

ON THE UNIFICATION OF *LAPLACEA* AND *GORDONIA* (THEACEAE)

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SUMMARY

Laplacea Kunth and *Gordonia* Ellis, generally treated as two separate genera, are not distinct and therefore do not merit full generic status.

Kobuski (1950), in his treatment of the Central and South American species of *Laplacea* Kunth (Theaceae — Theoideae), considered that this genus was represented by about 10 species in the Malayan and Indonesian region, but his promised treatment of these species never eventuated. Most authors have considered the two genera, *Laplacea* and *Gordonia* Ellis, to be distinct (e.g., Melchior 1925, Kobuski 1950, Backer & Bakhuizen f. 1963), but Burkill (1917), in a preliminary study of the genus *Gordonia*, listed all the species of *Haemocharis* Salisb. ex Mart. & Zucc. (synonymous with *Laplacea*) as probably belonging to *Gordonia*, although he did not formally recombine them. Sealy (1958) also considered that the two genera were probably inseparable. In preparing an account of the Theaceae for the 'Tree Flora of Malaya' (Keng 1978) and for the 'Flora Malesiana', study of the literature and of the specimens available convinced me that *Laplacea* was in fact inseparable from *Gordonia*.

For the purpose of discussion, two main series of evolutionary trends in the flowers of subfamily Theoideae (or Camellioideae, Keng 1962) of Theaceae, can be traced:

Series I. From a flower with a large number of 'bracteoles' (perules) gradually increasing in size and passing into the sepals, which in turn, by degrees, increase in size and change in texture and colour and pass into petals (Fig. 1, type A), to flower with three clearly differentiated and definitely numbered appendicular parts: 2 'bracteoles', 5 sepals and 5 petals (Fig. 1, type B).

Series II. From a flower with 5 totally free, slender styles (Fig. 1, type C), to one with a style base and 5 branches, and finally to one with a single stout style which has a shallowly 5-lobed stigma (Fig. 1, type D).

In addition to these two, other plausible trends include the following:

(a) From a flower with free stamens to one with various degrees of fusion of its filaments or to another with different grades of adnation of its filaments to the corolla.

