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A new species and a new record of *Phanera* (Fabaceae) in Laos, with a lectotypification and a new combination for *P. involucrans*

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Abstract

A new species of *Phanera* (Fabaceae), *P. roseoalba* from the Bolaven Plateau, southern Laos, is described and illustrated, along with its vernacular name and preliminary conservation status. In addition, a distribution of *P. nervosa* is recorded in Laos for the first time, and a second-step lectotypification is made for *Bauhinia involucrans*, with a proposal of its new combination *P. involucrans*.

Key words: Cercidoideae, flora, Indochina, taxonomy

Introduction

Phanera de Loureiro (1790: 37–38) (Fabaceae) is a genus of woody liana distributed mainly in the tropics and subtropics of South Asia to Malesia, with a few species extending to Australia (Mackinder & Clark 2014, Sinou *et al.* 2020). Until recently, the genus had been placed within the large pantropical genus *Bauhinia* Linnaeus (1753: 374) s.l. (e.g. Larsen & Larsen 1980, 1984, Chen *et al.* 2010), comprising ca. 300–350 species (Larsen & Larsen 1984, Chen *et al.* 2010). Recent molecular analyses, however, showed *Bauhinia* s.l. to be polyphyletic (e.g. Lai *et al.* 1997, Hao *et al.* 2003, Sinou *et al.* 2020), and the genus was delimited into several smaller genera including *Phanera*, which now comprises ca. 80 species (Mackinder & Clark 2014, Sinou *et al.* 2020). *Phanera* is distinguished from the other genera derived from *Bauhinia* s.l. by a combination of features, such as a habit of mostly tendrilled liana, lobed calyces, non-elongated hypanthia, and 3 fertile stamens per flower (Mackinder & Clark 2014, Clark *et al.* 2017, Sinou *et al.* 2020). In Laos, 15 species of *Phanera* have been recorded (Newman *et al.* 2017–present, Mattapha *et al.* 2021).

During our floristic inventories of the Bolaven Plateau, southern Laos (Souladeth *et al.* 2020, Tagane *et al.* 2020), we collected two interesting species of genus *Phanera*. After further comparisons with related taxa based on the literature and specimens, one was identified as *Phanera nervosa* Bentham (1852: 262), which had not been recorded from Laos, and another one was found to differ morphologically from any other known taxa of *Phanera* distributed in Laos and surrounding countries. Here, we report the former as a new record of *P. nervosa* in Laos, and describe and illustrate the latter as a new species, *Phanera roseoalba* Tk.Yamam., Tagane & Soulad., along with its vernacular name and preliminary conservation assessment. In addition, the taxonomic comparisons of the new species with related taxa led us to realize *Bauhinia involucrans* Gagnepain (1952: 313), which has been treated as a member of *Bauhinia* s.l., needs a second-step lectotypification, and should be placed in the genus *Phanera*. Here, a second-step lectotypification is made and a new combination in *Phanera* is proposed.

Material & method

Morphological observations

To assess the nobility of the new species and confirm distribution records in Laos, we consulted taxonomic literature (Kurz 1873, Gagnepain 1952, Larsen 1968, Larsen & Larsen 1980, 1984, Hô 2000, Kress *et al.* 2003, Newman *et al.* 2007, Chen *et al.* 2010, Mackinder & Clark 2014, Sinou *et al.* 2020, Mattapha *et al.* 2021, 2022) and herbarium specimens housed at BKF, FOF, FU, HNL, KAG, VNM and those digitized images available at JSTOR Global Plants (<https://plants.jstor.org>), AAU Herbarium Database (<https://sciencemuseum.dk/herbariet>), Botanical Collections of Meise Botanic Garden (<https://www.botanicalcollections.be>), Catalogue des herbiers de Genève (<http://www.ville-ge.ch/musinfo/bd/cjb/chg>), Chinese Virtual Herbarium (<http://www.cvh.ac.cn>), Indian Virtual Herbarium (<https://ivh.bsi.gov.in>), Kew Data Portal (<https://data.kew.org>), Muséum National d'Histoire Naturelle (<https://www.mnhn.fr>), Natural History Museum Data Portal (<https://data.nhm.ac.uk>), Naturalis Bioportal (<https://bioportal.naturalis.nl>), and Tropicos (<https://tropicos.org>).

