

A taxonomic revision of *Mayodendron* (Bignoniaceae) in Thailand

CHATCHAI NGERNSAENG SARUAY^{1,2,*}, WEEREESA BOONTHASAK¹
& VORADOL CHAMCHUMROON³

ABSTRACT

A taxonomic revision of *Mayodendron* (Bignoniaceae) in Thailand is presented. One species, *M. igneum*, is recognized and provided with an updated morphological description, comparison with related species, illustrations, distribution, habitat and ecological data, phenology, conservation assessment, vernacular names, uses, and a list of specimens examined. Based on the reproductive morphological characters, *Mayodendron* can be distinguished from *Radermachera* by the type and position of the inflorescences, the morphology of the calyx and corolla, and the size and characteristics of the fertile stamens. The specimen *Brandis 1357* at HBG [HBG522936] is designated as the lectotype of *M. igneum*. This species is assessed as Least Concern (LC) according to the IUCN criteria. Leaflet and wood anatomy, as well as pollen morphology of *M. igneum* are characterized. The species has bifacial leaflets with anomocytic stomata, diffuse-porous wood with hetero- or homocellular rays, and prolate-spheroidal to subprolate pollen with heterobroccate reticulate sculpturing and four aperture types.

KEYWORDS: Lamiales, lectotypification, palynology, plant anatomy, plant taxonomy.

Accepted for publication: 17 March 2026. Published online: 30 April 2026

INTRODUCTION

Mayodendron Kurz is a monotypic genus in the family Bignoniaceae Juss. (Zhang & Santisuk, 1998; POWO, 2025), belonging to the order Lamiales (APG IV, 2016). It is sometimes treated as a synonym of *Radermachera* Zoll. & Moritzi (van Steenis, 1976; Santisuk & Vidal, 1985; Santisuk, 1987; Fischer *et al.*, 2004). The genus comprises a single accepted species, *M. igneum* (Kurz) Kurz, which is distributed from Assam in north-eastern India through southern China, Taiwan, and Indo-China (POWO, 2025).

Spathodea ignea Kurz was first described by Kurz (1871) and later transferred to the genus *Mayodendron* by Kurz (1875). In 1976, *Mayodendron* was reduced to a synonym of *Radermachera* by van Steenis (1976), who made the new combination *R. ignea* (Kurz) Steenis. van Steenis (1976) justified this taxonomic decision by stating that: (1) the calyx,

being only halfway slit, could not be properly considered spathaceous; (2) the pseudoseptum is absent; (3) the mature septum is terete and corky; (4) the fruit valves, septum, and seeds are morphologically identical to those of *Radermachera*. In Thailand, Santisuk (1974) published an initial account of *Mayodendron* in which he recognized a single species, *M. igneum*, which he then subsequently later treated under the genus *Radermachera* in the Flora of Thailand (Santisuk, 1987). However, based on reproductive morphological characteristics, *Mayodendron* can be distinguished from *Radermachera* by the type and position of the inflorescences, the morphology of the calyx and corolla, and the size and features of the fertile stamens. Therefore, we support the recognition of *Mayodendron* as a distinct genus, in agreement with the treatments of Kurz (1875, 1877), Clarke (1884), Dop (1930), Santisuk (1974), and Zhang & Santisuk (1998).

¹ Department of Botany, Faculty of Science, Kasetsart University, Chatuchak, Bangkok 10900, Thailand.

² Biodiversity Center Kasetsart University (BDCKU), Bangkok 10900, Thailand.

³ Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation, Bangkok 10900, Thailand.

