

The genus *Morinda* (Rubiaceae) in Thailand

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Received 13 Nov 2012

Accepted 23 May 2013

ABSTRACT: The genus *Morinda* (Rubiaceae) is revised and presented with a key to species, descriptions with distributional and ecological data, together with illustrations of some species. Nine species are considered, one of which is divided into two varieties. Two species and one variety are endemic to the country. *M. talmyi* is typified. *M. longifolia* and *M. pumila* are reduced to synonymy with *M. pandurifolia* and *M. tomentosa*, respectively.

KEYWORDS: revision, endemic, distributional data, taxonomic studies

INTRODUCTION

The genus *Morinda* was described by Linnaeus¹, including three species, *M. citrifolia* L., *M. royoc* L., and *M. umbellata* L. The genus comprises ca. 40 species, distributed mainly in the pantropical region². The species occur in primary and secondary forests and scrubs in the lowlands as well as at higher altitudes. These plants are distinguished from other genera of the Rubiaceae by the following characters: the growth habits are small trees or shrubs, rarely lianas. Leaves are petiolate or sessile, with chartaceous to coriaceous. The inflorescences are either leaf-opposed or axillary, with a stalked head of flowers which are fused together by their ovaries. Flowers are bisexual; stamens inserted in the tube or near the throat; the ovary is bilocular, with longitudinal false dissepiments, each carpel has 2 ovules; style with 2-lobed stigma. The fruits are fused together as syncarps; seeds are globose or semi-globose²⁻⁴. The genus *Morinda* is placed in the tribe Morindeae, subfamily Rubioideae and the systematic affinities of the genus have been discussed by Baillon⁵, Vercourt⁶, Bremekamp⁷, Johansson^{8,9}, Robbrecht¹⁰, and Razafimandimbison et al^{2,3,11,12}.

Taxonomic studies of the genus *Morinda* in Thailand have been presented on checklist or description of new species. Craib¹³ described five new species from Thailand, viz., *M. cinnamomea*, *M. longifolia*, *M. nana*, *M. pumila*, and *M. scabrida*. He also published the list of the species from Thailand¹⁴. Fifteen species and three varieties were recorded but no key made available.

The lack of a revision has led to difficulty in identification of the Thai species and has frequently

given rise to wrong determinations. Hence this present work is considered worthwhile undertaking an up-to-date study. Nine species (10 taxa) are now recognized from Thailand.

TAXONOMIC TREATMENT

Morinda

L., Sp. Pl.: 176. 1753; Benth. & F. Muell., Fl. Austral. 3: 423. 1866; Kurz, Forest Fl. Burma 2: 58. 1877; Hook. f., Fl. Brit. Ind. 3: 157. 1880; Pitard in Lecomte, Fl. Indo-Chine 3: 418. 1922; Ridl., Fl. Mal. Pen. 2: 117. 1923; Backer & Bakh. f., Fl. Java 2: 349. 1965; Ohwi, Fl. Jap.: 826. 1965; Wong, Malay Nat. J. 38: 95. 1984 & in Ng, Tree Fl. Mal. 4: 376. 1989.

Trees, shrubs or scandent shrubs; young branches terete or subterete, with a longitudinal groove in the middle on the wider side, bark smooth, glabrous or with sparse and short hairs; older branches subterete, bark smooth or shallowly fissured, glabrous or with sparse and short hairs. *Leaves* simple, opposite; blade variable in shape, elliptic, broadly elliptic, oblong, obovate, lanceolate or fiddle-like shaped; base attenuate, cuneate to rounded; apex acute or acuminate; coriaceous or membranous, glabrous, with sparse and short hairs, puberulous or tomentose; lateral veins prominent or obscure, domatia usually present in axils of lateral veins on the lower leaf surface. *Interpetiolar stipules* acute to acuminate, truncate, obtuse, bilobed or foliaceous, usually partially connate and forming a sheath enclosing basal parts of the internode. *Leaf-opposed inflorescences*: solitary or paired, with ovaries connate into pedunculate capitula, each capitulum composes of many flowers fused by their

Table 1 Key to species of *Morinda* in Thailand.

1. Trees or shrubs. Leaves very uniform. Pedunculate capitula at anthesis more than 4 mm long	
2. Trees. Corolla hypocrateriform, lobes oblong, corolla tube up to 1.8 cm long	
3. Leaves less than 14 cm wide, venation prominent. Infructescences globose, subglobose or oblique, ripening black	
4. Leaves margin entire. Corolla tube more than 1 cm long. Filaments straight	
5. Leaves and flowers glabrous	3. <i>M. coreia</i>
5. Leaves and flowers hairy	9. <i>M. tomentosa</i>
4. Leaves margin undulate. Corolla tube up to 1 cm long. Filaments curved	4. <i>M. elliptica</i>
3. Leaves more than 14 cm wide, venation obscure. Infructescences ellipsoid, ripening whitish yellow or whitish green	2. <i>M. citrifolia</i>
2. Shrubs. Corolla infundibular, lobes ovate or elliptic, corolla tube more than 1.8 cm long	
6. Both surfaces of leaf glabrous or with sparse and short hairs. Fruitlets free, or slightly connate at the base	1. <i>M. angustifolia</i>
6. Upper surface of leaf with sparse and short hairs, lower one with dense hairs. Fruitlets fused	7. <i>M. scabrida</i>
1. Shrubs or scandent shrubs. Leaves variable in shape. Pedunculate capitula at anthesis sessile or up to 4 mm long	
7. Leaves coriaceous, with sparse and short hairs on both surfaces, upper leaf surface dark green, venation prominent	
8. Leaves 0.5–1 × 1.5–2 cm, lateral veins 4–5 pairs	5. <i>M. nana</i>
8. Leaves 1–3.5 × 3–15 cm, lateral veins 8–12 pairs	6. <i>M. pandurifolia</i>
7. Leaves membranaceous, glabrous on both surfaces, upper leaf surface light green venation obscure	8. <i>M. talmyi</i>

ovaries. *Flowers* (4-)5-(6-) merous, fragrant, bisexual; usually heterostylous, with brevistylous and longistylous flowers; calyx tube at least basally connate; calyx lobes truncate or denticulate, acute or obtuse, one teeth sometimes enlarged and subfoliaceous; corolla infundibular or hypocrateriform, white or coloured; corolla tube inside glabrous or usually covered with sparse and short hairs and in upper half villous or with long hairs, lower part of tube with or without longitudinal narrow slits below stamens; corolla lobes oblong or elliptic, glabrous or usually covered with sparse and short hairs at base. *Stamens* included or exerted in the corolla tube; filaments short or long, anthers included or exerted. *Ovary* 2-locular, with 2 ovules per locule; stigma bilobed, included or slightly exerted. *Infructescences* globose, subglobose, ellipsoid or oblique, consist of fused drupes or fruitlets not distinctly fused. *Seed* 1–4 per fruitlet, flattened, concavo-convex, ovoid or ellipsoid, with a narrow transversal slit at lower part, seed coat membranous.