The measurements for the description of the new species are based on the herbarium specimens collected in our field surveys. To compare significant characters of the new species with those of similar ones, seven characters (proportion of bifid part of leaf lamina, type of terminal inflorescence, colour of hairs on pedicels/bracteoles/buds, length of pedicels, length of petal's claw, length of petal's lamina, and presence or absence of hairs on pistils) of *Phanera involucellata* (Kurz 1873: 72–73) de Wit (1956: 471) and *Bauhinia involucrans* are observed and measured on digitized herbarium specimens listed in Appendix 1, along with reviewing descriptions in previously published literatures (Kurz 1873, Gagnepain 1952, Larsen 1968, Larsen & Larsen 1980, 1984, Chen *et al.* 2010) (Table 1).

TABLE 1. Morphological comparisons of *P. roseoalba* with *P. involucellata* and *P. involucrans*.

Characters	<i>P. roseoalba</i>	<i>P. involucellata</i>	<i>P. involucrans</i>
Proportion of bifid part of leaf lamina	1/2–3/5	1/3–1/2	emarginate or 1/10–1/3(–1/2)
Type of terminal inflorescence	compound corymb	raceme, panicle	raceme, compound corymb
Colour of hairs on pedicels, bracteoles, and buds	light brownish	gray	ferruginous
Length of pedicels (cm)	3.2–5.0	(4–)5.5–9	2.8–3.7
Length of petal's claw (cm)	0.9–1.4	(1.5–)1.8–2.5	1.0–1.1
Length of petal's lamina (cm)	1.2–1.8	(1.3–)1.5–2.8	1.5–1.8
Hairs on pistils	pubescent (light brownish)	glabrous	pubescent (ferruginous)

Taxonomy

Second-step lectotypification and new combination

Phanera involucrans (Gagnep.) Tk.Yamam. & Tagane, **comb. nov.**

Basionym: *Bauhinia involucrans* Gagnep., Bull. Mus. Natl. Hist. Nat., Sér. 224: 313 (1952). Type:—VIETNAM. Dong Nai: station agricole de Blao, 23 May 1933, E. Poilane 22502 (lectotype P00798548 image!, first-step designated by Larsen & Larsen (1980), second step designated here; isolectotypes AAU image!, E00885434 image!, K001092984 image!, L0018738 image!, P00798547 image!).

Notes 1:—In the protologue of *Bauhinia involucrans*, the gathering *Poilane 22502* was cited by Gagnepain (1952). We traced six sheets of this gathering stored in five herbaria. In citing "TYPE: *Poilane 22502*, P", Larsen & Larsen (1980) specified the herbarium as P, and such citation corresponds to the designation of the lectotype according to the Article 7.11 of *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code)* (Turland *et al.* 2018). However, in P, there are two sheets of *Poilane 22502* (P00798547 & P00798548), and the existence of more than one sheet warrants a subsequent lectotypification in accordance of the Art. 9.17 of the *Shenzhen Code*. Therefore, the specimen sheet with barcode P00798548 is designated here as the lectotype, because it is well preserved, congruent with the protologue by Gagnepain (1952), and has pencil sketches of dissected flower in detail, which are useful for its identification and taxonomy.

Notes 2:—Although this species has been treated as a member of *Bauhinia* s.l. (Gagnepain 1952, Larsen & Larsen 1980, POWO 2023), it should be placed in the genus *Phanera*, because of its habit of woody liana with tendrils, non-elongated hypanthia, calyx splitting into (4–)5 lobes at anthesis, and 3 fertile stamens per flower, and thus here the new combination is proposed.

New species

Phanera rosealba Tk. Yamam., Tagane & Soulad., *sp. nov.*

Type:—LAOS. Attapeu Province: Bolaven Plateau, Samakhixay District, Sox Village, in seasonal dry evergreen forest, 15°03'26.68"N, 106°50'11.58"E, 253 m elev., 19 December 2019, *P. Souladeth, S. Tagane, D. Kongxaisavath, S. Rueangruea, S. Somran, Y. Suyama, E. Suzuki L3481* (holotype FOF0006810!, isotypes BKF, KAG155843!). Figures 1 & 2.