* Corresponding author: fsciccn@ku.ac.th

Fischer *et al.* (2004) recognized a broadly defined tribe Tecomeae Endl., comprising 43 genera with a wide geographic distribution. *Radermachera*, including *Mayodendron* was placed within this tribe. However, Tecomeae was later shown to be paraphyletic with respect to other tribes within Bignoniaceae (Olmstead *et al.*, 2009). Olmstead *et al.* (2009) conducted phylogenetic analyses using three chloroplast DNA regions (*ndhF*, *trnL-F*, and *rbcL*) to infer evolutionary relationships in Bignoniaceae and to propose a revised classification. Their results indicated that *Radermachera* does not belong in Tecomeae, but rather forms part of a distinct paleotropical clade. *Mayodendron*, however, has not yet been included in any published molecular phylogenetic analyses. The paleotropical clade comprises approximately 20 genera of trees (Olmstead *et al.*, 2009). Of these, 10 genera are native to Thailand, while two, *Heterophragma* DC. and *Radermachera* are native to Asia. *Dolichandrone* (Fenzl) Seem. and *Markhamia* Seem. ex Baill. occur in both Africa and Asia. *Fernandoa* Welw. ex Seem. and *Stereospermum* Cham. are distributed across Africa, Madagascar, and Asia. The monotypic genera *Kigelia* DC. (*K. africana* (Lam.) Benth.) and *Spathodea* P.Beauv. (*S. campanulata* P.Beauv.) are African in origin and have been introduced to Thailand. All members of the paleotropical clade share a tree habit, in contrast to the climbing habit common in most members of Tecomeae *sensu stricto* (Olmstead *et al.*, 2009). Of the 20 genera presumed to belong to the paleotropical clade, 16 have been included in molecular phylogenetic analyses. In addition to *Mayodendron*, several unsampled tree genera, such as the Thai endemic *Santisukia* Brummitt, Indo-Malayan *Pajanelia* DC. and Asian *Pauldopia* Steenis, are also likely to belong to this clade (Olmstead *et al.*, 2009).

Although Santisuk (1987) treated the single species of *Mayodendron* in the Flora of Thailand (though within the genus *Radermachera*), this study provides a more comprehensive and updated taxonomic treatment of *M. igneum*. We examined Thai specimens from local and international herbaria, including virtual herbarium repositories, as well as through direct field observations. As a result, this paper presents a full taxonomic account, including lectotypification, an updated species description, morphological comparison with related

species, distribution, habitat and ecological information, vernacular names, phenology, uses, conservation status, illustrations, a distribution map in Thailand, and specimens examined. In addition, leaflet and wood anatomy, as well as pollen morphology are reported.

MATERIALS AND METHODS

Herbarium specimens deposited at BK, BKF, CMU, CMUB, and QBG, as well as digital specimens from E, L, and HBG were examined. All herbarium acronyms follow Thiers (2025, continuously updated). The taxonomic history of *Mayodendron* was compiled using the literature (Kurz, 1871, 1875, 1877; Clarke, 1884; Dop, 1930; Santisuk, 1974, 1987; van Steenis, 1976; Santisuk & Vidal, 1985; Zhang & Santisuk, 1998) and online databases (IPNI, 2025; POWO, 2025). Morphological characteristics, distribution, habitat and ecology, and phenology were described based on both historical and newly collected herbarium specimens, along with field observations. The characteristics of *Radermachera* were compiled from previous studies (e.g., Kurz, 1875, 1877; Clarke, 1884; Dop, 1930; Santisuk, 1974, 1987; van Steenis, 1976; Santisuk & Vidal, 1985; Zhang & Santisuk, 1998; Fischer *et al.*, 2004), as well as from the author's examination of herbarium specimens and observations.

Vernacular names were compiled from specimen labels and relevant literature (Santisuk, 1974, 1987; Pooma & Suddee, 2014). The conservation assessment follows the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Committee, 2024), incorporating field data and GeoCAT analysis (Bachman *et al.*, 2011).

The anatomical characters of leaflets of *M. igneum* were examined using sections prepared from five mature leaflets per individual, with samples collected from three individuals. The samples were first fixed and processed using the paraffin method, then sectioned at a thickness of 10–20 µm with a sliding microtome, and stained with fast green. Measurements of 30 cells per character per individual were conducted under the microscope. For the study of epidermal cells, leaflets were peeled and mounted directly as a wet mount for observation.