About 40 species, the majority widely distributed throughout tropical and subtropical regions, nine species in Thailand (Table 1).

1. *Morinda angustifolia* Roxb., [Hort. Beng.: 15. 1814, *nom nud.*] Cor. Pl. 3: 32, t. 237. 1819 & Fl. Ind. 2: 201. 1824; DC., Prodr. 4: 447. 1830; Kurz, Forest Fl. Burma 2: 61. 1877; Hook. f., Fl. Brit. Ind. 3: 156. 1880; Brand., Ind. Trees: 392. 1906; Pitard in Lecomte, Fl. Indo-Chine 3: 419. 1922; Craib, Fl. Siam. Enum. 2: 174. 1934; Hara, Fl. E. Himal.: 312.

1966. Type: India, Silhet, 12 July 1809, Wallich, Cat no. 8420 (holotype **K-W!**).

Key to the varieties

- | | |
|--------------------|-----------------------------|
| 1. Leaves glabrous | a. var. <i>angustifolia</i> |
| 1. Leaves hairy | b. var. <i>scabridula</i> |

a. var. *angustifolia* Shrubs up to 3 m; young branches subterete, bark smooth, greenish, glabrous; older branches subterete, bark smooth or shallowly fissured, brownish to grey. *Leaves* elliptic, oblong or obovate, 3–7 by 19–25 cm, coriaceous; base attenuate or cuneate; margin entire; apex acuminate; upper leaf surface light green, lower leaf surface greenish, glabrous on both surfaces; lateral veins 7–9 pairs, venation prominent; drying dark brown; petiole 0.5–1 cm long, glabrous. *Stipules* triangular, acuminate, connate at base, glabrous, usually persistent. *Leaf-opposed inflorescence*: capitula solitary or paired; peduncle at anthesis 1–3 cm long. *Flowers* 4–5 (–6)-merous, fragrant, bisexual, heterostylous; calyx tube at least basally connate; lobes truncate or obtuse; corolla infundibular, greenish or white to pink; corolla tube 2–2.7 cm long, inside glabrous, outside with sparse and short hairs; corolla lobes ovate or elliptic, 3.8–7 by 10–15 mm. *Stamens* included in the corolla tube, attached to the tube at the middle or lower part; filaments linear, 0.5–1 mm long; anthers yellow, oblong, 4.5–5.5 mm long; style white, 5–8 mm long in brevistylous flower, 18–27 mm long in longistylous flower, glabrous. *Ovary* 2-locular; stigma bilobed, included or slightly exerted from the corolla throat,

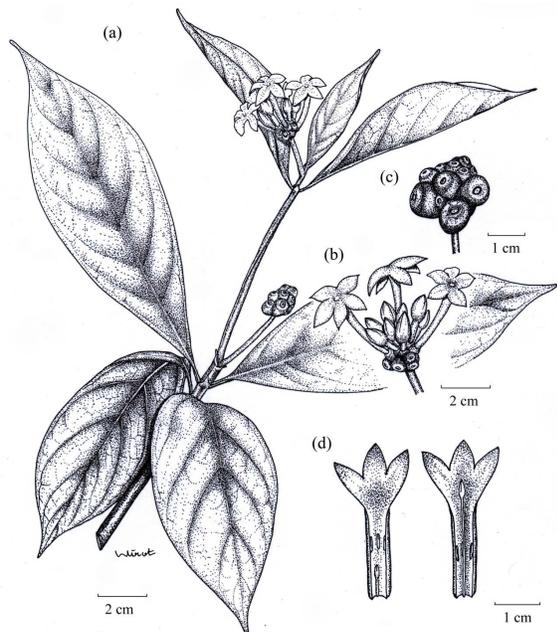


Fig. 1 *M. angustifolia* Roxb. var. *scabridula* Craib: (a) habit; (b) inflorescence; (c) infructescence; (d) longitudinal section of brevistylous and longistylous flowers. (a), (b) and (c) from *W. Kesonbua* 87; (d) from *W. Kesonbua* 87 (brevistylous flower) and *W. Kesonbua* 88 (longistylous flower). Drawn by *W. Kesonbua*.

3–8 mm long. *Infructescences* oblique, with 16–37 fruitlets; fruitlet free, individual not distinctly fused. *Seed* ovoid or ellipsoid, 2–3 by 5–6 mm, testa rough.

Thailand.—NORTHERN: Chiang Mai [Mae Rim district, 18 Mar. 1994, *H.B.G. Garrett* 171 (**ABD 2 sheets, BKF, BM, K, L, TCD**)]; Lampang [Mae Tha district, 26 Oct. 1983, *Anderson* 5237 (**BKF**)].

Distribution.— India, Bangladesh, Bhutan, Myanmar, Indo-China.

Ecology.— Scattered in dry dipterocarp and mixed deciduous forests, alt. 600–1000 m. Flowering period: March–October.

Vernacular.— ‘Salak ban’ (Northern).

Note.— *M. angustifolia* is distinguished from all other Thai species of *Morinda* in its fruits free or less connate at the base. The corolla varies in colour from white to pink.

b. var. scabridula Craib, *Fl. Siam. Enum.* 2: 174. 1934. Type: Thailand, Phitsanulok, Nakhon Thai district, *A.F.G. Kerr* 8907 (holotype **BK!**; isotypes **ABD!**, **BM!**, **K!**). Fig. 1.

Leaves covered with sparse and short hairs throughout.

