

A JOURNAL ON TAXONOMIC BOTANY
PLANT SOCIOLOGY AND ECOLOGY

REINWARDTIA

Editors

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Published by

HERBARIUM BOGORIENSE

BALAI PENELITIAN DAN PENGEMBANGAN BOTANI

PUSAT PENELITIAN DAN PENGEMBANGAN BIOLOGI - LIPI

BOGOR, INDONESIA

Reinwardtia Vol. 11, Part 3, 153 - 225

25 March 1998

10 ISSN 0034 - 365 X

THE BURMESE CINNAMOMUM (LAURACEAE)*)

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ABSTRACT

The Burmese species of *Cinnamomum* are revised and 11 species are recognized. Out of these eight new species are described for the first time.

ABSTRAK

Jenis-jenis *Cinnamomum* yang terdapat di Burma direvisi dan 11 jenis diakui adanya di sana. Di antaranya 8 jenis baru dipertelakan untuk pertama kali.

INTRODUCTION

Studies on the South Indian *Cinnamomum* species (13 species) were published in 1983 (Bull. Bot. Survey India 25(1-4): 90-133). Those from Sulawesi (8 species), the Philippines (32 species), the Moluccas (3 species), New Guinea (20 species), the Solomon Island (4 species), the Pacific area (10 species) and Australia (5 species) were published in 1986 (Gingkoana 6: 1-171), a total of 85 species.

Except for one Indian species, since 1986 no new species have been published. This new Indian species *C. nicolsonianum* Manilal and Shylaja, has to be reduced to *C. malabathrum* (Burman f.) Bl. as a mere form. This species is very common in S. India; its bark is collected for cosmetic preparations (although it has hardly any fragrancly) and the leaves are an inferior substitute for those of *C. tamala* of N. India (tamala patra). *C. malabathrum* has been formerly included within *C. iners* Reinw. ex Blume, but is quite different in flower and fruit characters. The assumption, that it is related to *C. verum* Presl, based on a cladistic investigation is wrong, since wrong differentiating characters were chosen.

*) Editors' note: When Prof. Dr. A.J.G.H. Kostermans died in 1994, he left behind a number of unfinished manuscripts. Only one of those we consider ready for publication so that it is published here. Since the indented key to the species prepared by him contained confusing numbering and misleading couplets, we reconstruct the key into a parallel one. Otherwise very little editing has been made to the manuscript although Prof. Kostermans had no opportunity to proofread the final typed manuscript we found among his papers.

The Burmese area is botanically very badly known. I have recognized 11 species of *Cinnamomum* of which 8 are new to science. Kurz in his flora of 1877 presented a poor and inaccurate treatment of *Cinnamomum*. He recognized altogether 8 species, of which he had seen no specimens of *C. zeylanicum* (neither have I) and of which *C. caudatum* represents *Neocinnamomum caudatum*. Of the others only *C. parthenoxylon* (syn.: *C. porrectum*) and *C. obtusifolium* (= *C. bejolghota*) might have been correctly identified. Of the others *C. iners* is a mixture of several species; *C. assia* does not occur there, the description is similar to that of *Neocinnamomum caudatum*; *C. sulphuratum* is partly *C. tavoyanum*, and *C. inunctum* might be *C. glaucescens*.

As no material is available there is no possibility to correct the mistakes. Hooker f. in 1886 did not do much better. In the *C. tavoyanum-lucens* group much has to be done and much more material is needed to disentangle the species.

KEY TO THE SPECIES

- 1 a. Flower glabrous.....1. *C. kingdon-wardii*
- b. Flower pubescent.....2
- 2 a. Basal-lateral nerves not reaching the leaf tip.....3
- b. Basal-lateral nerves reaching the leaf apex.....4
- 3 a. Branchlets glabrous or apically with minute adpressed hairs. Leaves coriaceous, underneath adpressed pilose. Panicles sericeous. Glands large, stipitate at base of filament.....2. *C. heiferii*
- b. Branchlets densely, minutely sub-lanuginose. Leaves chartaceous to sub-coriaceous, sublanuginose underneath. Panicles minutely sub-lanuginose. Glands small, attached at the middle of the filament.....3. *C. lucens*
- 4 a. Lower leaf surface glabrous, at least when old, leaves very large.....5
- b. Lower leaf surface minutely hairy, leaves smaller.....6
- 5 a. Lower leaf surface glabrous.....11. *C. birmanicum*
- b. Lower leaf surface initially sub-adpressed pilose, becoming glabrous.....*C. pachyphyllum*
- 6 a. Lower leaf surface minutely sub-lanuginose.....4. *C. cupulatum*
- b. Lower leaf surface tomentellous or pilose.....7
- 7 a. Lower leaf surface tomentellous (hairs erect).....8
- b. Lower leaf surface subadpressed pilose.....9
- 8 a. Leaves chartaceous, attenuate.....5. *C. tavoyanum*
- b. Leaves stiffly coriaceous, obtuse or apiculate.....6. *C. nalingway*
- 9 a. Leaves chartaceous.....8. *C. hkinlurnense*
- b. Leaves stiffly coriaceous.....10
- 10 a. Leaves with caudate, 1 cm long acumen.....9. *C. glauciphyllum*
- b. Leaves obtuse or shortly, obtusely acuminate.....10. *C. ellipticifoUum*

1. *Cinnamomum kingdon-wardii* Kosterm., spec. nov. • Fig. 1.

Arbor in omnibus partibus glabris ramulis tenuibus, gemmis terminalibus parvis, foliis oppositis subcoriaceis lanceolatis vel oblongis, sensim attenuatis, basi breve acutis, supra nitidis laevibus nerviis tribus principalibus pergracilibus prominulis, subtus conspicue reticulatis nitidis nervo mediano gracilibus prominentibus, nerviis subbasalibus lateralibus apice laminarum attingentibus tenuibus prominentibus, nerviis secundariis obscuris regularibus, petiolis gracilibus supra concavis; paniculis pseudo-terminalibus pauci-floris brevibus; pedicellis obconicis brevibus; tubo parvo; tepalibus (sub-maturis) ovatis, acutis intus sparse sericeis, antheris 4-locellatis, filamentis latis aequilongis; glandulis magnis applanatis basi filamentorum adnatis; staminodiis magnis sagittatis stipitatis; stylus cylindricis, stigmate magnis peltatis. — TYPUS: *Kingdon-Ward 18414* (BM).

Tree, glabrous in all its parts, except the inside of the flowers. Branchlets slender; terminal bud small. Leaves opposite, sub-coriaceous, lanceolate or oblong, 2 x 8 — 4 x 16 cm, apically gradually tapered, base shortly acute; above smooth, glossy, the three main nerves very thin, prominulous; below conspicuously reticulate, midrib slender, prominent, the sub-basal lateral nerves, which reach the leaf tip, slender, prominent; secondary nerves very obscure, not much differentiated from the reticulation, regular, parallel, horizontal, near the lamina base ca 2 mm apart. Petiole slender, up to 7 mm long, folded above. Panicles pseudo-terminal, few-flowered, up to 4 cm long. Pedicel obconical, 2-3 mm long. Tube 0.5 mm high. Tepals (sub-mature) ovate, acutish, 2-3 mm long, inside sparsely sericeous, denser near the base. Stamens slightly shorter; anthers 4-celled (upper cells somewhat smaller) ovate-elliptic, as long as the broad filament. Glands large, flat, attached to the basal part of the filament. Staminodes with large, hastate head and as long, broad stipe. Style cylindrical; stigma large, peltate.

DISTRIBUTION: Only known from the type locality.

ECOLOGY: Lowland species.

NOTE: Because of its glabrous flowers this species is allied to *C. glabriflorum* of India, but different by the reticulate under surface of the leaves, the short inflorescences and the large stigma; moreover the basal nerves reach the leaf tip.

BURMA: Mishima Hills, along the river bank in sere jungle, Kamlang R. at 250 m alt., March, fl., *Kingdon-Ward 18414* (A, BM, L).