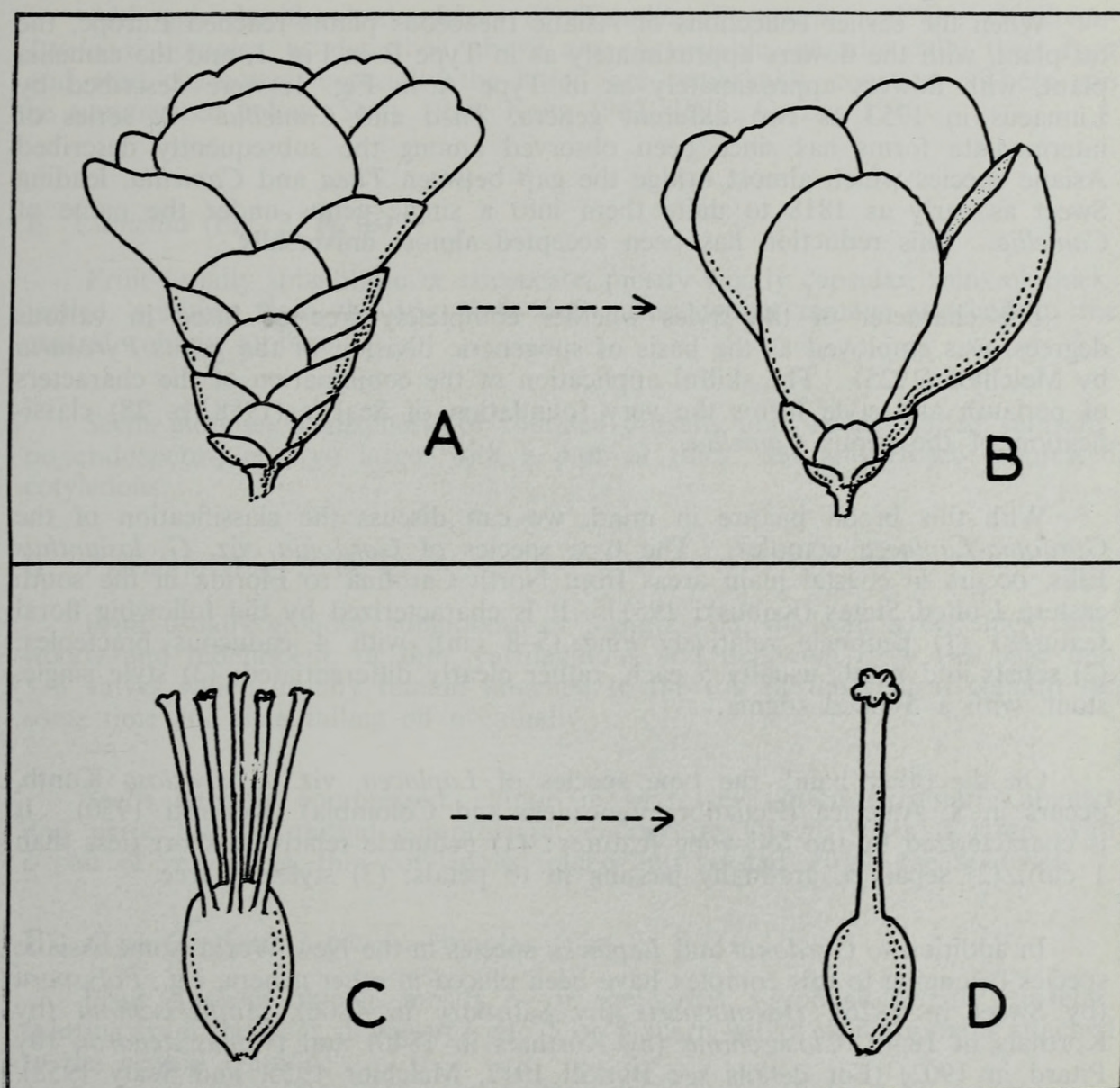


Fig. 1. Diagrammatic representation of two series of evolutionary trends in the Theaceae-Theoideae, showing four basic types of flowers: A. With successive but not clearly differentiated appendicular parts; B. With clearly differentiated appendicular parts: 2 bracteoles, 5 sepals and 5 petals; C. With 5 free styles; D. With a single style which is a complete fusion of 5 units. Intermediate stages between A & B, and between C & D are omitted.

(b) Progressive reduction of the number of ovary locules (from 5 to 3) and of the number of ovules (from several to 2) in each locule.

(c) Progressive reduction of the length of peduncles.

A full range of variation, from presumably the extremely basic form to the highly modified form, and also almost every possible combination of these varied features, can be found in the flowers of different species of *Camellia* (cf. Sealy 1958), and to a lesser extent, in those of *Pyrenaria* (Keng 1981); both genera, like the *Gordonia-Laplacea* complex, belonging to subfamily Theoideae of the Theaceae.

When the earlier collections of Asiatic theaceous plants reached Europe, the tea-plant, with the flowers approximately as in Type B in Fig. 1, and the camellia plant, with flowers approximately as in Type A in Fig. 1, were described by Linnaeus in 1753 as two different genera, *Thea* and *Camellia*. A series of intermediate forms has since been observed among the subsequently described Asiatic species which almost bridge the gap between *Thea* and *Camellia*, leading Sweet as early as 1818 to unite them into a single genus under the name of *Camellia*. This reduction has been accepted almost universally.

The character of the styles whether completely free or fused in various degrees, was employed as the basis of subgeneric division of the genus *Pyrenaria* by Melchior (1925). The skilful application of the combination of the characters of perianth and style forms the very foundation of Sealy's (1958, p. 28) classification of the genus *Camellia*.

With this broad picture in mind, we can discuss the classification of the *Gordonia-Laplacea* complex. The type species of *Gordonia*, viz. *G. lasianthus* Ellis, occurs in coastal plain areas from North Carolina to Florida in the south eastern United States (Kobuski 1951). It is characterized by the following floral features: (1) peduncle relatively long (5–8 cm), with 4 caducous bracteoles; (2) sepals and petals usually 5 each, rather clearly differentiated; (3) style single, stout, with a 5-lobed stigma.