Thailand.—NORTHERN: Mae Hong Son [Mae Sariang, 18 Sept. 1967, *Iwatsuki & Fukuoka* T-10370 (**BKF, P**)]; Chiang Mai [Ban Bo Luang, 12 June 1973, *Geesink, Phanichapol & Santisuk* 5850 (**AAU**)]; Doi Chiang Dao, 13 July 1998, *Chatchai* 894 (**BKF**), 1 April 1955, *Garrett* 1446 (**K, P**); Doi Suthep, 23 Mar. 1965, *Chermsirivathana* 318 (**BKF**) & 356 (**BK**), 23 April 1991, *Dawson* 26 (**BK, K**) & 27 (**BKF, K**), 23 Feb. 1988, *Maxwell* 88–223 (**BKF, CMU, L**), 1 April 1988, *Maxwell* 88–417 (**CMU**), 29 Jan. 1989, *Maxwell* 89–107 (**CMU**), 24 Mar. 1992, *Soradat* 425 (**BKF**); Mae Rim district, 18 Mar. 1994, *BGO. Staff* 432 (**QBG**), 5 Feb. 2001, *Pongamornkul* 613 (**QBG**); Mae Sa Botanic Garden, 17 April 1964, *Pooma* 411 (**BKF**); Chiang Rai [Mae Salong, 27 Feb. 1926, *Winit* 1610 (**BK, K**)]; Nan [NE of Santisuk, km 45–55 along road 1081, *Larsen, Larsen, Niyomdham, Siriruga, Tarvengadum & Nrgaard* 43 537 (**AAU, BKF, PSU, P**)]; Lampang [Jae Son National Park, 14 Feb. 1996, *Maxwell* 96–208 (**BKF, L**)]; Phitsanulok [Nakhon Thai district, *Kerr* 8907 (**ABD, BK, BM, K**); Thung Salang Luang National Park, 19 Feb. 1964, *Kerr* 4736 (**BK, BM, K**), 7 April 1964, *Pradit* 785 (**BK**), 19 April 1964, *Pradit* 813 (**BK**); Phu Soi Dao National Park, 9 Mar. 2003, *Kesonbua* 87 (**KKU**) & 88 (**KKU**); NORTH-EASTERN: Loei [Dan Sai, 18 April 1968, *Chermsirivathana* 949 (**BK**)]; SOUTH-WESTERN: Kanchanaburi [Si Sawat, 24 May 1962, *Kasem* 169 (**BK**)].

Distribution.— Endemic to Thailand.

Ecology.— In deciduous dipterocarp, dry evergreen, hill evergreen and mixed deciduous forests, alt. 120–1200 m. Flowering period: January–May.

Vernacular.— ‘Charak dong’, ‘tueng sai’, ‘salak’, ‘yo din’ (Chiang Mai); ‘salak pa’ (Lampang).

Note.— Var. *scabridula* differs from the typical variety only in its leaves having short hairs on both surfaces.

2. *Morinda citrifolia* L., *Sp. Pl.*: 176. 1753; Roxb., *Fl. Ind. ed.* 2, 2: 196. 1824; Miq., *Fl. Ind. Bat.* 2: 242. 1856; Benth. & F. Muell., *Fl. Austral.* 3: 423. 1866; Kurz, *Forest Fl. Burma* 2: 60. 1877; Hook. f., *Fl. Brit. Ind.* 3: 155. 1880; Brand., *Ind. Trees*: 392. 1906; Pitard in Lecomte, *Fl. Indo-Chine* 3: 423. 1922; Ridl., *Fl. Mal. Pen.* 2: 117. 1923; Craib, *Fl. Siam. Enum.* 2: 175. 1934; Backer & Bakh. f., *Fl. Java.* 2: 351. 1965; Wong, *Malay Nat. J.* 38: 94. 1984 & in Ng, *Tree Fl. Mal.* 4: 377. 1989.— *M. bracteata* Roxb., *Fl. Ind.* 2: 198. 1824; Thw., *Enum. Pl. Zeyl.*: 144. 1859. Type: India, *Hermann* s.n. (lectotype **BM!**).

Trees up to 10 m; young branches terete, bark greenish or grey, glabrous; older branches subterete,

bark smooth, grey to light brownish grey. *Leaves* elliptic or broadly elliptic, 14.5–25 by 15.5–35.5 cm, coriaceous; base attenuate or cuneate; margin entire or less undulate; apex acute; upper leaf surface glossy dark green, lower leaf surface pale green, glabrous on both surfaces; lateral veins 5–7 pairs, venation obscure, domatia usually presence in axils of lateral veins on the lower surface; drying dark brown or black; petiole 1–2.5 (–3.8) cm long, glabrous. *Stipules* truncate or obtuse to acuminate or bilobed, sometimes almost foliaceous, connate at base, usually persistent. *Leaf-opposed inflorescence*: capitula solitary peduncle at anthesis 5–15 mm long. *Flowers* 5–6-merous, fragrant, bisexual; calyx tube basally connate; calyx lobes truncate, one teeth sometimes enlarged and subfoliaceous; corolla hypocrateriform, white or greenish; corolla tube 8–10 mm long, with long hairs or villose in upper 1/3 and usually in tube, outside white, glabrous; corolla lobes oblong, 1.5–2.5 by 4–7 mm, inside white, glabrescent, outside glabrous. *Stamens* included in the corolla tube or immediately below the corolla throat; filaments 2–3 mm long; anthers yellow, oblong, 2.5–3 mm long; style white, 8–10 mm long, glabrous. *Ovary* 2-locular; stigma greenish, bilobed, 1.5–3 mm long. *Infructescences* ellipsoid, with 50–90 fruitlets, glabrous; ripening whitish yellow or whitish green. *Seed* concavo-convex or ovoid, 4–5 by 8–11 mm, with a slit at lower part, testa rough.

Thailand.— Widely cultivated in all provinces; NORTHERN: Chiang Mai [Muang district, 25 April 1991, Maxwell 91–372 (CMU, P); Phrao district, 7 Dec. 1997, Watthana 54 (QBG)]; NORTH-EASTERN: Khon Kaen [Khon Kaen University, 4 June 2002, Kesonbua 44 (KKU)]; EASTERN: Nakhon Ratchasima [Khao Yai National Park, 16 April 1927, Kerr 12 767 (ABD, BKF, BM, K)]; CENTRAL: Pathum Thani [not located, 30 July 1973, Murata & Fukuoka T-17326 (BKF); Samut Prakan [Pak Nam, 26 April 1931, Kerr 20 446 (ABD, BKF, BM, K, TCD), 25 April 1920, Marcan 239 (AAU, BM)]; SOUTH-EASTERN: Trat [Ko Chang, 2 May 1974, Geesink, Hattink & Phengkklai 6606 (BKF, P), 4 April 1923, Marcan 1293 (AAU, ABD 2 sheets, BM)]; PENINSULAR: Surat Thani [Ko Tao, 20 July 1927, Kerr 12 977 (ABD, BK, BKF, BM, K, E, TCD)]; Satun [Tarutao Island, 1 Dec. 1979, Congdon 209 (AAU, PSU), 1 May 2003, Kesonbua 76 (KKU); Adang Island, 15 Jan. 1928, Kerr 14 086 (ABD, BKF, BM, K, TCD)]; Songkhla [not located, 10 Sept. 1979, Choatip 24 (PSU)]; Ko Kobe, Songkhla lake, 26 May 1984, Sirirugsa 838 (PSU)].