Phanera rosealba is similar to *P. involucellata* distributed in Myanmar and Thailand, and *P. involucrans* endemic to southern Vietnam in having glabrous branches and leaves throughout, and conspicuous bracteoles (exceeding 1 cm long) situated just below the hypanthium enveloping young buds, but distinguished from the former by having lamina bifid 1/2–3/5 its length (vs. 1/3–1/2 in *P. involucellata*), terminal inflorescences of compound corymbs (vs. mostly simple racemes, sometimes panicles composed of a few racemes), shorter pedicels at anthesis (3.2–5 cm long vs. (4–)5.5–9 cm long), relatively smaller petals (claws 0.9–1.4 cm long, lamina 1.2–1.8 cm long vs. claws (1.5–)1.8–2.5 cm long, lamina (1.3–)1.5–2.8 cm long), and densely pubescent ovary and style (vs. glabrous); from the latter by having lamina bifid 1/2–3/5 to its length (vs. emarginate or bifid 1/10–1/3(–1/2) of its length in *P. involucrans*), and pedicels, bracteoles, and buds covered with light brownish hairs (vs. densely ferruginous hairy) (Table 1).

Description:—Woody liana, ca. 10 m tall. Branches glabrous throughout, young branches light green *in vivo*, dark brown *in sicco*; tendrils 7–9 cm long, glabrous. Stipules caducous, not seen. Leaves simple, alternate; petiole 2.4–3.7 cm long, sparsely puberulous when very young, soon glabrous; lamina broadly ovate, 6.2–11.4 × 5.9–9.3 cm, apex bifid 1/2–3/5 of lamina with a narrow sinus up to 6.5 mm, tips subacute to obtuse, base subcordate, 9-veined from base, prominent on abaxial surface, with 2 rounded alveoles at base of veins on adaxial side, mid vein ending with arista 2–2.5 mm long, abaxial surface of veins sparsely puberulous when very young, soon glabrous. Inflorescences terminal compound corymbs, composed of a few short corymbs, and axillary simple corymbs to racemes; peduncle slight greenish *in vivo*, dark brownish *in sicco*, glabrescent; rachises same in colour as peduncles, glabrescent near base, becoming puberulous acropetally. Pedicels 3.2–5 cm long, puberulous to pubescent with light brownish hairs; bracts often caducous, lanceolate to broadly elliptic, 0.8–1.2 × 0.2–0.8 cm, puberulous on both surfaces, margin entire, apex acute to acuminate; bracteoles ovate to broadly elliptic, 1.2–1.8 × 0.6–1.0 cm, puberulous on both surfaces, apex acute to acuminate, situated on upper part of pedicels near base of hypanthium, enveloping buds when young; short-stalked capitate hairs present at proximal area of adaxial surface of bracts and bracteoles, and adjoining area of pedicels. Floral buds fusiform, up to 1.5 cm long, 5-ribbed. Hypanthium tubular, 0.6–0.8 cm long, pubescent with light brownish hairs. Calyx (4–)5-lobed; lobes lanceolate to ovate, 0.7–0.8 × 0.3–0.5 cm, pubescent with light brownish hairs throughout, papillate glands present on proximal area adaxially. Petals 5, light pink, subequal, sparsely covered with woolly long hairs throughout, especially denser along margin and veins of lamina; claws 0.9–1.4 cm long; lamina broadly ovate to rhombic with crenulate margins, 1.2–1.8 × 0.9–1.4 cm, apex obtuse to rounded. Fertile stamens 3; filaments 2.8–3.0 cm long, covered with woolly long hairs; anthers 0.3–0.4 cm long, glabrescent to puberulous, light pinkish *in vivo*, dehiscing by longitudinal slits. Staminodes 7; filaments 1.3–2.0 cm long, glabrescent; reduced anthers puberulous. Floral disc absent. Pistils densely pubescent with light brownish hairs except stigmatic surface; ovary 0.7–0.9 cm long on a short stalk of 0.5–0.9 cm long; style 0.9–1.3 cm long; stigma small capitate, ca. 1 mm in diameter. Young fruits densely pubescent; mature fruits not seen.