On the other hand, the type species of *Laplacea*, viz. *L. speciosa* Kunth, occurs in S. America (Ecuador, Venezuela and Colombia) (Kobuski 1950). It is characterized by the following features: (1) peduncle relatively short (less than 1 cm); (2) sepals 5, gradually passing in to petals; (3) styles 5, free.

In addition to *Gordonia* and *Laplacea* species in the New World, some Asiatic species belonging to this complex have been placed in other genera, e.g., *Polyspora* (by Sweet in 1826), *Haemocharis* (by Salisbury in 1806), *Antheeischima* (by Korthals in 1840), *Closaschima* (by Korthals in 1840) and *Nabiasodendron* (by Pitard in 1902) (For details see Burkill 1917, Melchior 1925, and Sealy 1958). Among numerous rather confusing binomials, "*Polyspora*" *axillaris* (Roxb. ex. Ker) Sweet and "*Haemocharis*" *integerrima* (Miq. Koord. & Val. single out as examples. The former species was originally described from cultivated plants in India, its native home as later studies revealed, is S. China and Hong Kong. It is characterized by the following: (1) peduncle subsessile; (2) bracteoles (perules) gradually passing into sepals, about 10 in all; (3) petals 5 or 6; (4) style single, stout, shallowly 5-lobed at summit. The latter species was described from Java, although the floral structure in general agrees with the former species, the five distinct styles are almost totally free at the base.

Thus the floral structure of the four above-mentioned taxa, approximate the following combinations of the four basic types in Figure 1.

<i>Gordonia</i>	BD
<i>Laplacea</i>	BC
" <i>Polyspora</i> "	AD
" <i>Haemocharis</i> "	AC

Although the floral characters of *Camellia*, *Pyrenaria* and the *Gordonia-Laplacea* complex as described above are so variable, paradoxically their fruit and seed characters, especially the latter, are remarkably constant. These can be summarized below (Sealy 1958; Keng 1962, 1972; Corner 1976).

I. *Camellia* (Fig. 2, A, B)

Fruit usually subglobose or tricoccate, mostly woody capsular, thin- or thick-walled, splitting from the apex into 3–5 valves which remain attached to the central column at base.

Seeds globose, hemispheric or rounded dorsally and wedge-shaped ventrally, no endosperm; embryo large, with a pair of thick, flat and closely adpressed cotyledons.

II. *Pyrenaria* (Fig. 2, D, E)

Fruit usually globose, subglobose or 3–5-grooved, the wall either thick, soft-woody and indehiscent, or thin, cartilaginous and dehiscing from the base into 3–5 valves which usually remain attached to the top of the central column for some time and then falling off eventually.

Seeds laterally compressed, elliptic in side view, often irregularly angular and plane due to mutual compression; endosperm absent; embryo large, with a pair of very large, thin cotyledons folded and twisted within the seedcoat.

III. The *Gordonia-Laplacea* complex (Fig. 2, G, H)

Fruit ellipsoid oblong, mostly 5- or sometimes 3-grooved, woody capsular, splitting from the apex downward into 5 or 3 sharp valves which remain attached to the central column.

Seeds relatively small, ellipsoid, flattened, with a large obliquely attached apical wing; endosperm of a thin layer; embryo fairly large, slightly curved; cotyledons lanceolate, flat and closely adpressed.