Distribution.— Widely cultivated throughout the

tropics.

Ecology.— Cultivation. Flowering period: all year round.

Vernacular.— ‘Mata suea’ (Northern); ‘yo’, ‘yo ban’ (Central).

Note.— *M. citrifolia* is distinct from all other *Morinda* in having enlarged and leaf-like stipules, ellipsoid fruits and leaves larger than other species. Some specimens have one enlarged and subfoliaceous calyx lobe.

3. *Morinda coreia* Ham., Trans. Linn. Soc. London 13: 537. 1822. Type: India, Malabar, Mithila, Sukanagor, B. Hamilton 709 (holotype: E; isotype K!).— *M. tinctoria* Roxb., [Hort Beng.: 15. 1814, nom. nud.] Fl. Ind. 1: 197. 1824; Hook. f., Fl. Brit. Ind. 3: 156. 1880; Pitard in Lecomte, Fl. Indo-Chine 3: 424. 1922. Type: India, Roxburgh drawing 918 (lectotype K!).— *M. exserta* Roxb., Fl. Ind. 2: 199. 1824. Type: India, Roxburgh s.n., not seen.

Trees up to 15 m; young branches terete to subterete, bark smooth, greenish, glabrous; older branch subterete, bark shallowly fissured, brownish to grey. *Leaves* elliptic, 8.5–11.5 by 18–25.5 cm, coriaceous; base cuneate; margin entire; apex acute or acuminate; upper leaf surface light green, lower leaf surface greenish, glabrous on both surfaces; lateral veins 7–10 pairs, venation prominent, domatia usually presence in axils of lateral veins on the lower surface; drying dark black; petiole 1.2–3.5 cm long, glabrous. *Stipules* triangular, acute to acuminate, connate at base, usually caducous. *Leaf-opposed inflorescence*: capitula solitary or paired; peduncle at anthesis 2.5–6 cm long. *Flowers* 5–6-merous, fragrant, bisexual; heterostylous; calyx tube basally connate, glabrous; calyx lobes truncate or denticulate; corolla hypocrateriform, white or greenish; corolla lobes oblong, 2.5–5 by 10–15 mm; corolla tube 1.2–1.7 cm long, glabrous on both sides. *Stamens* included the tube or exerted in corolla tube; filaments linear, straight, 1–5 mm long; anthers yellow, oblong, 6–7 mm long; style white, glabrous, 5–7 mm long in brevistylous flower, 13–16 mm long in longistylous flower. *Ovary* 2-locular; stigma bilobed, 4–7 mm long, included or exerted in the corolla tube. *Infructescences* globose or subglobose, with 10–35 fruitlets, glabrous, ripening black. *Seed* ellipsoid or ovoid, 3.5–5 by 6–9.5 mm, testa rough.

Thailand.— NORTHERN: Mae Hong Son [Mae Sarieng, 12 July 1968, Larsen, Santisuk & Warncke 2373 (AAU, P), 5 July 1996, Sangkhachand 347 (BK)]; Chiang Mai [Bo Luang, 12 June 1973, Geesink, Phanichapol & Santisuk 5850 (P), 14

June 1968, *van Beusekom & Phengklai* 1236 (AAU, BK, BKF, K, L, P); Doi Inthanon, 18 July 1988, *Fukuoka* T-62048 (BK, BKF), 18 July 1998, *Phengklai, Tamura, Niyomham & Sangkhachand* 4276 (BK, BKF, K), 24 Nov. 1969, *Worawat* 25 (BKF); Ob Luang, 20 April 1983, *Umpai* 481 (BK); NORTH-EASTERN: Loei [Phu Kradueng, 27 Aug. 1988, *Fukuoka* T-63680 (BK, BKF, L); Wang Sapung, 21 May 1951, *Pan* 105 (BK, BKF)]; Khon Kaen [Khon Kaen University, 16 Mar. 2002, *Kesonbua* 7 (KKU), 26 Mar. 2002, *Kesonbua* 9 (KKU), 5 June 2002, *Kesonbua* 24 (KKU); Chum Phae, 11 Aug. 1972, *Larsen, Nielsen & Santisuk* 31 666 (P)]; Nakhon Ratchasima [Sakae Rat, 6 July 1991, *Eidthang* W-232 (BK, BKF)]; SOUTH-WESTERN: Kanchanaburi [Sai Yok, 15 July 1946, *Kostermans* 1166 (P), 29 Mar. 1992, *Preecha* 385 (BK, BKF)]; CENTRAL: Saraburi [Sam Lan forest, 13 April 1974, *Maxwell* 74–262 (BK, L), 7 June 1975, *Maxwell* 75–578 (AAU, BK, L)]; SOUTH-EASTERN: Chon Buri [Toong Brong, 4 May 1971, *Maxwell* 71–388 (BK), 6 May 1972, *Maxwell* 72–211 (AAU, BK)]; Sichang Island, 8 May 1993, *Maxwell* 93–396 (BK, BKF, L, Herb., Biology, Chiang Mai University)].

Distribution.— India, Indo-China.

Ecology.— In deciduous dipterocarp, hill evergreen and mixed deciduous forests, alt. 50–1300 m. Flowering period: February–July.

Vernacular.— ‘Khu’ (Karen - Kanchanaburi); ‘kho’ (Karen); ‘yo pa’ (General).

Note.— *M. coreia* is easily distinguished by having tree-like habit, glabrous and coriaceous leaves, white and glabrous corolla, and the stamens which are inserted or included in the corolla tube.

4. *Morinda elliptica* (Hook. f.) Ridl., Jour. Str. Br. Roy. As. Soc. 79: 86. 1918 & Fl. Mal. Pen. 2: 118. 1923; Wong, Malay Nat. J. 38: 94. 1984 & in Ng, Tree Fl. Mal. 4: 377. 1989.— *M. citrifolia* var. *elliptica* Hook. f., Fl. Br. Ind. 3: 156. 1880; King & Gamble, J. As. Soc. Beng. 73: 87. 1904. Type: Myanmar, Tavoy, F. de Silva & W. Gomez in *Wallich*, Cat. no. 8434 (holotype K-W!).