Wood samples were collected from three individuals, with three replicates per individual. The samples were sectioned at a thickness of 15–20 µm in transverse, tangential, and radial planes, and stained with safranin. Thirty cells per character per individual were measured for wood anatomy. Permanent slides of leaflets and wood were prepared following the standard protocols of Johansen (1940) and Kermancee (2008). Anatomical features were examined and photomicrographed using an Olympus BX53 microscope equipped with an Olympus DP74 digital camera at the Department of Botany, Faculty of Science, Kasetsart University (KU). Anatomical terminology follows Metcalfe & Chalk (1957).

Comparative data on leaflet morphology and wood anatomy of *M. igneum* and *Radermachera hainanensis* Merr. were obtained from the authors' observations. In addition, published descriptions of *Dolichandrone* (Boonthasak & Ngernsaengsaruy, 2021), *Santisukia* (Meeprom *et al.*, 2022), and *Fernandoa adenophylla* (Wall. ex G.Don) Steenis (Ngernsaengsaruy *et al.*, 2023) were examined for comparison within the paleotropical clade of Bignoniaceae (Olmstead *et al.*, 2009).

Unacetolysed pollen samples of *M. igneum* were examined and photographed using an Olympus BX53 microscope equipped with an Olympus DP74 digital camera. For scanning electron microscopy (SEM), pollen grains were mounted on aluminium stubs using double-sided adhesive tape, sputter-coated with gold, and examined using an FEI Quanta 450 SEM (Hillsboro, OR, USA) at an accelerating voltage of 15.00 kV. at the Scientific Equipment Centre, Faculty of Science, Kasetsart University. The characteristics of thirty pollen grains were examined and measured following the methods of Erdtman (1945, 1952) and Simpson (2010). Terminology used for pollen morphology follows Punt *et al.* (2007).

Comparative data on pollen morphology of *M. igneum*, *R. hainanensis*, and *Santisukia* were obtained from the authors' observations. Published descriptions of *Dolichandrone* (Boonthasak & Ngernsaengsaruy, 2021) and *F. adenophylla* (Ngernsaengsaruy *et al.*, 2023) were also examined for comparison within the paleotropical clade of Bignoniaceae.

RESULTS AND DISCUSSION

TAXONOMIC TREATMENT

Mayodendron Kurz, Prelim. Rep. Forest Pegu, App. D. t.1. 1875; Kurz, Forest Fl. Burma 2: 232. 1877; C.B. Clarke in Hook.f., Fl. Brit. India 4: 381. 1884; Dop in Lecomte *et al.*, Fl. Indo-Chine 4: 597. 1930; Santisuk, Thai Forest Bull., Bot. 8: 8. 1974; Z.-Y. Zhang & Santisuk in C.Y. Wu & P.H. Raven, Fl. China 18: 224. 1998. Type species: *Spathodea ignea* Kurz = *Mayodendron igneum* (Kurz) Kurz.

Trees, evergreen. *Leaves* (2–)3–4-pinnately compound, decussate; leaflets opposite, entire and repand, with a few scattered peltate glandular trichomes on both surfaces. *Inflorescences* cauliflorous or ramiflorous, a short corymb-like raceme. *Flowers* bracteolate; calyx tubular, spathaceous, one side lobed up to the middle; corolla tubular-funnel-shaped, the basal tube shorter and narrower than the upper tube, (4–)5-lobed, lobes short, equal or subequal, revolute; fertile stamens 4, equally or subequally long (scarcely didynamous), filaments adnate at insertion up to the middle of corolla tube, anthers divaricate, longitudinal dehiscent; staminodes present; disc annular, surrounding the base of ovary; pistil: ovary superior, narrowly cylindrical, 2-locular, ovule numerous, axile placenta, stigma flattened 2-lobed. *Fruits* loculicidal capsule, narrowly cylindrical, slightly twisted, septum terete and corky. *Seeds* numerous, flattened, rectangular, with a lateral hyaline-membranous wing.