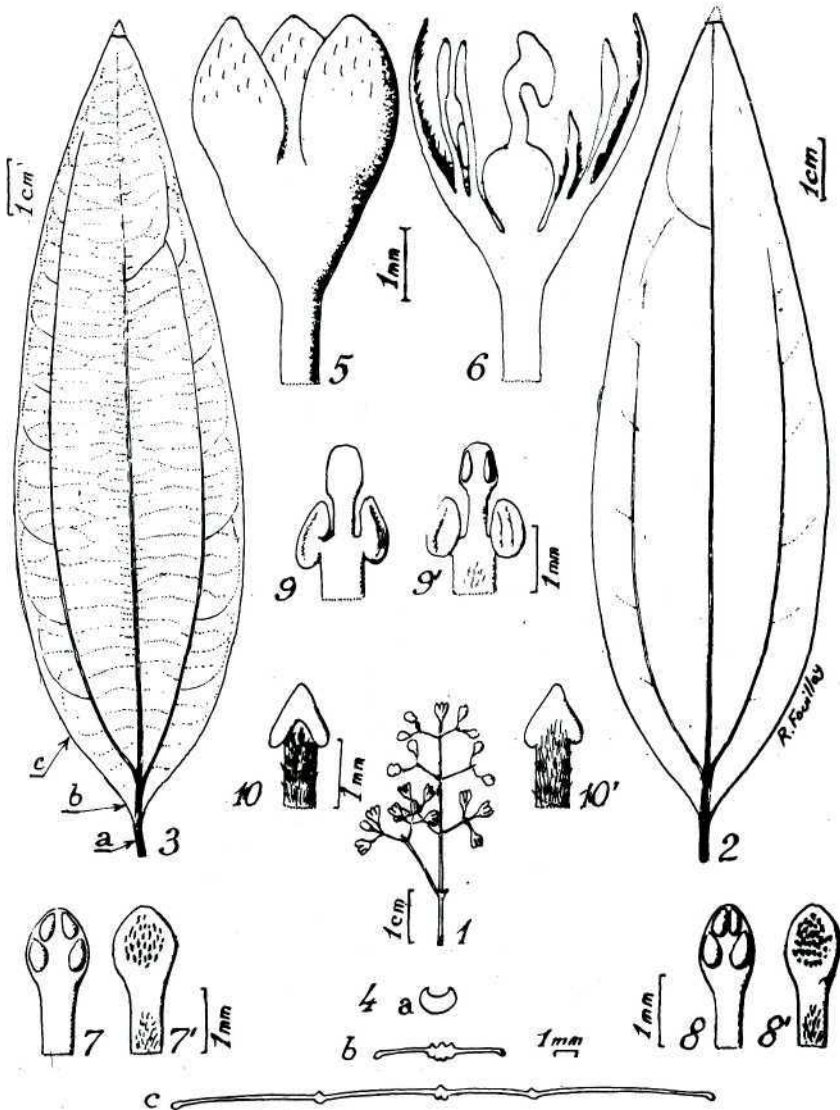


Fig. 1. *Cinnamomum kingdon-wardii* Kosterm. (1) Inflorescence; (2) upper leaf surface; (3) lower leaf surface; (4) cuts at a, b, c; (5) flower; (6) its section; (7-7') whorl I, red spot on anther; (8-8') whorl II; (9-9') whorl III; (10-10') whorl IV. After Kingdon-Ward 18414.

2. CINNAMOMUM HELFERII de Lukmanoff

Cinnamomum helferii de Lukmanoff, Nomencl. & Iconographie des Canelliers & Camphriers 15, t. 12, fig. 111. 1889 (Paris); Kostermans, Bibl. Laur. 299. 1964 (*helferi*). — Typus: Tenasserim & Andamans, Herb. Heifer (P) - *Heifer K.D. 4242*, fl.

Cinnamomum zeylanicum, forma *foliis parvis ovato-ellipticis*, e Tenasserim et Andaman, Miquel, Ann. Mus. bot. Lugd. bat. 1257. 1864. - Typus: *Heifer Kew Distr. 4242 (K, U)*.

Tree. Branchlets glabrous or apically with microscopical adpressed hairs. Terminal bud small, densely minutely grey sericeous. Leaves opposite, coriaceous, ovateelliptic to ovate-oblong, 3 x 6 - 7.5 x 14 cm, obscurely acuminate or attenuate, base cuneate or acute; above smooth, glossy, the three main nerves slender, prominulous or so in a groove; below paler, smooth, sparingly very minutely adpressed pilose, glabrescent, the three main nerves thin, prominent; the basal (or almost so) lateral nerves ending 12 cm below the apex; secondary nerves obscure, parallel, bent, horizontal, ca 3-5 mm apart. Petioles slender, 10-15 mm long, slightly concave above. Panicles pseudoterminal rather few-flowered, up to 10 cm long, minutely, towards the flowers densely greysericeous. Pedicels thin, up to 4 mm long. Tube shallow, obconical. Tepals ovate oblong, thin, inside sericeous. Inner tepals slightly shorter; anthers oblong, 4 celled, as long as the filaments; glands rather large, very shortly stipitate at the base of the filament. Staminodes sagittate with as long stipe. Style cylindrical; stigma peltate. Immature fruit ellipsoid. Cupula shallowly cup-shaped, rather thin, ca 2 mm high, 6 mm diam. at the entire thin rim, the pedicel obconical, 5 mm long.

DISTRIBUTION: Lower Burma.

NOTES: An obscure species, in leaf shape resemblong somewhat *Cinnamomum tamala* but much broader, and the cupula has an entire margin (in *C. tamala* the tepals are persistent); it reminds also slightly of *C. glauciphyllum*, but the latter has caudate leaves.

Another problem is the typification. De Lukmanoff quotes only Heifer from Tenasserim & the Andamans, without a number, and other not authentisized specimen of him. As, however, the (poor) description fits, I have accepted *Heifer K.D. 4242* as the type specimen. I have seen this in K and U.

SOUTH BURMA: Tenasserim (and Andamans?), fl., Herb. *Heifer K.D. 4242 (K, U)*; Thandaung, Oct., young fr., *Dickason 5186, 5189 (A)*.

3. CINNAMOMUM LUCENS Miq. — Fig. 2

Cinnamomum lucens Miquel, Ann. Mus. bot. Lugd. bat. 1: 261. Oct. 1864, p.p., quoad Griffith 713; Hooker f., Fl. Brit. Ind. 5: 131. 1886, p.p.; Kostermans, Bibl. 315. 1964, p.p. — Typus: *Griffith 713* (L).

Cinnamomum sulphuratum var. *merguiense* Meisner in DC, Prodr. 15(1): 18. 1864; Hooker f., l.e. 131; Kostermans, Bibl. 353. 1964. — Typus: *Griffith* in Herb. Wight (DC).

Cinnamomum albiflorum auct. non Nees, Nees in Wallich Pl. As. rar. 3: 32. 1832, quoad *Ganes 140*, Tavoy, 13 Oct. 1827, fl. (GRAZ) - *Wallich 2569* - G (K).

Tree ca 21 m high and 30 cm diam. Bark and wood faintly aromatic (Parker). Branchlets slender, apically microscopically densely sub-lanuginose. Terminal bud small with similar indumentum. Leaves spirally arranged, chartaceous to sub-coriaceous, subovate-elliptic to subovate-oblong, 2 x 6 — 4 x 12 cm — 6 x 20 cm, distinctly acuminate (acumen broad, ca 1 cm long), base acute; above rather dull, smooth, the three main nerves thin, prominulous; below smooth, initially densely, microscopically sub-lanuginose, tardily glabrescent, midrib slender, prominent, the sub-basal lateral nerves which end at $\frac{2}{3}$ the lamina length thin, prominent; in the upper leaf part several pairs of acute, erect-patent lateral, slender nerves; secondary nerves regular, parallel, horizontal, widely spaced. Petioles 1.5 - 2 cm long, slender, concave above. Panicles mostly pseudo-terminal, rarely axillary, subracemiform, few-flowered, 3-4 cm long, densely, very minutely sub-lanuginose; peduncle long, slender, branchlets very thin, few, 0.5-3 cm long. Pedicel thin, 3-7 mm long, slightly obconical apically. Flower tube small. Tepals ovate-oblong, acutish, inside sericeous, 3-4 mm long. Stamens 2-2.5 mm long; anthers small, 4-celled, the densely pilose filaments twice as long; glands small, attached to the middle of the filament; inner anthers with small, apical cells. Staminodes sagittate on long pilose stipes. Style slender, stigma small, subcapitellate-peltate. Fruit ellipsoid, 6 x 9 mm. Cupula small, thick, cupshaped, 3 mm high, 6 mm diam. at the entire rim; basal part obconical, merging into the obconical pedicel, together ca 6 mm long.