Trees up to 10 m; young branches subterete, bark smooth, greenish, glabrous; older branches terete, bark shallowly fissured, brownish to grey. *Leaves* elliptic, 4–6.5 by 10–19.5 cm, coriaceous; base cuneate; margin undulate; apex acute or acuminate; upper leaf surface light green, lower leaf surface greenish, glabrous on both surfaces; lateral veins 6–8 pairs, venation prominent, domatia usually presence in axils of lateral veins on the lower surface; drying dark black; petiole 1–2.5 cm long, glabrous. *Stipules* trian-

gular, acute to acuminate, connate at base, usually caducous. *Leaf-opposed inflorescence*: capitula solitary or paired; peduncle at anthesis 3–6 cm long. *Flowers* 5 (–6)-merous, fragrant, bisexual; calyx tube at least basally connate, glabrous; calyx lobes obtuse or triangular; corolla hypocrateriform, white or greenish; corolla tube 0.6–1 cm long, glabrous on both sides; corolla lobes oblong, 2–2.5 by 5.5–8 mm, glabrous on both sides. *Stamens* exerted, attached to the tube by a short filament; filaments linear, curved, 1–2 mm long; anthers white or yellowish grey, oblong, 5–6 mm long; style white, 1.3–1.6 cm long, glabrous. *Ovary* 2-locular; stigma bilobed, 4–6 mm long, exerted in the corolla tube. *Infructescences* subglobose or oblique, with 38–60 fruitlets, glabrous, ripening black. *Seed* ellipsoid or ovoid, 4.5–6 by 6.5–8 mm, testa rough.

Thailand.— PENINSULAR: Ranong [Kapor district, 13 Aug. 1977, *Santisuk* 1240 (PSU); Ngaw waterfall, 27 April 1974, *Tippa* 127 (BK)]; Phangnga [Khong Nang Yon, 28 April 1973, *Geesink & Santisuk* 4981 (AAU, E, K, L, P)]; Nakhon Si Thammarat [Ban Kiri Wong, 26 April 2003, *Kesonbua* 74 (KKU)]; Satun [Adang Island, 6 Dec. 1979, *Congdon* 225 (AAU, PSU)]; Phuket [Khao Chiang Khrod and Khao Sa, 7 May 1968, *van Beusekom & Phengklai* 630 (P)]; Krabi [Klong Chilad, 13 July 1992, *Larsen, Larsen, Niyomdham, Sirirugsa, Tarvengadum & Nrgaard* 43 361 & 43 363 (P), 15 km NW of Krabi, 15 July 1992, *Larsen, Larsen, Niyomdham, Sirirugsa, Tarvengadum & Nrgaard* 43 421 (P)]; Songkhla [Had Yai district, 23 April 1985, *Vacharee* 630 (BK)]; Khao Kor Hong, 3 Jan. 1974, *JRC* PS 218 (PSU), 8 Nov. 1990, *Larsen, Larsen, Barfod, Nanakorn, Ueachirakan & Sirirugsa* 41 223 (BKF), 2 July 1993, *Puff & Sridith* 930 702-1/2 (AAU, PSU), 26 Aug. 1974, *Sutus* 33 (PSU); Klong Hoy Kong, 6 May 1985, *Tongseedam* 22 (PSU, L)]; Yala [Betong district, 13 Aug. 1923, *Kerr* 7637 (AAU, ABD, BK, BM, E, K)]; Nikom Kua Long, 1 Dec. 1972, *Pinnin et al.* 1 (P)]; Narathiwat [Khao Samnak, 23 April 1986, *Niyomdham et al.* 1210 (AAU, BKF, P)]; Bacho district, 22 April 1961, *Sangkhachand* 77 (L, K, P), 16 Dec. 1968, *Sangkhachand* 1573 (BK); Tak Bai, 9 Sept. 1987, *Sangkhachand & Sriboonma*, 1567 (BKF, P)].

Distribution.— India, Malaysia.

Ecology.— In evergreen rainforest and mixed deciduous forests, alt. 0–200 m. Flowering period: January–August.

Vernacular.— ‘Ka-mu-du’ (Malay-Narathiwat); ‘yo pa’ (Trang, Satun).

Note.— *M. elliptica* is similar to *M. coreia*, but it differs by the smaller flower, the exerted stamens and the curved filament. *M. elliptica* is confined only in

the south, but *M. coreia* is widespread in the country but not in the south.

5. *Morinda nana* Craib, Bull. Misc. Inform., Kew 1932: 434. 1932 & Fl. Siam. Enum. 2: 177. 1932. Type: Thailand, Nakhon Phanom, Ta Uten district, A.F.G. Kerr 8461 (holotype **BK!**; isotypes **ABD!**, **BM!**, **K!**).

Shrubs or scandent shrubs; young branches terete, bark smooth, greenish, with sparse and short hairs; older branches subterete, bark smooth, brownish to grey. *Leaves* variable, elliptic or fiddle-like shaped, 0.5–1 by 1.5–2 cm, coriaceous; base cuneate; margin entire; apex acute; upper leaf surface dark green, lower leaf surface greenish, with sparse and short hairs on both surfaces; lateral veins 4–5 pairs, venation prominent; drying dark brown; petiole up to 3 mm long, glabrous. *Stipules* triangular, acute to acuminate, connate at base, usually persistent. *Leaf-opposed inflorescence*: capitula solitary, peduncle at anthesis sessile or up to 3 mm long. *Flowers* 5–6-merous, fragrant, bisexual; calyx tube basally connate, with sparse and short hairs; calyx lobes obtuse or triangular; corolla hypocrateriform, white or greenish; corolla tube 6–7 mm long, glabrous or with sparse and short hairs on both sides; corolla lobes oblong, 1–2 by 4–5 mm long, with sparse and short hairs on both sides. *Stamens* included or exerted in the corolla tube, attached to the tube by a short filament; filaments linear, 1–1.5 mm long; anthers yellow, oblong, 3–4 mm long; style white, 9–10 mm long, glabrous. *Ovary* 2-locular; stigma bilobed, 1.5–2 mm, included or exerted in the corolla tube. *Infructescences* subglobose or oblique, with sparse and short hairs. *Seed* ellipsoid or ovoid, testa rough.

Thailand.— NORTH-EASTERN: Nakhon Phanom [Ta Uten district, 6 Feb. 1924, Kerr 8461 (**ABD**, **BK**, **BM**, **K**)]; EASTERN: Amnat Charoen [Chanuman district, Ban Bung Kheio, 26 Mar. 1923, Kesonbua 61 & 62 (**KKU**)].

Distribution.— Endemic to Thailand.

Ecology.— Very common along stream banks, alt. ca. 200 m. Flowering: February–March.

Vernacular.— ‘Yo phaya mai’ (Eastern).

Note.— *M. nana* differs from the other *Morinda* and its allies by the smaller leaves and inflorescence.