Mayodendron is closely related to *Radermachera* in its tree habit, leaf type, and fruit and seed characteristics. However, *Mayodendron* can be distinguished from *Radermachera* by the type and position of the inflorescences, as well as the morphology of the calyx and corolla, and the size and character of the fertile stamens. The morphological characteristics of the two genera are compared in Table 1.

Mayodendron igneum (Kurz) Kurz, Prelim. Rep. Forest Pegu, App. D. t. 1. 1875; Kurz, Forest Fl. Burma 2: 233. 1877; C.B. Clarke in Hook.f., Fl. Brit. India 4: 382. 1884; Dop in Lecomte *et al.*, Fl. Indo-Chine 4: 597. fig. 65, 5–6. 1930; Santisuk, Thai Forest Bull., Bot. 8: 8. fig. 4. 1974; Z.-Y. Zhang & Santisuk in C.Y. Wu & P.H. Raven, Fl. China 18: 225. 1998.— *Spathodea ignea* Kurz,

Table 1. Comparison of morphological characteristics of *Mayodendron* and *Radermachera*.

Characteristics	Genera	
	<i>Mayodendron</i>	<i>Radermachera</i>
Leaf type	(2–)3–4-pinnate	1–3-pinnate
Inflorescences	short corymb-like raceme, cauliflorous or ramiflorous	thyrses, terminal or ramiflorous, but never cauliflorous
Bracteoles	present	present or absent
Calyx	spathe-like (spathaceous) and one side lobed up to the middle	campanulate and irregularly lobed, rarely truncate
Corolla	tubular-funnel-shaped, not bilabiate, (4–)5-lobed, lobes short, equal or sub-equal, revolute	mostly short basal tube, widened into salver-shaped, funnel-shaped or campanulate upper tube, bilabiate, 5-lobed, lobes rounded
Fertile stamens	4, equal or subequal (scarcely didynamous), filament straight, adnate at insertion up to the middle of corolla tube	4, didynamous, filament curved, adnate at insertion of corolla tube

J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 40(1): 77. 1871.—*Radermachera ignea* (Kurz) Steenis, Blumea 23(1): 127. 1976; Santisuk & J.E.Vidal in J.-F. Leroy, Fl. Cambodge Laos Vietnam 22: 24. t. 3, fig. 10. 1985; Santisuk in Smitinand & K.Larsen, Fl. Thailand 5(1): 41. 1987.— Type: Myanmar, locality unspecified, s.d., *Brandis 1357* (Herb. D. Brandis) (lectotype **HBG** [HBG522936, photo seen], designated here; isoelectotypes **CAL** [not seen], **K** [not seen]). Figs. 1–3.

Trees 3–12(–15) m tall, 30–100 cm GBH. *Bark* slightly fissured, brown to greyish brown. *Leaves* (2–)3–4-pinnate; petioles 15.5–18.5 cm long; primary rachises 38–55 cm long; primary leaflets 5–6 pairs; petiolules 1–7 cm long; secondary rachises 5–23 cm long; secondary leaflets 1–7 pairs; petiolules 0.5–2.7 cm long; tertiary rachises 1.5–5 cm long; tertiary leaflets 1–2 pairs; quaternary leaflets 1 pair (if present); petioles, rachises and petiolules glabrous; leaflets numerous, elliptic, broadly elliptic, obovate, ovate or lanceolate, 4–12 × 2–5.6 cm, usually unequal-sided, apex acute, acuminate, caudate or obtuse, base cuneate or obliquely cuneate, margin entire and repand, subcoriaceous, slightly bullate, glabrous and with a few peltate glandular trichomes on both surfaces, glossy above, midrib raised below, lateral veins 3–5 pairs, curving and connected in loops near the margin, veinlets reticulate; petiolules