DISTRIBUTION: Lowland forest in lower Burma.

NOTES: Miquel, when describing *Cinnamomum lucens*, had three collections before him, the one described here, the other being *Cinnamomum tavoyanum*, which has a different indumentum of straight, patent hairs, the third from Nilgiram = *C. perrottetii*. *C. sulphuratum* var. *merguiense* might be this but I have not seen the type specimen.

The leaves resemble those of *C. soncaurium*, but the indumentum is different, moreover the fruit cup is different.

SOUTH BURMA: Tenasserim Div., hills west of Paungdaw Power Sta. in mixed open forest beside waterfall, common in this area, alt. 600 m, Oct., buds, *Keenan, U Tung Aung & Rule 1779* (K, L); Mergui, March, fr., *Meebold 14876* (BO, K, L); Tenasserim & Andamans, fl., Herb. *Heifer 4245* (K, L, P, U); Mergui, fl., *Griffith 713* (B, L, P); Tavoy, Nov., fl., *Parker 2175* (DD); Zimba valley, Nov., fl., *Parker 2234* (A); Mintha Sakan, Nov., fl., *Parker 2194* (A).

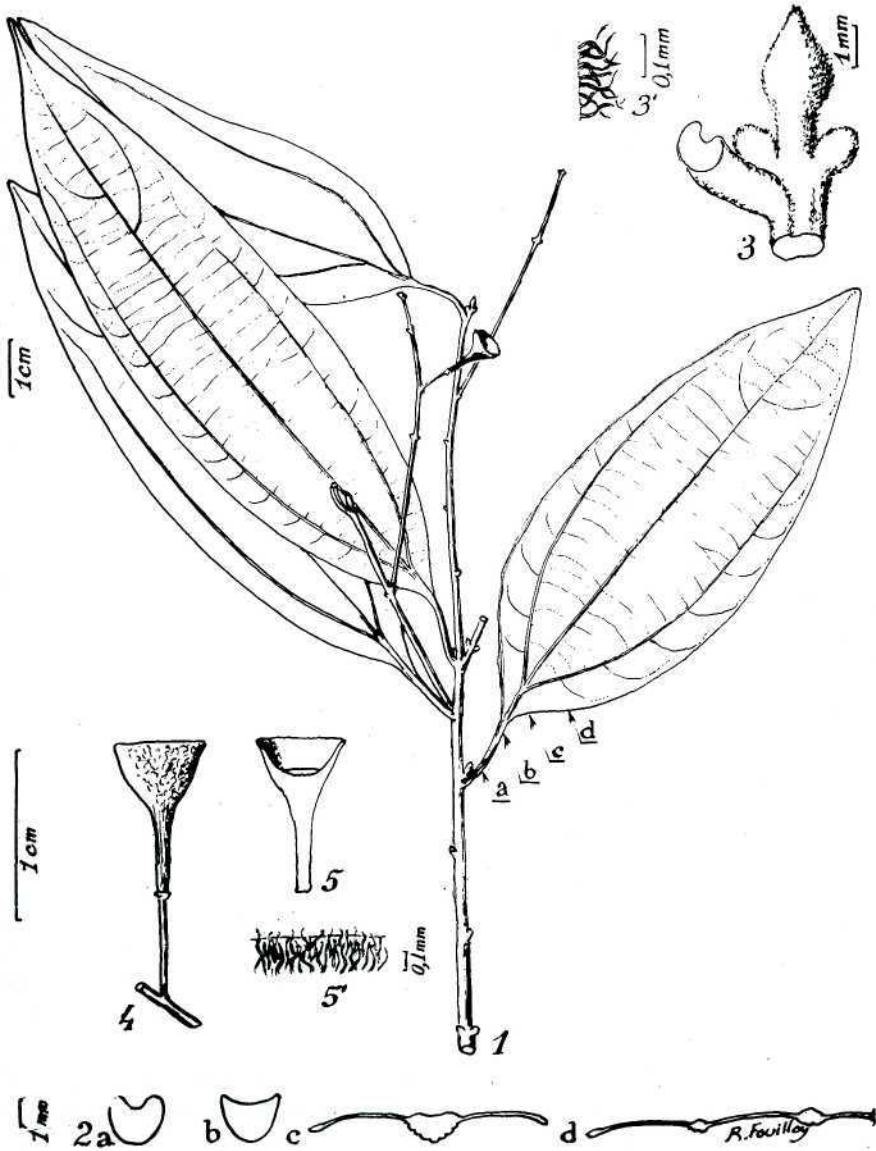


Fig. 2. *Cinnamornum lucens* Miq. (1) Fruiting twig, righthand leaf upper surface, lefthand one lower surface; (2) cuts at a, b, c, d; (3) indumentum, also of petiole and axes; (4) cupula; (5) section of cupula; (5') interior rim, pilose as the outside rime. After Meebold 14376.

4. *Cinnamomum cupulatum* Kosterm., *spec. nov.*

Arbor ramulis gracilis dense minutissime sublanuginosis, gemmis terminalibus parvis dense sublanuginoso-tomentellis, foliis oppositis chartaceis oblongis vel oblongo-ellipticis acuminatis basi acutis vel subcuneatis, supra glabris nitidis laevibus nerviis tribus principalibus tenuibus prominulis, subtus sat parse minutissime sublanuginosis laevibus nervo mediano tenuibus prominentibus, nervis basalibus-lateralibus tenuibus prominulis apice laminarum attingentibus, nerviis secundariis obscuris parallelis horizontalibus numerosis, infructescentiis axillaribus perlongis gracilibus dense minutissime sublanuginosis, fructus ellipsoideis, cupulis magnis profundis costatis, tepalibus persistentibus induratis.— TYPUS: *Bot. Survey 103 (K)*.

Tree; branchlets slender, minutely, very densely minutely sublanuginose. Terminal bud small, very densely sublanuginose-tomentellous. Leaves opposite, chartaceous, oblong to oblong-elliptic, 3 x 11 — 5 x 14 cm, acuminate (acumen 1-1.5 cm long), base acute to subcuneate; above smooth, glossy, glabrous (except the base), the three main nerves slender, smoothly prominulous; below rather sparsely, minutely sublanuginose, smooth, the slender midrib prominent, the basal lateral nerves, which reach the leaf apex thin, prominulous; secondary nerves faint, parallel, horizontal, ca 2 mm apart. Petiole slender, 8-13 mm long, flattish above. Infructescences axillary, slender with few fruit, up to 14 cm long densely, minutely sublanuginose with long thin main peduncle and few, thin, up to 2 cm long branches. Fruit ellipsoid, 7 x 10 mm, deeply embedded in the large cup. Cupula large, very deep, cup-broadly funnel-shaped, up to 9 mm high and 8 mm diam. at the rim, with small, longitudinal ribs/ the rim with persistent, hardened, 1-2 mm long tepals, of which only the tip (less than 0.5 mm) does not harden and breaks off; pedicel 8 mm, cylindrical.

DISTRIBUTION: Tenasserim.

NOTES: The leaves resemble somewhat those of *Cinnamomum tavoyanum*, but the indumentum of leaves and branchlets is different and resembles that of *C. lucens*, but from the latter it deviates by the basal nerves reaching the leaf tip. Most remarkable are the fruit cupula which resemble those of *Cinnamomum verum*, but with less pronounced ribs.