Additional specimen examined:—LAOS. Sekong Province: La Mam District ["Nam man District"], Tan Village, Tattlie Waterfall, in secondary broad-leaved evergreen forest, 400–500 m elev., 5 December 2008, *S. Wu WS-1906* [fl. buds, fl. & young fr.] (MO6146836 image!).

Distribution:—LAOS (so far known only from two provinces: Attapeu and Sekong, eastern side of the Bolaven Plateau).

Habitat and ecology:—This species was found in seasonal dry evergreen forest and secondary broad-leaved evergreen forest at 250–500 m elev. Flowering specimens were collected in December.

Etymology:—The specific epithet *rosealba* is derived from the feature of its petals which are light pinkish in colour.

Vernacular name:—Siew Boua ["Siew" in Lao refers to *Bauhinia* or *Phanera* in general and "Boua" refers to the pinkish in colour of petals], suggested here.



FIGURE 1. Holotype of *Phanera roseoalba* Tk.Yamam., Tagane & Soulad. (*Souladeth et al.* L3481 (FOF0006810)). Photo: D. Kongxaisavath.

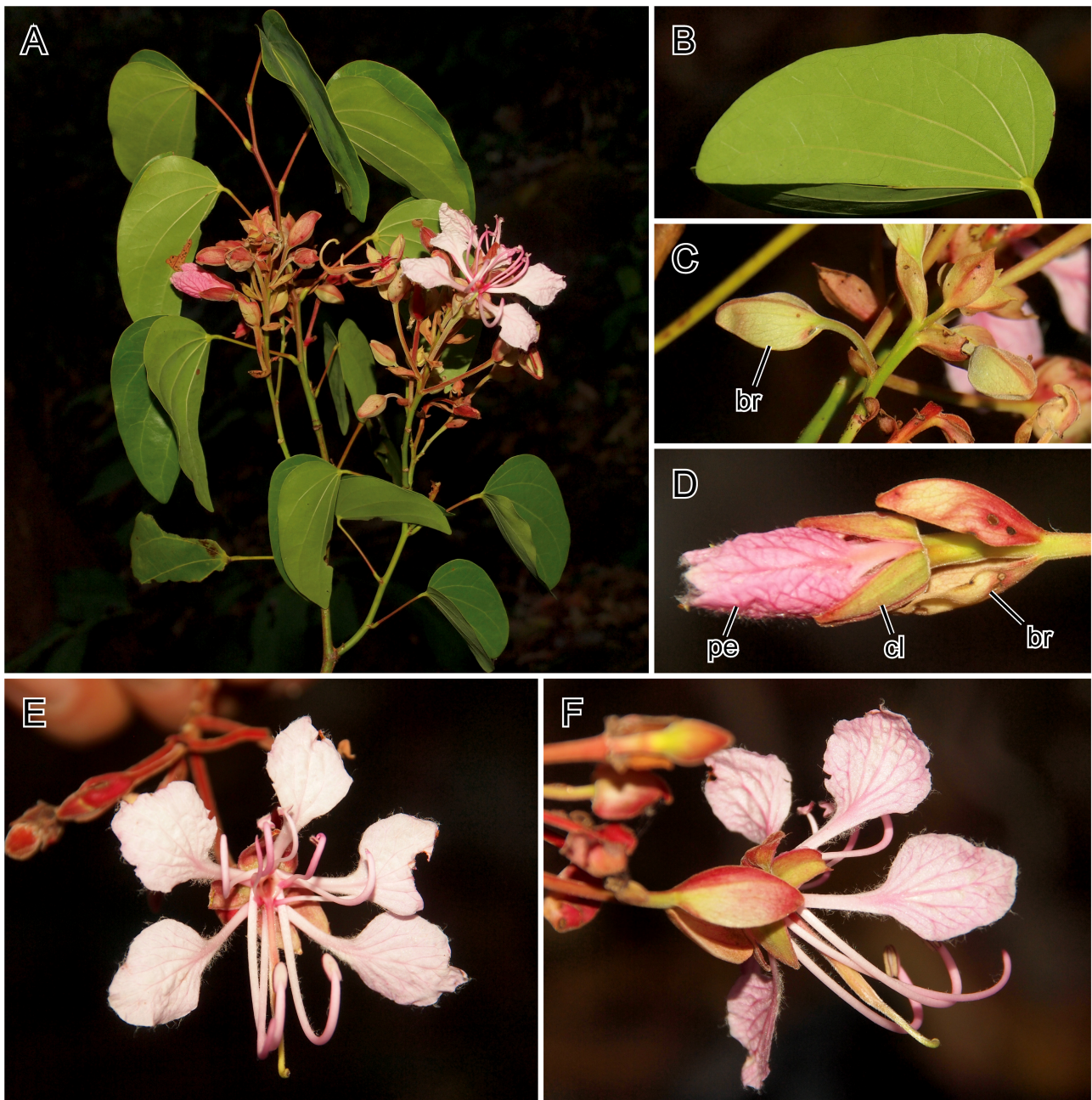


FIGURE 2. *Phanera roseoalba* Tk.Yamam., Tagane & Soulad. (*Souladeth et al. L3481*). A. Flowering branch; B. Portion of abaxial leaf surface; C. Young floral buds enveloped by two bracteoles; D. Floral bud just before anthesis, showing bracteoles, calyx splitting into lobes, and light pinkish petals; E. Flower (front view); F. Flower (diagonally backward view). Abbreviations: br, bracteole; cl, calyx lobe; pe, petal. Photos: S. Tagane.

Preliminary conservation assessment:—Data deficient (DD). Currently, *Phanera roseoalba* is known to occur at two localities in the vicinity of the Bolaven Plateau. From our observations by five field surveys on the Bolaven Plateau in 2018–2020 (*Souladeth et al. 2020*, *Tagane et al. 2020*), the species was only found in a small area at eastern periphery of the Bolaven Plateau, Attapeu Province, and we estimate mature individuals less than 250 for this population. Another locality is known from northeast