1–5 mm long or leaflets sessile; petioles, rachises and petiolules greenish purple and green. *Inflorescences* a short corymb-like raceme, 6–40-flowered; peduncles 0.5–2.5 cm long; rachises 2.5–11.5 cm long; peduncles and rachises pubescent. *Flowers*: bracteoles lanceolate, 0.7–1.7 × 0.2–0.7 mm, pubescent on both sides; pedicels 0.8–1.7 cm long, pubescent; calyx reddish purple, tubular, spathe-like, 1.5–2.5 × 0.6–0.8 cm, one side lobed up to the middle, veins convergent to the apex, pubescent and usually with yellow glands outside, glabrous inside; corolla orange or orangish yellow, tubular-funnel-shaped, 6–7 cm long, straight, basal tube narrowly cylindrical, 1–1.5 cm long, 3–4 mm diam., upper tube funnel-shaped, 5–5.5 cm long, 1.5–2.5 cm diam., longer and broader than basal tube, (4–)5-lobed, lobes suborbicular, 0.9–1.1 cm diam., equal or subequal, revolute, corolla tube and lobes glabrous on both sides; fertile stamens 4, 4.8–5.2 cm long, equal or subequal, filament orange, straight, adnate at insertion up to the middle of corolla tube, lower part pubescent, anthers 4–4.5 mm long, divaricate; staminodes 1, needle-like, 2–3 mm long; disc annular, yellowish green, surrounding the base of ovary; pistil 5–7 cm long, ovary reddish purple, narrowly cylindrical, 0.8–1 cm long, 1.5–2 mm diam., with dense transparent glands, style purplish green, 4.5–6 cm long, slender, stigma