The specimen is poorly annotated and gives only the generally used name Hamanthin Po (hamanthin = *Cinnamomum*), whereas as locality only Tenasserim is quoted.

BURMA: Tenasserim Circle, fr., *Bot. Survey (Forests) 103 (K)*.

5. CINNAMOMUM TAVOYANUM Meissner

Cinnamomum tavoyanum Meissner in DC, Prodr. 15(1): 20. 1864; Hooker f, Fl. Brit. Ind. 5: 131. 1886 (exclude *Cinnamomum lucens* Miquel, p.p., exclude *Heifer* 4245); Gamble, Man. Ind. Timb., ed. 2: 560. 1902, p.p.; Brandis, Ind. Trees 533. 1906, p.p.; Lace, List Trees & shrubs Burma 109. 1912; ed. 2: 137. 1922; D. Bois, Pl. Alim. 3: 63. 1934; Bor, Man. Ind. For. Bot. 52. 1953; Kostermans, Bibl. Laur. 357. 1964. - Typus: *Wallich*, herb. Burma (*Gomez* 583, Tavoy, fl. Dec. 1803 (DC).

Cinnamomum lucens Miquel, Ann. Mus. bot. Lugd. bat. 1: 261. Oct. 1864, p.p., quoad *Griffith* 737 (exclud. *Griffith* 713, which is *C. lucens* and Nilgiris, which is *C. perrolletii*); Hooker f, I.e. 131; Kostermans, Bibl. 315. 1964. —Typus: *Griffith* 737(U).

Cinnamomum sulphuratum auct. non Nees, Kurz, Prelim. Rep. Pegu 99. 1875; For. Fl. Brit. Burma 2: 288. 1877; Mason, Burma 2: 283. 1883; Hooker f, I.e. 131; Kostermans, Bibl. 353. 1964. —Typus: *Kurz*, Tenasserim, fl. Oct.-Dec.

? *Cinnamomum sulphuratum*, var. *merguiense* Meissner, I.e. 18; Hooker f, I.e. 131; Kostermans, Bibl. 353. 1964. —Typus: *Griffith* in Herb. Wight (DC) non vidi.

Cinnamomum sulphuratum var. *oblongifolium* Nees in Wallich, Pl. As. Rar. 3: 32. 1832 (exclud. cit. *Cinnamomum javanicum*); Syst. Laur. 55. 1836 (exclud *C. javanicum* Bl.); Dietrich, Syn. 2: 1334. 1840; Hasskarl, Tweede Cat. Lands Plant, tuin Buitenz. 87. 1844 (as a synon. of *C. javanicum* Bl.); Miquel, Fl. Ind. bat. 1(1): 891. 1858 (as a synon. of *C. sulphuralum* Nees); Ann. Mus. bot. Lugd. bat. 1: 261. 1864 (as a part synonym of *C. lucens*); Meissner, I.e. 18 (as a var. of *C. sulphuralum*, exclud. Malay Penins., Ceylon); Cammerloher in Bull. Jard. bot. Buitenz., Ser. 3, 7: 465. 1925 (as a synon. of *C. javanicum* Bl.); Kostermans, Bibl. 353. 1964 (exclud. cit. Blanco). —Typus: *Wallich* 2583 - F (K, GRAZ) Tavoy, 8 Dec. 1827, fl. (also no: 583 in GRAZ).

? *Cinnamomum obtusifolium* Wall, var., ex Hooker f, I.e. —Typus: *Wallich* 2569 - G (K).

Cinnamomum albiflorum var., Nees in Wallich, Pl. As. rar. 3: 32. 1832- —Typus: *Gomez* 140, Tavoy, fl. (GRAZ).

Tree. Branchlets slender, very densely minutely grey tomentellous (hairs thin, stiff, straight). Terminal bud small, densely subadpressed tomentellous (hairs coarse). Leaves opposite, chartaceous, oblong, 3 x 12 - 4.5 x 15 cm, attenuate, base acute; above glabrous (except a small basal part), glossy, smooth, the three slender main nerves smoothly prominulous; below rather sparsely tomentellous (hairs very thin, almost straight, erect, glossy), midrib slender, prominent; the sub-basal lateral nerves which reach the leaf apex thin, prominent; secondary nerves none or very faint, regular, horizontal, parallel, ca 2 mm apart. Petiole rather slender, densely tomentellous, 8-13 mm long, flattish above. Panicles axillary, slender, lax, narrow, rather many flowered, up to 12 cm long, densely minutely grey hirtellous (hairs very thin, slightly wavy); peduncles slender, long; branches few, short. Pedicels (immature) 2 mm long. Tube inconspicuous. Tepals ovate, acutish, 2 mm long, inside sericeous. Stamens slightly shorter; anthers oblong, 4celled, as long as the pilose filaments; glands rather large, very shortly stipitate at either side the filament. Staminodes broadly hastate, stipitate. Style cylindrical, stigma small, peltate. Fruit unknown.

DISTRIBUTION: Lower Burma.

NOTES: The species and its relatives need an overhaul, when more material will be available. The entire group has been completely mixed up by Nees, Meissner, Miquel and Hooker. Hooker thought that this species was close to *C. iners*, a complete misconception. He included moreover some entirely different species.

The species is very close to *C. mollissimum* of the Malay Peninsula, and might be a mere form of it. However, the hairs of the indumentum are shorter than in *C. mollissimum* and a final decision must wait until more material becomes available.

For the time being I have included here the specimen *Braybon 194* which has a similar indumentum and similar flowers, but the leaves are elliptic and mature ones are 7 x 22 cm with strong nerves on the lower surface. This might be another species.

BURMA: Mergui, fl., *Griffith 787* (quoted as 737 by Miquel), fl. (K); ? Leikpok Chung, Mergui, alt. 130 m, fl. *Braybon's Collector* (DD); Tavoy: Dec. fl., *Gomez 583* and Oct., fl., *Gomez 140* (= *Wallich 2569 - G* (GRAZ, K, L).

6. *Cinnamomum nailingway* Kosterm., *spec. nov.* - Fig. 3

Arbor ramulis dense minutissime subadpresso pilosis, gemmis terminalibus parvis dense adpresso pilosis, foliis oppositis vel alternantibus rigide coriaceis ellipticis obtusis vel apiculatis basi breve acutis supra nitidis laevibus glabris nerviis tribus principalibus prominulis in sulcis, subtus sat sparse minutissime sublanuginoso, tomentellis, nervo mediano prominentibus, nerviis basalibus lateralibus gracilibus prominentibus apice laminarum attingentibus, margine involutis petiolis sat brevibus concavis; paniculis pseudo-terminalibus perlaxis dense minutissime sublanuginoso-tomentellis, floribus ignotis, fructus ellipsoideis, cupulis cupuliformibus nee profundis, tepalibus persistentibus vel parte basalibus persistentibus. —TYPUS: *Lace 2986(L)*.

Tree; branchlets densely, microscopically tomentellous (hairs not entirely straight). Terminal bud small, very densely sub-adpressed pilose (hairs stiff, straight). Leaves opposite and sub-opposite, rigidly coriaceous; above smooth, glabrous, glossy, the three slender main nerves prominulous in a groove; below rather sparsely, minutely tomentellous (hairs very thin, glossy, slightly bent), midrib slender, prominent, the basal (or almost so) lateral nerves slender, prominent, reaching the leaf apex; secondary nerves obscure, parallel, horizontal, rather widely spaced. Petioles 8-12 mm long, slightly concave above, stiff. Fruiting panicles pseudo-terminal, very lax, with few branches and very long main peduncle, densely, very minutely sub-lanuginoso-tomentellous, up to 13 cm long. Fruit ellipsoid, 6 x 10 mm. Cupula very shallow, wide, cup-shaped, 1-2 mm high, up to 4 mm diam. at the rim which bears the persistent, hardened, 3 mm long tepals, or the tips break and the large bases of the tepals with concave margin remain.