Furthermore, although the seedling characters of only very few species were examined (Burkill 1917, Keng 1962, 1972, Burger 1972), they appear to be vastly different among these three taxa. For example in *Camellia sinensis* O.K., the two large hemispheric cotyledons essentially retain within the seedcoat serving as food reservoirs, and remain underground; after the epicotyl emerges from the soil, 3–5 cataphylls are produced, followed by larger, petiolate foliage leaves (Keng 1962) (Fig. 2, C). In *Pyrenaria acuminata* Planch., the two huge, laminate cotyledons which were folded and twisted within the seedcoat, emerge and expand to full size (ca. 2.5 x 3.5 cm) and function instantly as photosynthetic organs (Keng 1972) (Fig. 2, F). Whereas in *Gordonia singaporeana* Wall. ex Ridl., the two tiny, oblong cotyledons, after emerging from the soil, expand to full size (ca. 0.2 x 1 cm) and function as photosynthetic organs until the foliage leaves are established. (Burkill 1917) (Fig. 2, I)

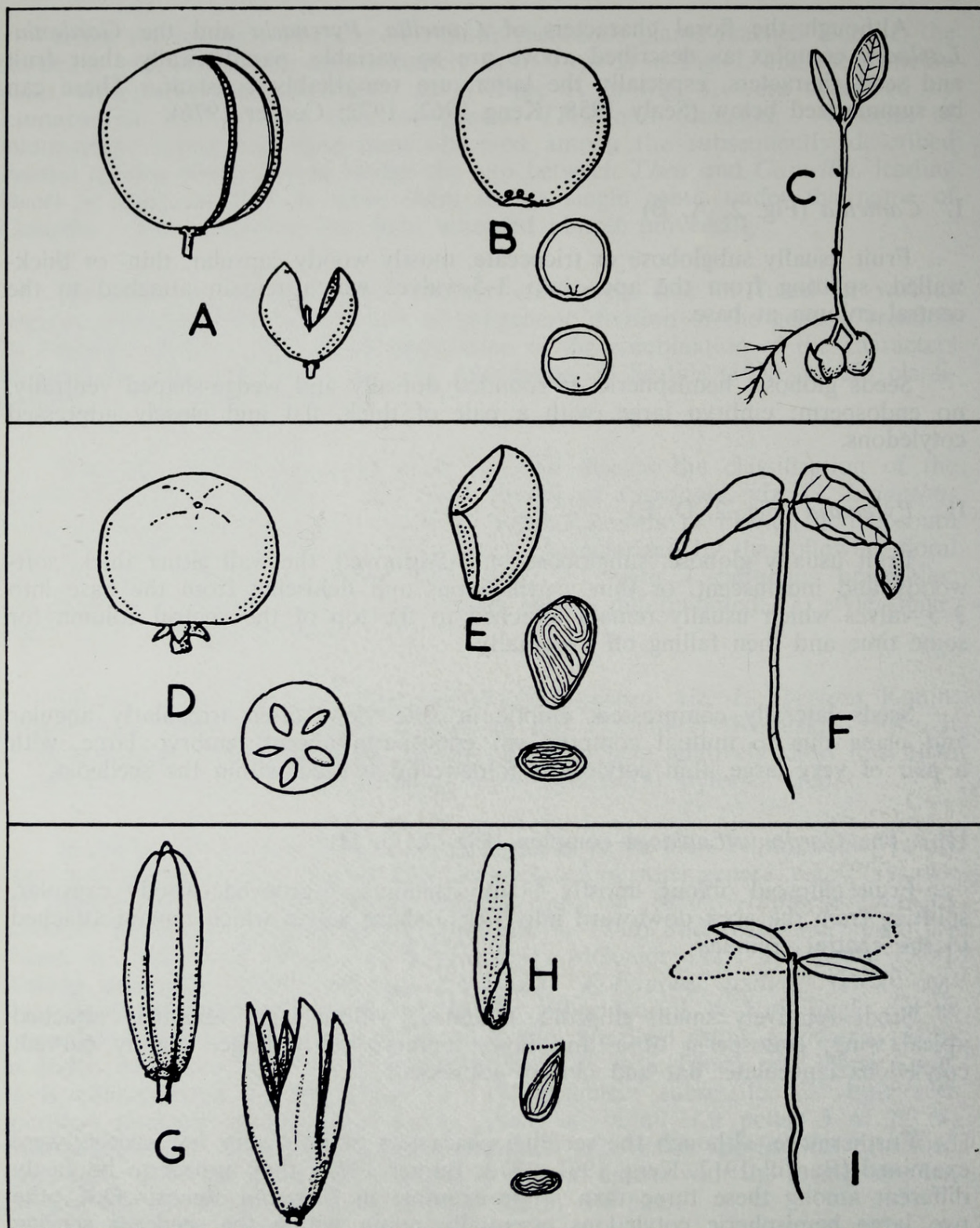


Fig. 2. Fruits, seeds, and seedlings of *Camellia sinensis* O.K. (A, B, C), *Pyrenaria acuminata* Planch. (D, E, F), and *Gordonia singaporeana* Wall. ex Ridl. (G, H, I).