6. *Morinda pandurifolia* Kuntze, Rev. Gén. 1: 289: 1891; Craib, Fl. Siam. Enum. 2: 178. 1934.— *M. persicaefolia* var. *pandurifolia* (Kuntze) Pitard in Lecomte, Fl. Indo-Chine 3: 122. 1922. Type: Cambodia, Campong luang, Thorel s.n. (isotype **P!**).— *M. pandurifolia* Kuntze var. *tenuifolia* Craib, Fl. Siam. Enum. 2: 178. 1934. Type: Thailand, Surat Thani,

Ban Na, A.F.G. Kerr 18 124 (holotype **BK!**, isotype **ABD!**).— *M. longifolia* Craib, Bull. Misc. Inform., Kew 1932: 434. 1932 & Fl. Siam. Enum. 2: 177. 1934. Type: Thailand, Tak, Raheng, A.F.G. Kerr 4577 (holotype **BK!** isotypes **ABD!**, **BM!**), **synon. nov.**

Shrubs or scandent shrubs; young branches terete, bark smooth, greenish, with sparse and short hairs; older branches subterete, bark smooth, brownish to grey. *Leaves* elliptic, lanceolate, oblong or fiddle-like shaped, 1–3.5 by 3–15 cm, coriaceous; base cuneate; margin entire; apex acute or acuminate; upper leaf surface dark green, lower leaf surface greenish, with sparse and short hairs on both surfaces; lateral veins 8–12 pairs, venation prominent; drying dark brown; petiole 1–3 cm long, glabrous or with sparse and short hairs. *Stipules* triangular, acute to acuminate, connate at base, usually caducous. *Leaf-opposed inflorescence*: capitula solitary; peduncle at anthesis sessile or up to 4 mm long. *Flowers* 5–6-merous, fragrant, bisexual; heterostylous; calyx tube basally connate, with sparse and short hairs; calyx lobes obtuse or triangular; corolla hypocrateriform, white or greenish, corolla tube 1.5–1.8 cm, inside glabrous or with sparse and short hairs, outside puberulous; corolla lobes oblong, 3–5.5 by 15–14.5 mm, inside glabrous, outside puberulous or with spares and short hairs. *Stamens* included or exerted in the corolla tube, attached to the tube by a short filament; filaments linear, 1–4 mm long; anthers yellow, oblong, 5.5–6.5 mm long; style white, 3–5 mm long in brevistylous flowers, 8–10 mm long in longistylous flower, glabrous. *Ovary* 2-locular; stigma bilobed, 1–2 mm long, included or exerted in the corolla tube. *Infructescences* globose, subglobose or oblique, with 23–50 fruitlets; fruitlet with sparse and short hairs, green. *Seed* ellipsoid or ovoid, 4.5–6.5 by 7–11.5 mm, testa rough.

Thailand.— NORTHERN: Tak [Raheng, Kerr 4577 (**BK**, **ABD**, **BM**)]; NORTH-EASTERN: Loei [Wang Sapung district, 15 April 1991, Din 161 (**BKF**)]; Phu Kradueng, 15 April 1991, Sin 161 (**BKF**); Maha Sarakham [Kosum Phisai, May 1968, Smitinand 10 444 (**BKF**, **P**)]; CENTRAL: Ang Thong [6 Mar. 1971, Maxwell 71–120 (**AAU**, **BK**)]; Wat Glang, Howa Pie, Muang district, 31 May 1975, Maxwell 75–570 (**AAU**, **BK**, **L**)].

Ecology.— In dry evergreen and deciduous dipterocarp forests, stream banks, alt. 0–150 m. Flowering period: December–April.

Distribution.— Indo-China.

Vernacular.— ‘Yo pa’ (Ang Thong).

Note.— *M. pandurifolia* is distinguished by its shrubs or scandent shrubs. The margin of leaf is entire and usually curving inwards in the middle part.

7. *Morinda scabrida* Craib, Bull. Misc. Inform., Kew 1932: 435. 1932 & Fl. Siam. Enum. 2: 179. 1934. Type: Thailand, Kanchanaburi, Bow Noi, A.F.G. Kerr 10260 (holotype **BK!**; isotypes **ABD!**, **BM!**, **K!**).

Shrubs up to 1 m; young branches terete to subterete, bark smooth, greenish, with sparse and short hairs; older branches subterete, bark smooth or shallowly fissured, brownish to grey. *Leaves* elliptic, oblong or obovate, 6–12 by 17–28 cm, coriaceous; base cuneate; margin entire; apex acute or acuminate; upper leaf surface dark green, with sparse and short hairs, lower leaf surface greenish, tomentose; lateral veins 6–10 pairs, venation prominent; drying pale green; petiole 1.5–2.6 cm long, with sparse and short hairs. *Stipules* triangular, acute to acuminate, connate at base, usually persistent. *Leaf-opposed inflorescence*: capitula solitary or paired; peduncle at anthesis 1–3.5 cm long. *Flowers* 4–6-merous, fragrant, bisexual; heterostylous; calyx tube connate, with sparse and short hairs; calyx lobes obtuse; corolla infundibular, white, greenish or purple; corolla tube 2–3.2 cm long, inside glabrous, outside with sparse and short hairs; lobes ovate or elliptic, 4–8 by 8–17 mm. *Stamens* included in the corolla tube, attached to the tube by a short filament; filaments linear, 1–2 mm long; anthers yellow, oblong, 3–4 mm long; style white, 12–15 mm long in brevistylous flower, 1.5–1.8 cm long in longistylous flower, glabrous. *Ovary* 2-locular; stigma bilobed, 2–4 mm long, included in corolla tube. *Infructescences* oblique, with 11–50 fruitlets, ripening black. *Seed* ellipsoid or ovoid, 3–5 by 5–7 mm, testa rough.

Thailand.— SOUTH-WESTERN: Kanchanaburi [Sangkhlaburi district, 9 Feb. 1960, *BKF* 20 (**BKF**, **K**, **L**), 14 June 2003, *Kesonbua* 81 (**KKU**), 31 Mar. 1967, *Nimanong* 3 (**BKF**), 24 Mar. 1967, *Prayad* 713 (**BK**, **BKF**); Bow Noi, 18 Jan. 1926, *Kerr* 10260 (**ABD**, **BK**, **BM**, **K**); Thong Pha Phum district, 15 June 2003, *Kesonbua* 82 (**KKU**)].

Distribution.— Endemic to Thailand.

Ecology.— In hill evergreen and mixed deciduous forests, alt. 250–700 m. Flowering period: January–March.

Note.— *M. scabrida* is closely similar to *M. angustifolia*, but it differs by having fused fruitlets and the leaf drying pale green, with short hairs on the upper surface and dense hairs on the lower one.