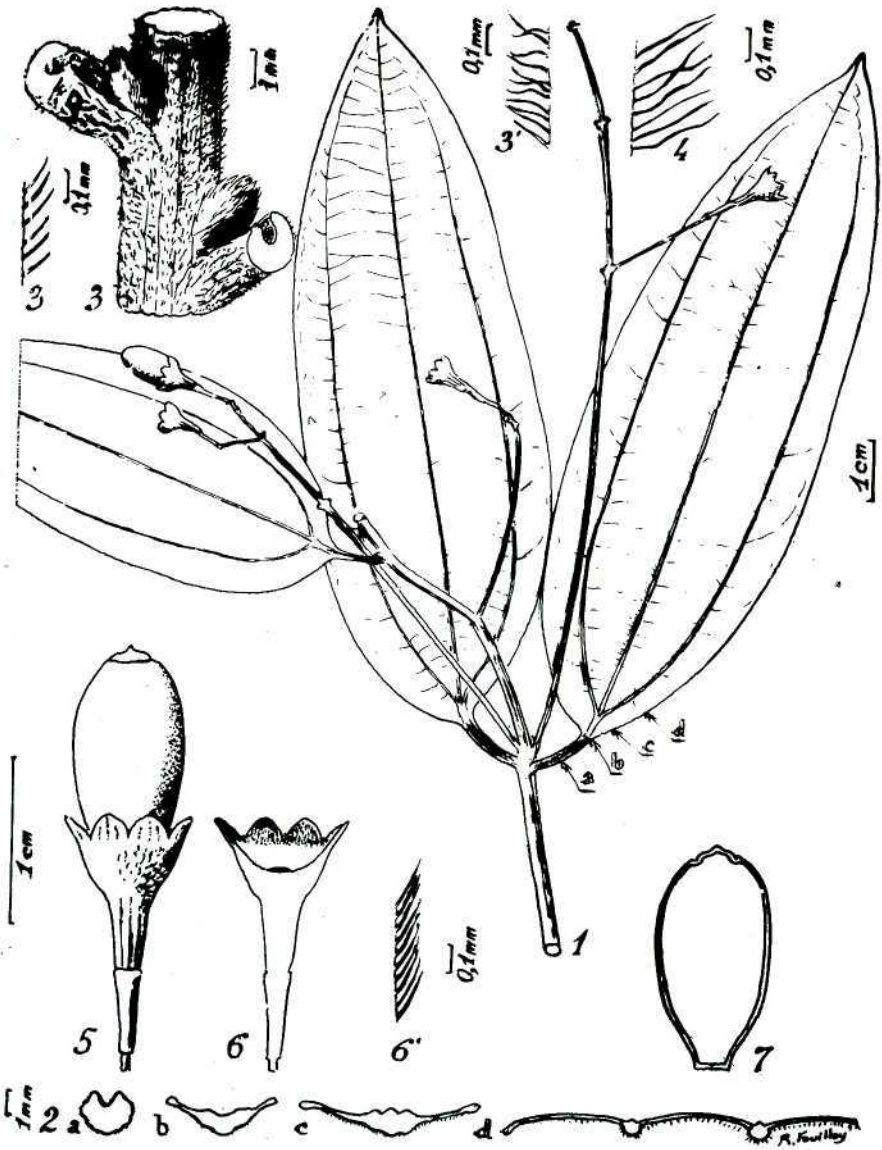


Fig. 3. *Cinnamomum nalingway* Kosterm. (1) Fruiting branch, right-hand leaf lower surface, lefthand leaf lower surface, lefthand one upper surface- (2) sections at a, b, c, d; (3) axillary bud; (3') branchlet pilosity; (3'') pilosity of petiole; (4) pilosity lower leaf surface and nervation; (5) fruit; (6) section of fruit; (6') outside pilosity of cupula and of both sides of tepals; (7) section of fruit. After J.H. Lace 2986.

fruit. After *J.H. Lace 2986*.

DISTRIBUTION: Only known from the type locality and Siam.

VERNACULAR NAMES: Nalingway.

NOTE: *C. nalingway* has only mucilage cells (no oil cells) in the leaves.

BURMA: Megaungnya Distr., Lebzauk For. Res., March, fr., *Lace 2986* (L). Siam: Kwae noi R., Wangka near Nickey, Ban Fi R., alt. 150 m, April, fl., *Kostermans 270* (A, L).

7. *Cinnamomum pachyphyllum* Kosterm., *spec. nov.* - Fig. 4

Cinnamomum oblusifolium var. *birmanicum* Meissner in DC, Prodr. 15(1): 13. 1864; Kostermans, Bibl. 329. 1964; Reinwardtia 8: 33. 1970 (*birmanica*). — Typus: Atran & Chappedong, *Wallich*, Herb. Birma. 1977, p.p. (DC) = *Wallich 2583 E* (K). (2 collection), the Atran specimens with buds, is considered the type.

Cinnamomum iners var. *subvenosum* Meissner, l.e. 20, p.p., quoad cit. Mergui, *Griffith*. — Typus: *Griffith K.D. 4246*, Mergui (K) = *Griffith 623*, Mergui (K, L).

Cinnamomum oblusifolium auct. non Nees, Kurz, For. Fl. Brit. Burma 2: 187. 1877.

Cinnamomum iners auct. non Reinw. ex Bl., Nees in *Wallich*, Pl. As. Rare. 3: 32. 1832, quoad *Wallich 2588-sphalm.* = *2583-E* from Atran R., April 1827 — Typus: *Wallich 2583-E* (K). and from Chappedong, fr. 1827 (K).

Cinnamomum zeylanicum var. *inodorum* Nees, Syst. Laur. 47. 1836, p.p., quoad specim. Burma.

Cinnamomum iners auct. non Reinw. ex Blume, Kurz, For. Fl. Br. Burma 2: 287, p.p.; Hooker f, Fl. Brit. Ind. 5: 130. 1866, p.p.

Cinnamomurn zeylanicum auct. non Bl., Brandis, Ind. Trees 533. 1906 p.p.

Arbor ramulis glabris vel apicem versus minutissime subadpresse pilosis, gemmis terminalibus parvis dense subadpresse minutissime tomentellis; foliis oppositis vel suboppositis glabris coriaceis ellipticis usque ad oblongis obtusis apiculatis basi obtusis vel cuneatis, utrinque laevibus supra nerviis tribus principalibus prominulis, subtus nervo mediano prominentibus, nerviis basalibus lateralibus prominentibus apice laminarum attingentibus, nerviis secundariis obscuris regularibus vel nullis; petiolis sat crassis; panicubis pseudo-terminalibus dense minutissime subadpresse tomentellis, multifloris, pedicellis cylindricis; tubo parvo; tepalis ovatis acutiusculis untrunque subadpresse tomentellis; staminibus antheris 4-locellatis, filamentis pilosis longioribus; glandulis sat parvi basi filamentorum adnatis; staminodiis conspicuiis, stipitatis; stylo cylindricis, stigmatate peltatis; fructus ellipsoideis apiculatis, cupulis cupuliformibus, nec profundis, tepalibus persistentibus. — TYPUS: *Kerr 10316* (L).