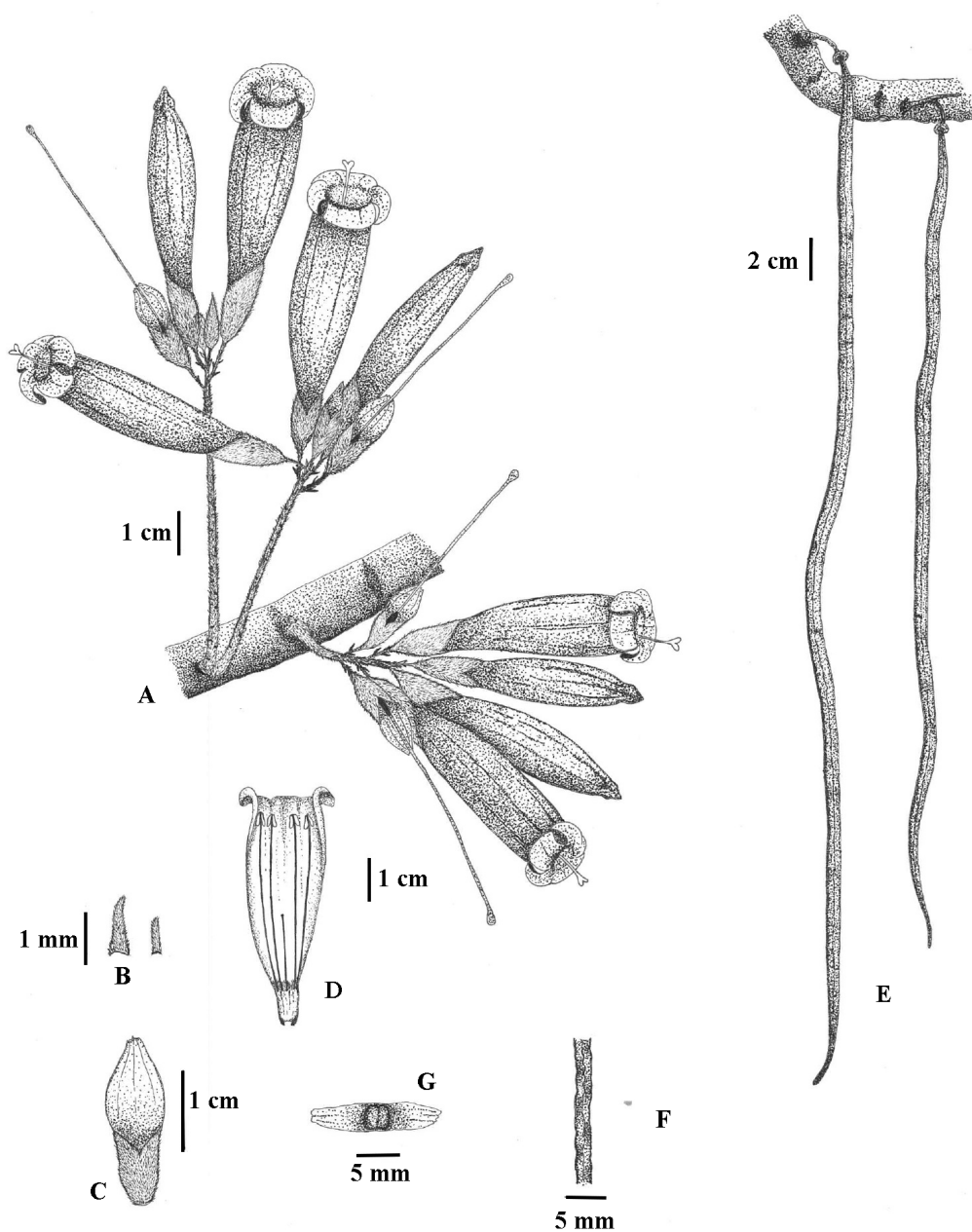


Figure 1. *Mayodendron igneum* (Kurz) Kurz: A. branchlet and inflorescences; B. bracteoles; C. spathaceous calyx; D. flower in longitudinal section showing 4, equal or subequal fertile stamens; E. branchlet and fruits; F. septum; G. winged seed. Drawn by Weereesa Boonthasak.