8. *Morinda talmyi* Pierre ex Pitard in Lecomte, Fl. Indo-Chine 3: 426. 1922; Craib, Fl. Siam. Enum. 2: 179. 1932.— *M. persicaefolia* Ham. var. *talmyi* Pitard in Lecomte, Fl. Indo-Chine 3: 426. 1922. Type:

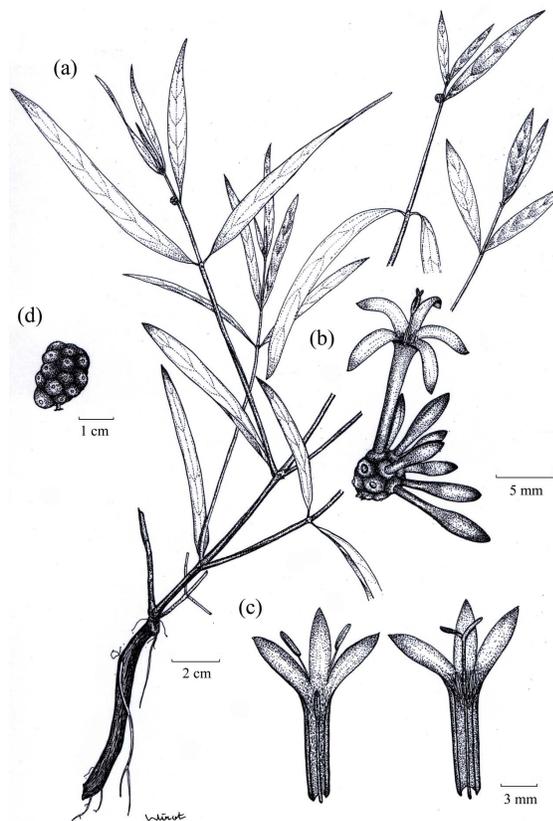


Fig. 2 *M. talmyi* Pierre ex Pitard: (a) habit; (b) inflorescence; (c) longitudinal section of brevistylous and longistylous flowers; (d) infructescence. (a) and (d) from *W. Kesonbua* 71; (b) from *W. Kesonbua* 72; (c) from *W. Kesonbua* 71 (brevistylous flower) and *W. Kesonbua* 72 (longistylous flower). Drawn by *W. Kesonbua*.

Cambodia, *Pierre* 3217 (lectotype **P!**, selected here). **Fig. 2.**

Small shrubs or scandent shrubs; young branches subterete, bark smooth, greenish, glabrous; older branches subterete, bark smooth, brownish to grey. *Leaves* elliptic, lanceolate, oblong or fiddle-like shaped, 1–3.5 by 3–11.5 cm, membranaceous; base cuneate; margin entire; apex acute or acuminate; upper leaf surface light green, lower leaf surface greenish, glabrous on both surfaces; lateral veins 5–8 pairs, venation obscure; drying dark brown; petiole 2–7 mm long, glabrous. *Stipules* triangular, acute to acuminate, connate at base, usually persistent. *Leaf-opposed inflorescence*: capitula solitary; peduncle at anthesis sessile or up to 2 mm long. *Flowers* 5–6-merous, fragrant, bisexual; heterostylous; calyx tube basally connate, glabrous; calyx lobes obtuse or triangular; corolla hypocrateriform, white or greenish; corolla tube 0.7–1 cm long, inside with sparse and

short hairs, outside glabrous; corolla lobes oblong, 1.5–2.5 by 5.5–7 mm. *Stamens* included or exerted in the corolla tube, attached to the tube by a short filament; filaments linear, 1–4 mm long; anthers white or yellowish grey, oblong, 2–3 mm long; style white, 4–7 mm long in brevistylous flower, 8–12 mm long in longistylous flower, glabrous. *Ovary* 2-locular; stigma bilobed, 2–3 mm long, included or exerted in the corolla tube. *Infructescences* subglobose or oblique, glabrous, with 15–35 fruitlets, greenish. *Seed* ellipsoid or ovoid, 3–5 by 5–7 mm, testa rough.

Thailand.— NORTH-EASTERN: Nong Khai [Phon Phisai district, 6 June 1963, *Chantaramuck* 472 (BK)]; Nakhon Phanom [Ban Teng, 24 Feb. 1993, *Chantaranothai, Parnell, Middleton & Simpson* 888 (TCD)]; EASTERN: Chaiyaphum [Ban Lad Yai, 9 Jan. 1985, *Paisooksantivatana* Y 1522-85 (BK)]; Nakhon Ratchasima [Tha Chang, 16 May 1931, *Kerr* 20470 (ABD, BK, BM, TCD)]; Phimai district, 16 Mar. 1958, *Smitinand* 4474 (BKF), 16 Mar. 1930, *TSBS* 2156 (BKF)]; Si Sa Ket [Kantharalak district, 7 April 1966, *Sangkhachand* 231 (BK)]; Kanthararom district, 15 Mar. 1959, *Suvarnakoses & Smitinand* 1549 (BKF, L, K, P)]; SOUTH-EASTERN: Nakhon Phanom [Tha Uthen district, 8 April 2002, *Kesonbua* 71 (KKU) & 72 (KKU)]; Maha Sarakham [Borabue district, 29 Oct. 1965, *Sutheesorn* 732 (BK)].

Distribution.— Indo-China.

Ecology.— In dry evergreen and deciduous dipterocarp forests, streamsides, alt. 200 m. Flowering period: January–June.

Note.— *M. talmyi* is highly variable in size and shape of the leaves. The leaves are usually linear and only 1 cm wide, some specimens are oblong, elliptic or ovate and up to 3 cm wide. It is similar to *M. pandurifolia*, but differs by its glabrous leaves and inflorescences.

9. *Morinda tomentosa* Heyne ex Roth, Nov. Pl. Sp.: 147. 1821; Kurz, Forest Fl. Burma 2: 60. 1877; Craib, Fl. Siam. Enum. 2: 178. 1934. Type: *Wight* 1321 (isotype K!).— *M. tinctoria* Roxb. var. *tomentosa* Hook. f., Fl. Brit. Ind. 3: 156. 1880; Pitard in Lecomte, Fl. Indo-Chine 3: 425. 1922. Type: India, not seen.— *M. pumila* Craib, Bull. Misc. Inform., Kew 1932: 434. 1932 & Fl. Siam. Enum. 2: 177. 1934. Type: Thailand, Chaiyaphum, Pak Pang, *A.F.G Kerr* 19981 (holotype BK!; isotypes ABD!, K!, BM!), **synon. nov.** Fig. 3.