Tree, up to 25 m high. Bark and wood aromatic. Branchlets rather stout, smooth, glabrous or apically microscopically subadpressed pilose. Terminal bud small, densely subadpressed tomentellous. Leaves opposite and subopposite, coriaceous to thickly coriaceous, glabrous (initially very minutely sub-adpressedly pilose underneath, the hairs sub-erect, almost straight,

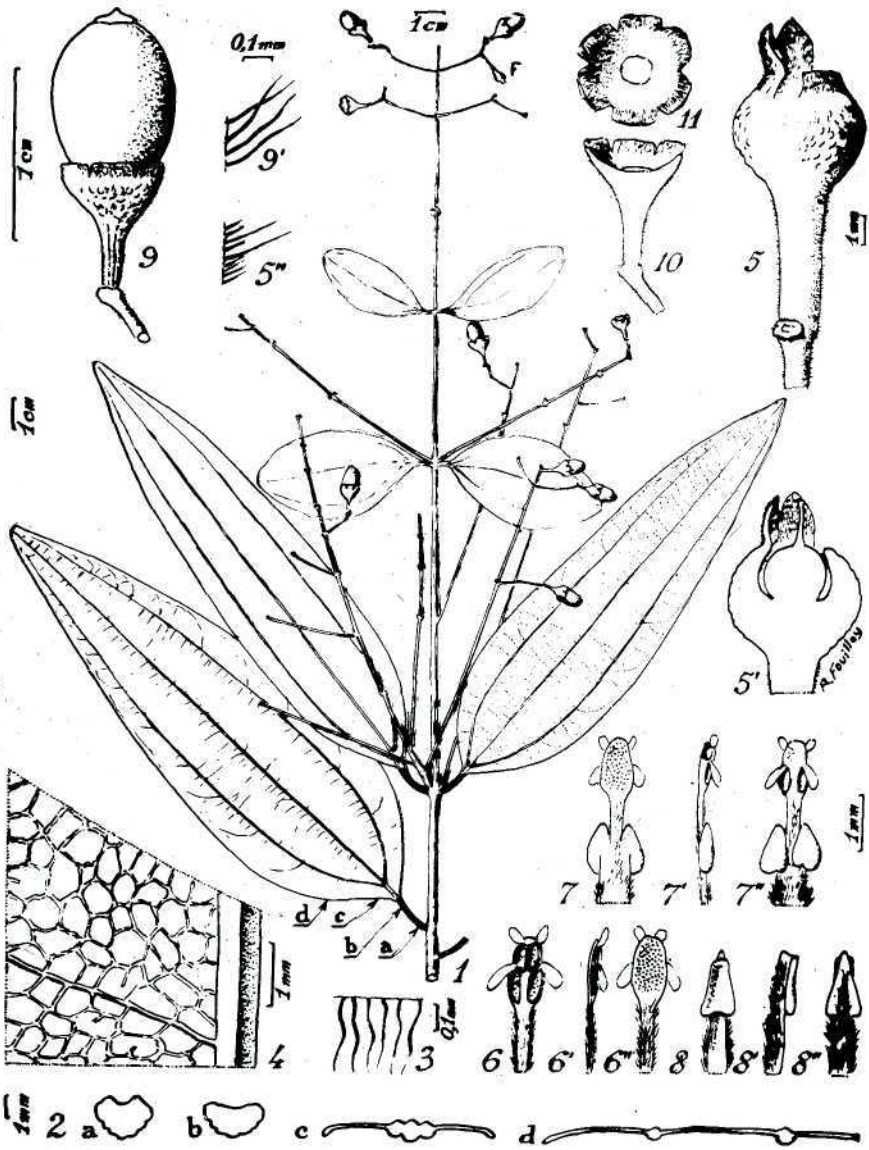


Fig. 4. *Cinnamomum pachyphyllum* Kosterm. (1) Fruiting twig, righthand leaf from above, lefthand one from below; (2) sections at a, b, c, d; (3) pilosity of inside; (4) nervation upper surface (center, middle nerve); (5) flower, after anthesis; (5') its section; (6-6') whorl I and II; (7-7') whorl III; (8-8') whorl IV; (9) fruit; (9') pilosity of outside of cupula; (10) section of cupula, seen from above. After A.F.G. Kerr, 103166.

very thin), elliptic to subovate-elliptic to subovate-oblong, usually large, 6 x 15 — 6 x 27 — 9 x 19 cm, obtuse or apiculate, base acute to obtuse to cuneate; above glossy, smooth, the three main nerves slender, smoothly prominulous; below paler, smooth, the midrib slender, smoothly prominent, the basal lateral nerves which reach the lamina apex, slender, prominent; secondary nerves obscure, very thin (or none), regular, parallel, horizontal, ca 2 mm apart. Petioles rather stout, 1.5-2 cm long, above flat, narrowly channeled medially. Panicles pseudo-terminal, many-flowered, 3-13 cm long, minutely tomentellous (hairs straight or slightly bent, very thin, sub-erect or erect); main peduncle rather stout, branchlets angular, up to 4 cm long, widely separated. Pedicels cylindrical, thin, densely, minutely tomentellous, 3-5 mm long. Flowers very minutely, densely sub-addressed grey tomentellous. Perianth tube 1 mm high, wide; tepals rather thick, ovate, acutish, 3 mm long, inside microscopically, densely tomentellous. Stamens slightly shorter; anthers slender, oblong, 4-celled (upper cells slightly smaller); filaments 1.5 times as long, slender, pilose. Glands rather small, very shortly stipitate, adnate to the base of the filament. Staminodes sagittate, stipitate. Style cylindrical; stigma rather large, peltate. Fruit ellipsoid, up to 8 x 11 mm, apiculate. Cupula fleshy, widely cup-shaped, shallow, 2-5 mm high, 4-7 mm diam. at the rim, which bears the persistent, enlarged, indurate (apical 1-1.5 mm pilose, not indurate), 2.5 mm long tepals; pedicel almost cylindrical, 5-7 mm long, ca 1.5 mm diam.

DISTRIBUTION: Burma, Thailand, Indochina, Malay Peninsula.

VERNACULAR NAMES: Hmantin, Huantin (Burma), A chue, Opchoi (Thailand).

NOTES: A species most closely allied to *Cinnamomum malabathrum* of S. India, but its bark and wood are aromatic and the indumentum is different. It shows also some resemblance to *C. iners*, but has thickly coriaceous leaves and a fruit cupula. It is a pity, that-as usual- so little information is given on the labels by the collectors.

I have found a specimen in the Sloane Herbarium (British Museum, London) (Vol. 331, folio 136) gathered in Pegu and sent by Dr. Edward Buckley in 1708, consisting of a leafy branch with some detached leaves and a note: "Canella seu malabathrum sed videtur species foliis longissimus". That the plant has been sent at such an early date, proves that it has commercial value, and I suspect that the specimens from Rangoon and Bangkok are form cultivated plants. The leaves vary from very broadly elliptic to oblong.

The Chappedong specimen in the Wallich Herbar. (K) = *Wall. 2583 - E*, p.p. was collected on the Chappedong forest on 22 Febr. 1827; it is a sterile branch and one detached leaf.

The Atran specimen is a branch with an inflorescens bud plus a small branch with abnormal very young fruit, collected 1 April 1827. A third part of *Wallich 2583 - E* is from Moulmein collected on 24 Jan. 1827, a sterile branch and one with diseased young fruit.

BURMA: S. Tenasserim, Dec, fl., *Brandt's s.n.* (K); Tavoy, Pyin-ngoe forest, Apr., fl., *Manson s.n.* (K); *ibid.*, Ladi Circle, Dec, fl., For. Off. (DD); *ibid.*, ster., *Palmer s.n.* (K), leaves up to 12 x 40 cm; fl., *Parish 180* (K, L); Atran and Chappedong (2 collections), ster. and with abnormal fls., *Wallich 2583 • E* (K); Rangon Distr., Kamayut, Febr., fl., *Parkinson 14000* (K); Dec, fl., *Dickason 6814* (L); Lower Ngawcheng valley, alt. 540 m, fr., *Kingdon Ward 258* (BM); Khaiyang, alt. 2000 m., May, young fr., *Kingdon Ward 17473* (BM); Moulmein, fl., *Griffith KD. 4246* (K, L); Mergui, fl., *Griffith 657* (L); Amherst, An Kaw Ngaw stream, 1000 m, Jan. fl., *Lace 5654* (L). Thailand: Peninsular, Pattani, Banang Sta., 300 m, ster. *Kerr 7694* (K); Ranawng, La-un, 50 m, Jan., buds, *Kerr 16485* (K, L); *ibid.*, Kao Pawta Chengking, 800 m, Jan., fl., *Kerr 16799* (K); *ibid.*, Kao Talu, 50 m, Febr., fl., *Kerr 11811* (K); Kao Nom Sao, Langsuan, 900 m, Febr., buds, *Kerr 12048* (K, L); Kanburi, Wangka, 200 m, bamboo forest, Jan., fr., *Kerr 10316* (K, L); Kao Luang, N. Sritamarat, 400 m, ster., *Kerr 15433* (K, L); Chaiaburi, Nawng Kai, 200 m, Febr., buds, *Kerr 8521* (K, L); Bangkok, Febr., fl., *Kerr 6741* (K, L); Bangkok, Tempicoumpoud, June, fl., *Kerr 10717* (K); Prov. Pre, Hue Me kami, 400 m, Febr., fl., *Kerr 4860* (K); North East, Prov. Nongkai, Chai Gabumi, 200 m, Febr., fl., *Kerr 8521* (K); North Central, Pu Lomlo Peak, Petchabun, Don Sui, 1400 m, Apr., fr., *Kerr 5775* (K); S. Lushai Hills, 1200 m, Aug., fl., *Wenger 215* (K).