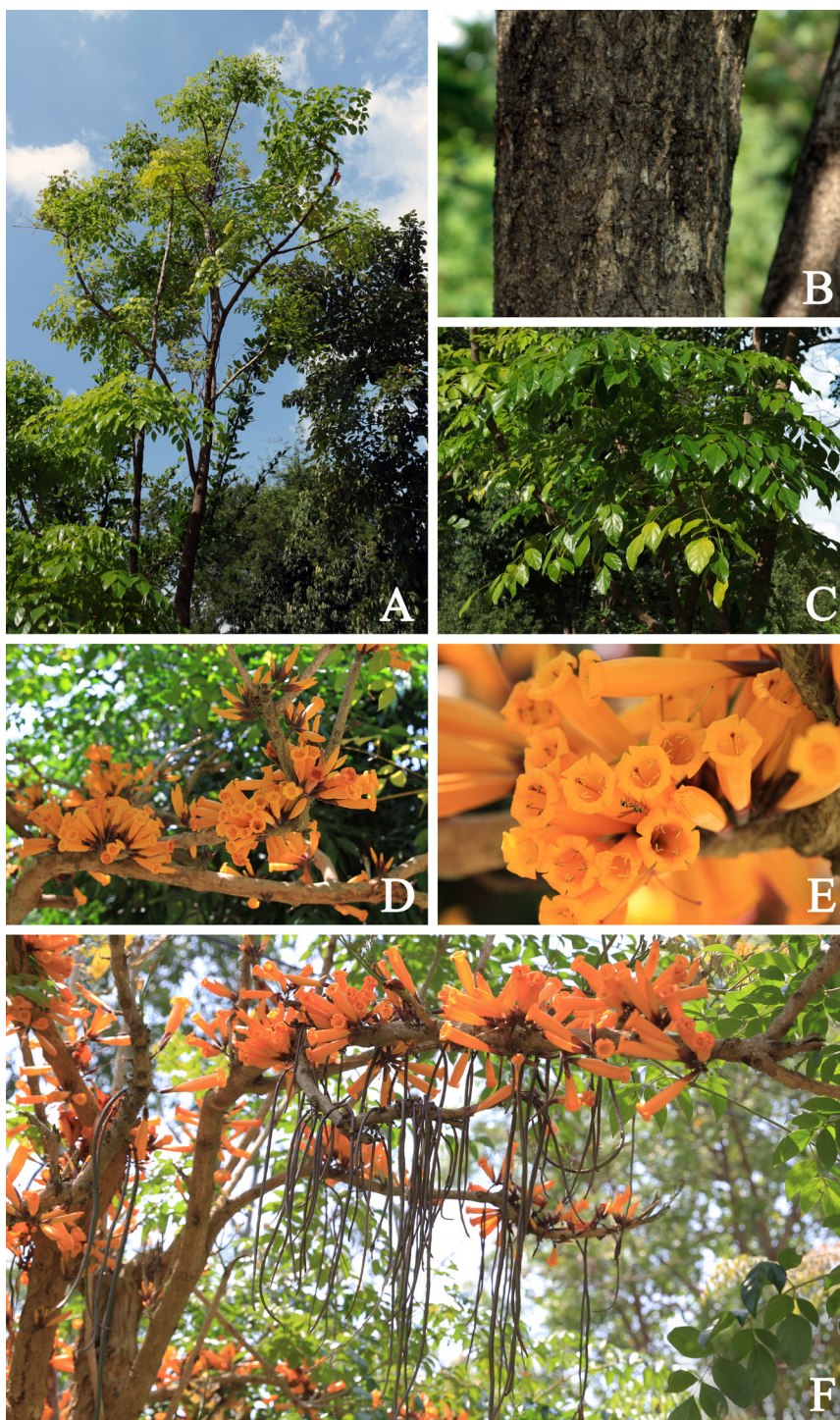


Figure 2. *Mayodendron igneum* (Kurz) Kurz: A. habit; B. bark; C. branchlets and leaves; D. branches, branchlets, and inflorescences; E. inflorescence; F. branches, branchlets, inflorescences, and fruits. Photos: Pichet Chanton (A–C); Chatchai Ngernsaengsaruy (D–F).



Figure 3. Lectotype of *Mayodendron igneum* (Kurz) Kurz, Brandis 1357 (HBG [HBG522936]) from Myanmar, designated here. Photo: University of Hamburg, Hamburg, Germany. <http://www.herbariumhamburgense.de/index.php>

flattened 2-lobed. *Fruits* narrowly cylindrical, 37–80 cm long, 5–7 mm diam., greenish purple, turning green when mature and brown when dry, septum terete, 2–3 mm diam., corky. *Seeds* flattened, rectangular with a lateral hyaline-membranous wing, $1-2.2 \times 0.2-0.4$ cm.

Distribution.— India (Assam), Bangladesh, Myanmar, China (Guangdong, Guangxi, Yunnan), Taiwan, Vietnam (Tonkin, Annam), Laos, and Thailand.

Distribution in Thailand.— NORTHERN: Mae Hong Son, Chiang Mai, Chiang Rai, Phayao, Lampang, Phrae; NORTH-EASTERN: Phetchabun, Loei; EASTERN: Nakhon Ratchasima; SOUTH-WESTERN: Uthai Thani, Phetchaburi; CENTRAL: Bangkok (cultivated)(Fig. 4).

Habitat and Ecology.— It is frequently found on limestone hills and also in dry evergreen forests and lower montane rain forests, at elevations of 300–1,200 m a.s.l.

Phenology.— Flowering nearly all year round, with a peak in March to May; fruiting February to July.

Conservation status.— *Mayodendron igneum* is widely distributed from Assam eastward to Taiwan and southward to Thailand. It has a relatively large Extent of Occurrence (EOO) of 75,584.90 km² and a small Area of Occupancy (AOO) of 56 km². This species does not face any major threats and is assessed as Least Concern (LC).