A. Spheric, dehiscent capsule, with a large seed inside; B. Exalbuminous seed, the embryo with a pair of hemispherical cotyledons; C. Seedling; the thick cotyledons serving as food reservoir for early stage of seedling development.

D. Subglobose, indehiscent, soft-woody, drupaceous capsule, with 1, 2 or several seeds in each of the 5 chambers; E. Exalbuminous seed, the embryo with a pair of extremely large thin cotyledons clasped and irregularly plaited within the seed coat; F. The cotyledons unfolded and spread from the seed coat, photosynthesizing during the early stages of seedling development.

G. Cylindrical capsule, dehiscing by 5 valves; H. Winged, scantily endospermous seed, the embryo with a pair of thin, narrow and slightly undulating cotyledons; I. The cotyledons emerging from the seed coat, photosynthetic. (A, B, C from Keng 1962; D, E, F based on Keng 1972; G, H, I based on Burkill 1917).

Since the floral characters of the *Gordonia-Laplacea* complex, as in *Camellia* and *Pyrenaria* of the same subfamily are so variable whilst their fruit and seed characters are uniform, it seems more logical and appropriate to treat this complex as a single genus rather than to split it into two, three or more genera with largely overlapping characters. In this sense, the geographical range of *Gordonia* (*sensu lato*) will cover both subtropical and tropical regions of S.E. Asia, N. America, and C. & S. America., and be closely comparable to that of *Cleyera* and *Ternstroemia* (Keng 1962, pp. 351-3) of Theaceae, and to that of numerous amphi-transpacific genera of various families as enumerated by Steenis (1962).

For the reasons given above, the present writer therefore formally proposes to merge *Laplacea* HBK with *Gordonia* Ellis, and to reduce the known species of *Laplacea* to *Gordonia*.

Gordonia Ellis in Phil. Transact. 60 (1770) 518, t. 11. *nom cons.*

Laplacea Humboldt, Bonpland and Kunth, Nov. Gen. Pl. 5 (1822) 160 (ed. folio, 207), t. 461; DC. Prodr. 1 (1824) 527; Benth. & Hook. f. Gen. Pl. 1 (1862) 186; Melchior in E. & P. Nat. Pflanzenfam. ed. 2, 21 (1925) 135; Kobuski in J. Arnold Arb. 28 (1947) 435, 30 (1949) 167, 31 (1950) 406. *syn. nov.*

The ten Malesian species which were formerly described under *Laplacea* (or *Haemocharis*) as enumerated by Burkill (1919) and Melchior (1925) will be treated and incorporated into the following account: "Flora Malesianae Praecursores LVIII, part 2, The genus *Gordonia* in Malesia."

The following West Indian species were formerly included in Kobuski's (1949) revision of *Laplacea*.

Gordonia alpestris (Krug & Urban) H. Keng, comb. nov.

Haemocharis alpestris Krug & Urban in Bot. Jahrb. 21 (1896) 547.

Haiti.

Gordonia angustifolia (Brit. & Wils.) H. Keng, comb. nov.

Haemocharis angustifolia Britton & Wilson in Bull. Torrey Bot. Cl. 50 (1923) 43.

Cuba.

Gordonia benitoensis (Brit. & Wils.) H. Keng, comb. nov.

Haemocharis benitoensis Britton & Wilson in Mem. Torrey Bot. Cl. 16 (1920) 82.

Cuba.

Gordonia curtyana (A. Rich.) H. Keng, comb. nov.