8. *Cinnamomum hkinlumense* Kosterm., *spec. nov.*

Arbor mediocris ramulis angulatis dense minutissime subadpresso pilosis, gemmis terminalibus parvis dense sericeis, foliis oppositis vel suboppositis chartaceis, ellipticis vel subovato-ellipticis, brevisiter acuminatis basi acutis supra opacis laevibus nerviis tribus principalibus tenuissimus prominulis in sulcis, subtus pallidioribus opacis, sat sparse subadpresso pilosis (nerviis tomentellis), nervo mediano sat gracilibus prominentibus, nerviis basalibus lateralibus apice laminarum attingentibus prominentibus, nerviis lateralibus minutis, nerviis secundariis tenuibus, conspicuis, parallelis horizontalibus, distantibus; petiolis gracilibus pilosis supra subconcavis; paniculis axillaribus vel ad ramulorum juvenilem extra-axillaribus, multifloris longis dense minutissime sub-adpresso pilosis; tubo perianthemum parvum, nee profundum; tepalibus ovatis acutiusculis intus sericeis; antheris 4-locellatis, filamentis latis pilosis aequilongis; glandulis magnis appanatis, parte basalibus filamentorum adnatis, staminodiis magnis breve stipitatis, stylo cylindricis stigma peltatis. Fructus ignotus. — TYPUS: *Kingdon- Ward 20788* (A).

Small or medium sized tree with angular slender, densely minutely sub-addressed branchlets. Terminal bud small, densely sericeous. Leaves opposite and sub-opposite, chartaceous, elliptic, rarely subovate-elliptic, (3.5 x 10) 5 x 12 - 6 x 17 cm, shortly (ca 1 cm) acuminate, base shortly acute; above dull, smooth, the main nerves very thin, prominulous in a groove; below dull, paler rather sparsely sub-addressed pilose, midrib prominent, the basal lateral nerves, which reach the leaf apex prominent, slender, sending off arcuate, erect-patent lateral branches; secondary nerves conspicuous, thin, bent, horizontal, parallel, ca 5 mm apart. Petioles slender pubescent, 1-1.5 cm long, slightly concave above. Panicles axillary and on the flush branch extra-axillary,

many flowered, lax, densely, minutely sub-adpressed pilose (hairs thin, straight), up to 16 cm long, with long, rather slender, main peduncle and widely spaced up to 3 cm long branchlets. Pedicels filiform, 5-7 mm long. Flowers densely sericeous. Tube very shallow. Tepals ovate, acutish, 3-4 mm long, inside sericeous. Stamens somewhat shorter, anthers elliptic, 4-celled, as long as the broad, flat, pilose filaments. Glands large, flat, attached to the basal part of the filament. Staminodes with large sagittate head and short, broad stipe. Style cylindrical; stigma rather large, peltate. Fruit unknown.

DISTRIBUTION: Known from a single collection in Burma.

NOTES: The label records fruit, but they were absent in the specimen examined. Affinity is hence uncertain. The species is characterized by the dull chartaceous leaves, sub-adpressed pilose underneath and the conspicuous, but thin parallel, horizontal secondary nerves, the thin petioles and the short filaments.

NORTH BURMA: North Triangle (Hkinlum), alt. 1300 m, May, fl., *Kingdon-Ward 20788* (A, fragment L).

9. *Cinnamomum glauciphyllum* Kosterm., *spec. nov.*

Frutex vel arbor parva ramulis glabris nitidis apicem versus dense minutissime adpresse pilosis, ramis conspicue lenticellatis, gemmis terminalibus parvis dense adpresse pilosis, foliis alternantibus, rigide coriaceis, ellipticis, breve caudato-acuminatis, basi breyiter cuneatis vel acutis; supra nitidis laevibus nerviis tribus principalibus tenuibus prominulis in sulcis, subtus glaucis sparse adpresse pilosis, nervo mediano gracibus prominentibus, nervis basibus lateralibus tenuibus prominentibus acumine laminarum attingentibus; nerviis secundariis obscuris regularibus; petiolis tenuibus brevibus; paniculis axillaribus brevibus, pauci-floris dense minutissime adpresse pilosis; fructus ellipsoideis; cupulis late infundibuhformis apice plane-cupuhformibus, pubescentibus. — **TYPUS:** *Kingdon-Ward s.n.* (BM), Burma.

Shrub or small tree, highly aromatic (*Kingdon-Ward*). branches with large, pustular lenticels; branchlets smooth, glossy, apically angular and very densely, minutely adpressed pilose. Terminal bud small with similar indumentum. Leaves spirally arranged to sub-opposite, stiffly coriaceous, elliptic, 3 x 8 - 4 x 10 cm, caudate-acuminate (acumen ca 1 cm long, slender), base shortly cuneate or acute; above smooth, glossy, glabrous, the main nerves slender, prominulous in a groove; below glaucous, laxly minutely adpressed pilose (hairs ca 0.2 mm long), midrib slender, prominent, the basal (or almost so) lateral nerves slender, prominent, ending at the base of the acumen, connected by obscure, parallel, sub-horizontal secondary nerves, ca 2 mm apart. Petiole slender, ca 1 cm long, slightly concave above. Infructescens axillary, up to 3 cm long with a single fruit, densely, minutely adpressed pilose. Fruit ellipsoid, densely adpressed

pilose (hairs coarse, straight). Cupula consisting of a basal fleshy, obconical part (not differentiated from the petiole) ca 6 mm long, slightly flaring into a thin, shallow cup, ca 1 mm high and up to 5 mm diam. at the rim, which bears the broad, truncate, 0.5-0.75 mm high bases of the tepals.

DISTRIBUTION: Only known from the type locality.

NOTE: With the scanty material it is impossible to compare it with other species. Characteristics are the caudate, slender acumen, the glaucous lower leaf surface with adpressed hairs and the cupula.

BURMA: Mungku Hkyet, 27° 45' N, 97° 50' E, alt. ca 2500 m, Aug., fr., Kingdon-Ward s.n. (BM, L), in high thickets along the ridge on the sheltered side, common, highly aromatic.

10. *Cinnamomum ellipticifolium* Kosterm., *spec. nov.* - Fig. 5

Arbor ramulis sat crassis glabris, gemmis terminalibus parvis minutissime sericeis, foliis oppositis vel alternantibus coriaceis ellipticis obtusis vel obscure brevissime obtuseque acuminatis, basi cuneatis, supra laevibus nitidis nerviis tribus principalibus tenuibus prominulis, subtus pallidioribus laevibus minutissime sat sparse adpresse pilosis, nerviis tribus principalibus tenuibus prominentibus, nerviis basalibus vel subbasalibus-lateralibus apice laminarum attingentibus, petiolo sat crassis, paniculis pseudo-terminalibus multifloris laxis magnis, dense minutissime adpresse pilosis, pedicellis gracilibus longis; tepalibus ovato-oblongis extus dense griseo sericeis intus sericeis; staminibus paulo brevioribus, antheris oblongis, 4-locellatis, filamentis fere glabris paulo minoribus; glandulis magnis elongatis basalibus; staminodiis conspicuis sagittatis stipitatis; stylo longo, stigmatate parvo, subcapitato; cupulis immaturis cupuliformis, basi tepalorum truncatis induratis persistentibus. — TYPUS: *Dickson 6814* (A).

