species with which *D. colorata* has been treated as synonymous.

Morphological character	<i>D. colorata</i>	<i>D. karsteniana</i>	<i>D. scandens</i>	<i>D. tiliifolia</i>
Shape of leaves	Exclusively 3-lobed	Exclusively 3-lobed	Exclusively 3-lobed	Entire to 3-lobed
Dimensions of involucreal stipules	8–10 × 3 mm	7–1.7 × 3–4 mm	4–7 × 1–2 mm	3.5–4 × 1.5–1.7 mm
Shape of bracteal stipule	Narrowly triangular	Narrowly triangular	Lanceolate	Linear
Shape of involucreal bracts	3-lobed, rarely 4 to unlobed,	Shallowly 3-lobed to unlobed	3-lobed	Entire to moderately 3-dentate
Color of involucreal bracts	Magenta	Magenta	Cream-colored	Pale greenish
Timing of bract abscission	Early	Early	Late	Late
Staminate involucreal (bracts)	4 free	4 free	2-lipped	2-lipped (2+3 lobes)
Color of staminate sepals	Pink	Pink	Pale green	Pale Green
Shape of stigma	Peltate	Peltate	Moderately crateriform	Crateriform to discoid
Stigma color	Green	Green	Green	Green
Shape of pistillate sepals	Laciniate (3 lobes)	Laciniate (3–5 lobes)	Pinnatifid	Pinnatifid
Number of pistillate sepals	6	6	8–12	10–12
Glandular trichomes in pistillate sepals	Absent	Absent	Present	Present

Bractlets of resiniferous glands	Deeply fimbriate	Deeply fimbriate	Entire and laminar	Shallowly laciniate
Ovary indument	Velutinous	Velutinous	Pubescent	Hispid-hirsute

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282 **Fig. 1.** *Dalechampia colorata* L. f. **A**, Habit; **B**, Petiolar stipules; **C**, Foliar stipels; **D**,  
283 Involucral stipule at base of the bract; **E**, Pseudanthium with entire involucral bracts; **F**,  
284 Pseudanthium with 3-lobed involucral bracts; **G**, Detail of staminate and pistillate  
285 cymules; **H**, Pistillate flower with peltate stylar tips; **I**, 3-fids pistillate sepals; **J**, 5-fids  
286 pistillate sepals; **K**, Fruit with persistent style and sepals; **L**, Fragment of resiniferous  
287 bractlets (**A-I**, Tracey 463, K; **J-L**, E. André, 1797, K).

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330 **Appendix.** Voucher informations for the species used in this study.

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 Taxon name, country and/or locality, collector(s), collection number and herbarium
 

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*Dalechampia colorata* L. f., Colombia, Cundinamarca, Mrs. Tracey 463 (K); without local, E. André 1797 (K); *Dalechampia tiliifolia* Lam., French Guiana without collector 201 (K); Peru, J. Jussieu s.n (P00674013); Brazil, Acre, W. A. Rodrigues s.n (INPA); Rio Branco, M. Almeida & L. Lima s.n (INPA); Ilha do Amapá, R. C. Oliveira & al. 1752 (UB); Amazonas, Manaus, G. T. Prance & al s.n (INPA); Ceará, Ubajara, A. Fernandes & P. Gibbs s.n (EAC); Crato, A. Fernandes & E. Nunes s.n (EAC); Maranhão, E. Nunes & P. Martins s.n (EAC). Loreto, G. Eiten & L. T. Eiten 10657 (K); Chapadinha, E. Nunes & Castro, A. J. s.n (EAC). Espírito Santo, J. C. Lopes & al. 201 (ESA); Goiás, M. L. Fonseca & al. 2418 (SP); Mato Grosso, G. F. Árbocz & N. M. Ivanauska 3982 (ESA); Juara-Alta Floresta, M. Macedo & S. Assumpção s.n (BHCB); Mato Grosso, J. Ratter & al. 1861 (UB); Rio Areões, J. A. Ratter & J. F. Filho 3399 (K). Pará, I. L. Amaral & al. 1128 (UB, K); Serra dos Carajás, C. R. Sperling & al. 5819 (K); Pernambuco, E. P. Heringer & al. 1005 (IPA); Piauí, F. C. Silva 17 (K). Rio de Janeiro, M. Glaziou 11536 (K); Roraima, L. O. A. Teixeira & al. 511 (INPA); Boa Vista, B. L. Stannard & M. G. M. Arrais 643 (K); Rondônia, C. A. Cid & al. 4300 (K); Without local, G. Gardner s.n. (K). Without local, Gardner s.n. (K). *Dalechampia scandens* L. Brazil, Amazonas, without collector s.n (INPA 1546A); Manaus, W. A. Rodrigues s.n (INPA); Bahia, I. Cordeiro 4768 (TEPB); Barra, L. P. Queiroz 4768 (TEPB); Ceará, D. Araújo & J. T. B. Jorge 1389 (HVASF); General Sampaio-RPPN Francly Nunes, M. F. Moro & al. 99 (EAC); Caridade, A. Fernandes s.n (EAC); Santa Quitéria, J. Paula-Souza 11123 (ESA); Mato Grosso, J.A. Lombardi & A. Salino 1677 (BHCB); Juruena, V. C. Souza & al. 18722 (ESA); Minas Gerais, H. S. Irwin & al. 23195 (K); Januária, J. A. Lombardi & A. Salino 1677 (BHCB). São Paulo, V. B. Zipparro 2504 (BHCB); Eldorado, A. Oriani & al. 580 (ESA). Pará, T. M. S. 7 (INPA); Pernambuco, Caruaru, A. M. S. Reis & al. 26 (PEUFR); Itamaracá, R. A. Pereira-Silva & L. Lima-Santos 5 (PEUFR);

Moreno, *M. J. Silva* 27 (PEUFR); Ouricuri, *V. C. Lima* 50 (PEUFR, IPA); Pesqueira, *M. Correia, G.M. Souza & I. Andrade* 194 (PEUFR); Petrolândia, *M. J. Silva* 507 (PEUFR); São Vicente Férrer, *M. A. F. Lucena & M. Oliveira* 65 (PEUFR); Serrambi, *Santos & Souza* 60 (PEUFR); Tamandaré, *J. R. R. Cantarelli & al.* 258 (PEUFR); Salgueiro, *J. R. Maciel & al.* 1261 (HVASF); Roraima, *J. A. Ratter & al.* 5392 (K); Rio de Janeiro, *Glaziou* 13191 (K). Without local, *Thomas* 720 (G). Von Santo Domingo, *Provincia Barahona, P. Fuertes* 266 (G).

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