Laplacea curtyana A. Richard, Ess. Fl. Cuba 1 (1845) 225.

Cuba.

Gordonia ekmanii (Schmidt) H. Keng, comb. nov.

Laplacea ekmani O.C. Schmidt in Fedde, Rep. Sp. Nov. Reg. Veg. 22 (1925) 94.

Cuba.

Gordonia haemotoxylon Swartz, Fl. nd. Occ. 2 (1800) 1199.

Jamaica.

Gordonia moaensis (Marie-Vict.) H. Keng, comb. nov.

Laplacea moaensis Marie-Victorin in Contr. Inst. Bot. Univ. Montreal 49 (1944) 72.

Cuba.

Gordonia portoricensis (Krug & Urban) H. Keng, comb. nov.

Haemocharis portoricensis Krug & Urban in Bot. Jahrb. 21 (1896) 548.

Porto Rico.

Gordonia urbanii (O.C. Schmidt) H. Keng, comb. nov.

Laplacea urbanii O.C. Schmidt in Fedde, Rep. Sp. Nov. Reg. Veg. 22 (1925) 93.

Cuba.

Gordonia villosa Macfadyen, Fl. Jamaica 1 (1837) 117.

Jamaica.

Gordonia samuelssonii (O.C. Schmidt) H. Keng, comb. nov.

Laplacea samuelssonii O.C. Schmidt in Fedde, Rep. Sp. Nov. Reg. Veg. 29 (1931) 16.

Haiti.

Gordonia wrightii (Griseb.) H. Keng, comb. nov.

Laplacea wrightii Grisebach in Mem. Amer. Acad. n.s. 8 (1860) 166.

Cuba.

The following Central and South American species were included in Kobuski's (1950) revision of *Laplacea*.

Gordonia acutifolia (Wawra) H. Keng, comb. nov.

Haemocharis semiserrata (Nees) Cambessedes var. *acutifolia* Wawra in Martius, Fl. Bras. 12 (1886) 290.

Brazil.

Gordonia brandegeei H. Keng, nom. nov.

Laplacea grandis T.S. Brandege in Univ. Calif. Publ. Bot. 6 (1915) 186. (non *Gordonia grandis* Andre 1880).

Mexico, Costa Rica, Guatemala, Panama, Honduras (?).

Gordonia fruticosa (Schrad.) H. Keng

Wikstroemia fruticosa Schrader in Gotting. Gel. Anzeig. 1821 (71) (May 5, 1821) 711..

Laplacea fruticosa (Schrad.) Kobuski in J. Arnold Arb. 28 (1947) 437.

Brazil, Peru, Venezuela, Guiana, Panama, Costa Rica.

Gordonia humboldtii H. Keng, nom. nov.

Laplacea speciosa HBK. Nov. Gen. & Sp. 5 (1822) 209, t. 461 (non *Gordonia speciosa* Choisy 1855).

Ecuador, Venezuela.

Gordonia obovata (Wawra) H. Keng, comb. nov.

Laplacea semiserrata (Nees) Camberssedes var. *obovata* Wawra in Marius, Fl. Braz. 12 (1886) 290.

Brazil.

Gordonia planchonii H. Keng, nom. nov.

Laplacea pubescens Planchon & Linden ex Triana & Planchon in Ann. Sci. Nat. ser. 4, 18 (1862) 269. (non *Gordonia pubescens* Cavanilles 1787).

Colombia, Bolivia, Peru.

Gordonia robusta (Kobuski) H. Keng, comb. nov.

Laplacea robusta Kobuski in J. Arnold Arb. 31 (1950) 415.

Colombia.

Gordonia spathulata (Kobuski) H. Keng, comb. nov.

Laplacea spathulata Kobuski in J. Arnold Arb. 31 (1950) 424..

Peru, Brazil.

Gordonia tomentosa (Mart. & Zucc.) Spreg. Syst. Veg. Cur. Post 4 (1827) 260.

Haemocharis tomentosa Martius & Zuccarini, Nov. Gen. & Sp. 1 (1826) 108, t. 67.

Brazil.

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