Trees up to 15 m; young branches terete, bark smooth, greenish, densely puberulous; older branches subterete, bark shallowly fissured, brownish to grey, with sparse and short hairs. *Leaves* elliptic, 8–9.5

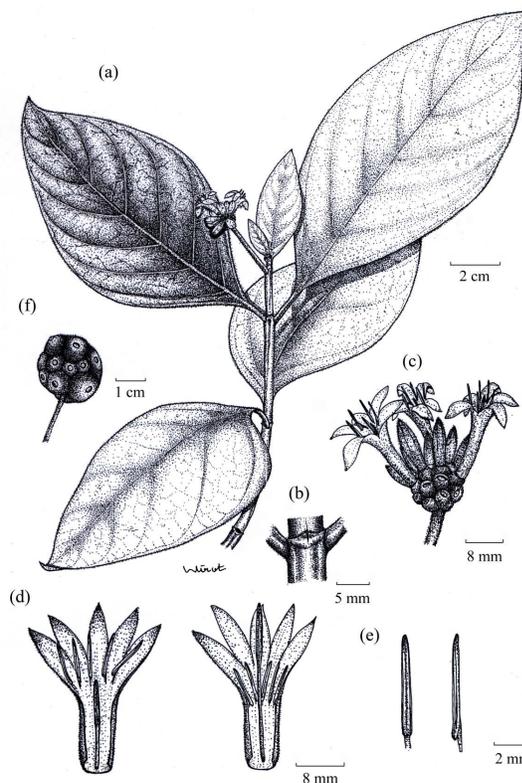


Fig. 3 *M. tomentosa* Heyne ex Roth: (a) habit; (b) stipule; (c) inflorescence; (d) longitudinal section of brevistylous and longistylous flowers; (e) anthers; (f) infructescence. (a), (b), (c), (e), and (f) from *W. Kesonbua* 22; (d) from *W. Kesonbua* 22 (brevistylous flower) and *W. Kesonbua* 35 (longistylous flower). Drawn by *W. Kesonbua*.

by 15.5–23 cm, coriaceous; base cuneate; margin entire; apex acute or acuminate; upper leaf surface dark or light green, puberulous, lower leaf surface greenish, tomentose; lateral veins 8–12 pairs, venation prominent, domatia usually present in axils of secondary vein on the lower surface; drying dark black; petiole 1–3 cm long, with dense hairs. *Stipules* triangular, acute to acuminate, connate at base, usually caducous. *Leaf-opposed inflorescence*: capitula solitary or paired; peduncle at anthesis 2–4.5 cm long. *Flowers* 5–6-merous, fragrant, bisexual; heterostylous; calyx tube basally connate, puberulous; lobes truncate or denticulate; corolla hypocrotiform, white or greenish; corolla tube 1.5–1.8 cm long, inside glabrous, outside puberulous; corolla lobes oblong, 3–5.5 by 10–14.5 mm. *Stamens* included or exerted in the corolla tube, attached to the tube by a short filament; filament linear, straight, 1–4 mm long; anthers yellow, oblong, 5.5–6.5 mm long; style white,

glabrous, 1.2–1.5 cm long in brevistylous flower, 1.5–1.8 cm long in longistylous flower. *Ovary* 2-locular; stigma bilobed, included or exerted in the corolla tube. *Infructescences* globose or subglobose, with 15–25 fruitlets, fruitlet with short and dense hairs, ripening black. *Seed* ellipsoid or ovoid, 4.5–6.5 by 7–11.5 mm long, testa rough.

Thailand.— NORTHERN: Mae Hong Son [Ban Sop Pong, 12 June 1989, *Anderson* 6023 (CMU)]; Chiang Mai [not located, 28 July 1992, *Larsen, Larsen, Niyomdham, Sirirugsa, Tarvengadum & Nrgaard* 43719 (P); Doi Inthanon, 23 April 1989, *Maxwell* 89–505 (BKF, CMU, L), 16 July 1988, *Phengklai et al.* 6544 (AAU, BKF, E), *Maxwell* 7 (BKF), 22 Aug. 1987, *Maxwell* 87–860 (BKF, CMU, L), 7 April 1988 (K); Doi Muang Awn, Sankampang district, 21 June 1990, *Maxwell* 90–659 (CMU, E, L), 25 June 1992, *Maxwell* 92–321 (CMU, E, L, P); Doi Suthep, 23 April 1991, *Dawson* 24 (BKF), 16 July 1988, *Fukuoka* T-62007 (BKF, L), 19 Sept. 1996, *Maxwell* 88–442 (AAU, BK, BKF, CMU, L)]; Chiang Rai [Khun Tan, 20 April 1942, *Sman* 132 (BKF), 15 April 1989, *Chalerm* 141 (BKF)]; NORTH-EASTERN: Loei [Wang Sapung, 17 April 1989 *Din* 32 (BKF), 16 Jan. 1990, *Din* 130 (BKF), 27 April 1991, *Din* 273 (BKF), 25 May 1934, *Pan* 105 (BKF); Phu Kradueng, 27 April 1998, *Fukuoka* T-63657 (BKF, L)]; Khon Kaen [Khon Kaen University, 2 Mar. 2001, *Kesonbua* 4 (KKU), 26 Mar. 2001, *Kesonbua* 9 (KKU), 5 May 2001, *Kesonbua* 22 (KKU), 13 May 2001, *Kesonbua* 35 (KKU)]; EASTERN: Chaiyaphum [Pak Pang, *Kerr* 19981 (ABD, BK, BM, K)]; SOUTH-WESTERN: Kanchanaburi [Erawan National Park, 19 April 1968, *van Beusekom & Phengklai* 512 (P)]; SOUTH-EASTERN: Chon Buri [Khao Khieo, 20 June 1975, *Maxwell* 75–622 (AAU, BK, L), 26 June 1976, *Maxwell* 76–408 (AAU, BKF, L)].

Distribution.— India, Myanmar, Indo-China.

Ecology.— In dry evergreen and deciduous dipterocarp forests, alt. 100–350 m. Flowering period: February–May.

Vernacular.— ‘Kho khamin’, ‘yo pa’, ‘sa kae’, ‘sa koei’, ‘hatsa koei’ (Northern); ‘talam phuk’ (Khon Kaen).

Note.— *M. tomentosa* is very closely similar to *M. coreia*, but it differs by having hairs on the leaf surface which is variable, both surfaces and usually having dense hairs, some specimens have only sparsely distributed hairs.

Acknowledgements: We thank the Biodiversity Research and Training Program (BRT T.145031), the Faculty of

Science, Ubon Ratchathani University and the Department of Biology, Faculty of Science, Khon Kaen University for supporting this study. We also thank the directors and curators of AAU, ABD, BK, BKF, BM, CMU, E, K, KKU, L, P, PSU, QBG, TCD, and Herbarium of Biology Department, Chiang Mai University, for making the specimens available for this study. The reviewers are thanked for their valuable comments.

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