Tree, 13 m tall. Branchlets rather thick, glabrous, smooth. Terminal bud small, microscopically grey sericeous. Leaves opposite and spirally arranged, stiffly coriaceous, elliptic to oblong (rarely obovate-elliptic), 3 x 8 - 5 x 13 cm, obtuse or rarely very obscurely shortly acuminate, base cuneate; above smooth, glabrous, glossy, the three main nerves thin, prominulous; below paler, smooth, rather sparsely very minutely adpressed pilose, the three main nerves slender, prominent, the basal or sub-basal lateral nerves reaching the leaf tip. Pedicels rather stout, 1-1.5 cm long, almost flat above. Panicles pseudo-terminal, many-flowered, lax, up to 15 cm long; branchlets few, up to 4 cm long, peduncle long, rather slender, minutely adpressed pilose. Pedicels slender, 5-7 mm long, cylindrical. Flowers densely grey sericeous; tube shallow, broadly funnel shaped. Tepals ovate-oblong, acutish, 4 mm long, inside sericeous. Stamens slightly shorter; anthers oblong, 4-celled, slightly shorter than the filaments, which have long hairs at the base. Glands very large, elongate, at each side of the filament. Staminodes hastate on an as long stipe. Style slender, stigma minute, subcapitellate. Immature cupula cup-shaped, rather sharply demarcated

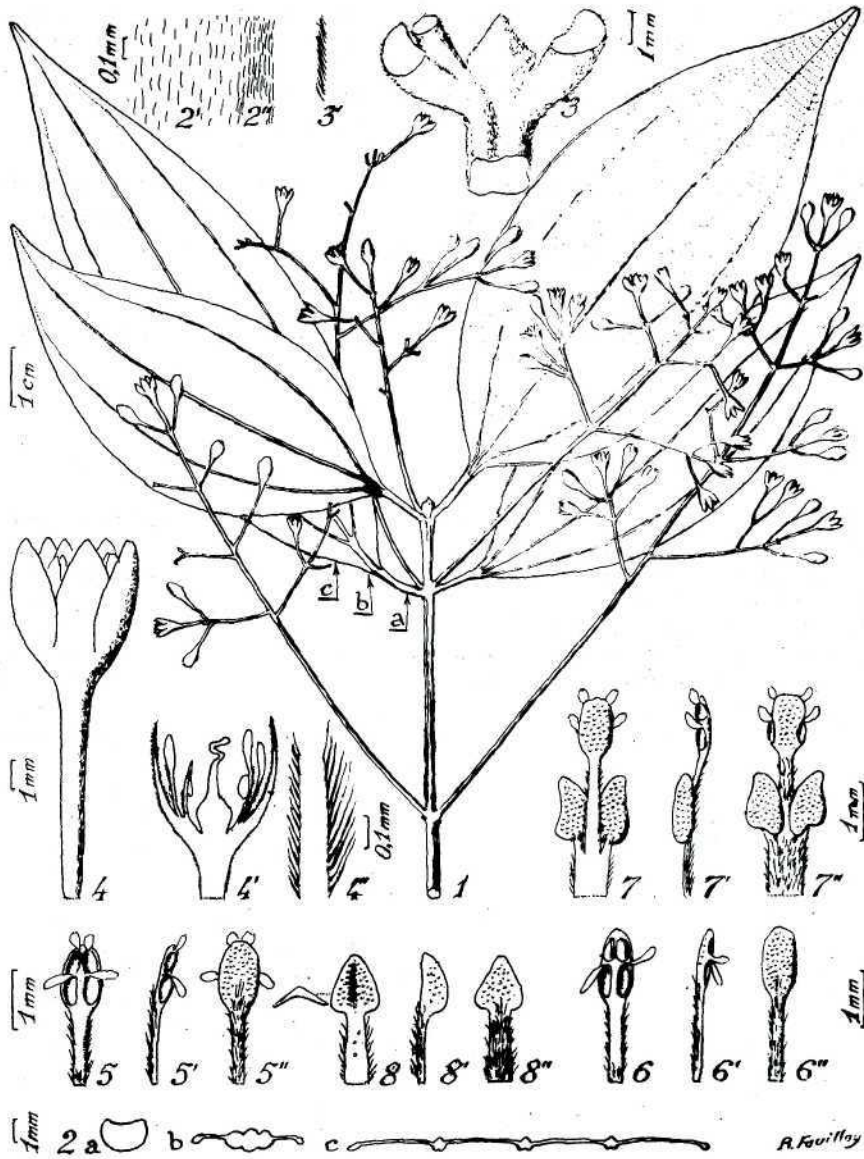


Fig. 5. *Cinnamomum ellipticifolium* Kosterm. (1) Flowering twig, righthand leaf upper surface, lefthand one lower surface; (2) sections at a, b, c, pilosity of lower surface; (2') on nerves below; (3) terminal bud; (3') its pilosity; (4) flower; (4') flower section; (4'') its interior pilosity, longer than the outside one; (5-5'-5'') whorl I; (6-6'-6'') whorl II; (7-T-7'') whorl III; (8-8'-8'') whorl IV. After For. off. 12288.

from the long pedicel, the margin bearing the large basal parts of the indurate tepals.

DISTRIBUTION: Lower Burma.

NOTES: Superficially the species shows some likeness with *Cinnamomum iners*, but the hairs of the indumentum of the lower leaf surface are longer, the flowers larger with much larger glands and the cupula is cup shaped with persistent tepal bases; whereas in *C. iners* there is no cup and the tepals persist as a whole.

In leaf shape it is very similar to *C. nalingway*, but the latter has an entirely different indumentum and an obconical very shallow, fleshy cupula of which the tepals persist as a whole.

Kurz in his *Flora of British Burma*, included this perhaps in *C. iners*, a species, which does not occur in Burma.

BURMA: Thaungyin Div., Taw ya loun Kaw Kareik For. Res., *For. Off.* 12288 (L); Rangoon, Dec, fl. & young fr., *Dickason* 6814 (A); Mergui, fl., *Griffith* 657 (GH).

11. *Cinnamomum birmanicum* Kosterm., *spec. nov.*

Cinnamomum bejolghota (non Sweet) Kostermans, *Reinwardtia* 8: 33. 1970, p.p., quoad *Falconer*, Tenasserim, sterile.

Arbor, foliis magnis, glabris pachyphyllus, subtus pallidis, nerviis basahbus apicem foliorum attingentibus, reticulatio minutis, cupulis fructiferis valde profundis, floribus sericeis. — TYPUS: *Falconer* s.n. (BO).

Tree with large, very thick, smooth leaves, the lower surface pale, glabrous, the three main basal nerves reaching the leaf apex, reticulation minute. Flowers sericeous. Fruit cup very deep (more than semi-globose).

NOTE: A badly known species, that should be re-examined. It resembles *C. bejolghota* Sweet, but the leaves are larger and have a more minute reticulation, moreover the main three basal nerves reach the leaf apex and the fruit cup is very deep.

BURMA; Tenasserim Prov., ster., *Falconer* s.n. (BO, L); N.E. Upper Burma, shrub 10-20 ft., foliage aromatic, open thickets in side valleys of streams, sterile, Sept. 1924, *Forrest* 24919, leaves elliptic. 14 x 29 - 11 x 27 cm, petiole very stout, 3 cm long, acumen broad, very short (BM); S. Tenasserim, Mar., fl., *Forest Officer* 1008 (CAL); Papu. fl., sine coll. 16094 (CAL); Amherst, Kaw Ngaw stream, 1000 m alt. young buds, *Wallich* Atran, buds 1 Apr. 1827 (another label reads: *Sylhet* 1828 (276 = 2574 A)); Tavoy, Kalemang Res., 800 ft., Mar., fr. *Sein Gyi* 953, cup 3 cm high, 2.5 cm diam., fr. 8.5 x 2 cm.

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The Publication of this issue of *Reinwardtia* is assisted by a grant from the Faculty of Science, Osaka City University (Japan) to which an acknowledgement is gratefully made.