of the the Bolaven Plateau, La Mam District, Sekong Province, based on a single specimen collected in 2008, but the current condition of this population is unknown. Additional localities can be found in eastern region of the the Bolaven Plateau, and thus further floristic investigations are needed to elucidate the distribution range of the species. Given the inadequacy of the information of its distribution and number of individuals, we here propose Data deficient (DD) according to the IUCN Red List Categories (IUCN 2012).

Notes:—*Phanera roseoalba*, *P. involucellata* and *P. involucrans* are likely to be closely related in that sharing a remarkable feature of bracteoles enveloping young buds, which is not found in any other *Phanera* species. The

phylogenetic relationships among these taxa are yet to be clarified, and here we treat each of them as an independent species. Future molecular studies will be needed to understand their relationships.

New record

Phanera nervosa Benth. in Miq., Pl. Jungh. 2: 262 (1852). Type:—INDIA. Sillet Mont, *N. Wallich* 5777 (lectotype K000760781 image!, designated by Bandyopadhyay (2012); isolectotypes BM000958839 image!, CAL0000067903 image!, G00359968 image!, K001122106 image!). Figure 3.



FIGURE 3. *Phanera nervosa* Benth. (Souladeth et al. L2798). A. Flowering branch; B. Adaxial leaf surface; C. Abaxial leaf surface; D. Flower (front view); E. Flower (side view). Photos: S. Tagane.

Specimens examined:—LAOS. Champasak Province: Bolaven Plateau, Paksong District, near Nong Luang Village, in wet evergreen forest, 15°04'44.53"N, 106°12'27.06"E, 1246 m elev., 3 July 2019, *P. Souladeth*, *S. Tagane*, *N. Tanaka*, *K. Soutakone*, *Y. Suyama*, *K. Phengmala*, *N. Ishii* L2798 (FOF0006129, KAG129087, TNS).

Distribution:—China, India, Myanmar, Laos, and Thailand.

Vernacular name:—Siew Dok-keo [“Siew” in Lao refers to *Bauhinia* or *Phanera* in general and “Dok-keo” refers to the white flowers], suggested here.

Notes 1:—Among *Phanera* species distributed in Laos, *P. nervosa* resembles *P. coccinea* de Loureiro (1790: 37–38) subsp. *coccinea* and *P. rubra* Lanorsavanh & Mattapha (in Mattapha et al. 2021: 545–546) in having lax inflorescences exceeding 3 cm in width, large flower buds exceeding 1.5 cm in length, calyx splitting into reflexed, lanceolate to oblong lobes, and densely pubescent pistils, but clearly distinguished from them by presence of ferruginous hairs on petioles and the abaxial surface of leaves even at maturity (vs. glabrous in both *P. coccinea* subsp. *coccinea* and *P. rubra*) and white to greenish petals (vs. orange-reddish). It is distinguished from the other *Phanera* species in Laos by

having a combination of following features: lamina bifid $1/3(-1/2)$ of its length; lax racemes of 3–10 cm wide; large obovoid flower buds 1.5–2 cm long; absence of floral disc; 3 fertile stamens per flower; densely pubescent pistils.

Notes 2:—Previously, *Phanera nervosa* has been known from northeastern India (Assam, Khasia, Sillet [type]), Myanmar (Kachin, Mandalay, Mon), southern China (Yunnan), and northern Thailand (Chiang Mai, Chiang Rai, Nan, Phitsanulok) (Larsen & Larsen 1984, Chen *et al.* 2010, POWO 2023, also based on herbarium specimens cited in Appendix 1). The new locality in Laos is rather apart (ca. 600 km) from the proximate habitat in Thailand, representing the southern and eastern limit of the distribution range of this species, and thus important in the conservative perspectives.

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Appendix 1. Specimens of *Phanera involucellata*, *P. involucrans*, and *P. nervosa* examined in this study.

***P. involucellata*.** MYANMAR. Mon: *Brandis 3* (K000760876). THAILAND. Kanchanaburi: *Amnajruangrit 137* (L3885974), *Bausekom et al. 3812* (P02744900, L1975827), *Kostermans 1431* (L1975829), *Larsen 10601* (AAU), *Larsen & Larsen 33986* (AAU, P02744901, L1975828), *Pengklay et al. 2899* (AAU, P02744903, L1975826); Nakhon Nayok: *Charoenchai 776* (L3891919); Nakhon Ratchasima: *Smitinand 4844* (AAU, BKF); Phetchaburi: *Larsen et al. 45070* (AAU), *Larsen et al. 45329* (AAU, BKF, L1975824), *Middleton et al. 853* (AAU, BKF, L3895402); Prachuap Khiri Khan: *Sirisanga et al. 4073* (AAU), *Sirisanga et al. 4596* (AAU); Rachaburi: *Larsen et al. 1181* (L1975825, P02744902).

***P. involucrans*.** VIETNAM. Dong Nai: *Poilane 22502* (AAU, E00885434, K001092984, L0018738, P00798547, P00798548), *Poilane 22689* (L1975830, P02746078), *Schmid s.n.* (P02746079, VNM00044929).

***P. nervosa*.** CHINA. Yunnan: *Li 12281* (KUN0125125), *Li 012281* (KUN1295696), *s.coll. 1620* (KUN0125124), *Peng 133* (KUN0169707), *Tao 19843* (HITBC0009747). INDIA. Assam: *Yandell 325* (L1962902); Khasia: *Hooker & Thomson s.n.* (BR0000029445134, L1962903, L1962904, U1263175); Sillet: *Wallich 5777* (BM000958839, CAL0000067903, G00359968, K000760781, K001122106). MYANMAR. Kachin: *Buchanan s.n.* (E00153422), *Kaulback 324* (E00153418); Mandalay: *Lace 5989* (E00153415, E00153416). Mon: *Lace s.n.* (E00153417). THAILAND. Chiang Mai: *Maxwell 97-905* (L1962899), *Watthan 2401* (HITBC0009748); Chiang Rai: *Maxwell 08-83* (L3895748); Nan: *Srisanga 1938* (HITBC0009749); Phitsanulok: *Murata et al. T-17053* (L1962900), *T-17082* (L1962901).