Etymology.— The specific epithet of *M. igneum* is derived from the Latin meaning fire-red, flame-coloured, fiery-red-and-yellow (Stearn, 1992; Radcliffe-Smith, 1998; Gledhill, 2002) and refers to flower colour.

Vernacular names.— Kaki (กากี)(Surat Thani); kasalong kham (กาสะลองคำ)(Chiang Rai, General); khae po (แคเปาะ) (Lampang); chang chuet (จางจืด) (Chiang Mai); Saphao (สะภา)(Northern); samphao lamton (สำเภาลามตัน)(Lampang); oi chang (อ้อยช้าง) (Northern); Lord Mayo's tree (English).

Uses.— Cultivated as ornamental trees.

Lectotypification.— *Spathodea ignea* was named and described by Kurz (1871), who cited only the specimen *Brandis 1357* (Herb. D. Brandis), collected from Myanmar (originally published as “Burma”), without specifying a locality. Kurz (1871)

did not designate a holotype, nor did he mention the name of the herbarium where the specimen was housed. The specimen *Brandis 1357* at **CAL** and **K** was mentioned by van Steenis (1976) as the type. We located only one sheet of this specimen at **HBG** [HBG522936]. Following Art. 9.6 of the ICN (Turland *et al.*, 2018), it constitutes a syntype. We therefore designate the **HBG** specimen as the lectotype, following Arts. 9.3 and 9.12 of the ICN (Turland *et al.*, 2018).

Notes.— *Mayodendron igneum* is similar to *Radermachera hainanensis* in its habit, leaf type, leaflet shape and size, apex and base, corolla colour, as well as fruit and seed characteristics. The differences between these two species are shown in Table 2.

Santisuk (1987) reported that *M. igneum* has 2-pinnate leaves with leaflets that are elliptic-lanceolate, ovate-lanceolate, or oblong-lanceolate in shape and acuminate or caudate apices and acute bases. However, our observations indicate that the leaf type can be 3–4-pinnate, and occasionally 2-pinnate, and the leaflets show more variation in shape, apex, and base, which are elliptic, broadly elliptic, obovate, ovate, or lanceolate, with acute or obtuse apices and cuneate or oblique bases. In addition to the distribution reported by Santisuk (1987), new occurrences of this species in Mae Hong Son, Phayao, Phetchabun, Loei, Nakhon Ratchasima, and Phetchaburi provinces are recorded.

Additional specimens examined.— THAILAND. NORTHERN: Mae Hong Son [Mueang, Ban Sanga, 14 Apr. 1977, *Nimanong & Phusomsaeng 1827* (**BKF**); Mae Sariang, Mae Kong, Salawin National Park, east side, west end of Mae Sam Laep Reservoir, 25 May 2005, *Maxwell 05-346* (**CMUB**, **L** [L3730655, L3730656]); locality unspecified, 21 June 1973, *Geesink et al. 6005* (**BKF**, **L** [L2815437])]; Chiang Mai [Chiang Dao, 19 Feb. 1957, *Bunchuai 335* (**BKF**, **K**); Chiang Dao, s.d., *Bunchuai 961* (**BKF**); Chiang Dao, above Ban Yang Pong Luang, 21 Mar. 1989, *Maxwell 89-363* (**BKF**, **CMUB**, **L** [L2815393, L2815394]); Chiang Dao, Ban Tham, Wat Tham Chiang Dao, 19 Mar. 2005, *Pooma et al. 4925* (**BKF**); Chiang Dao, Chiang Dao Wildlife Research Station, 4 Nov. 2018, *Boonthasak et al. 36* (**BK**); Fang, 3 July 1978, *Phengkklai et al. 4239* (**BKF**); Mae On, Huai Kao, Doi Lan, above Mae Kampong Village, 6 Apr. 1997, *Maxwell 97-311* (**BKF**, **CMUB**, **L** [L3730487]); Mae On, Doi Lan,

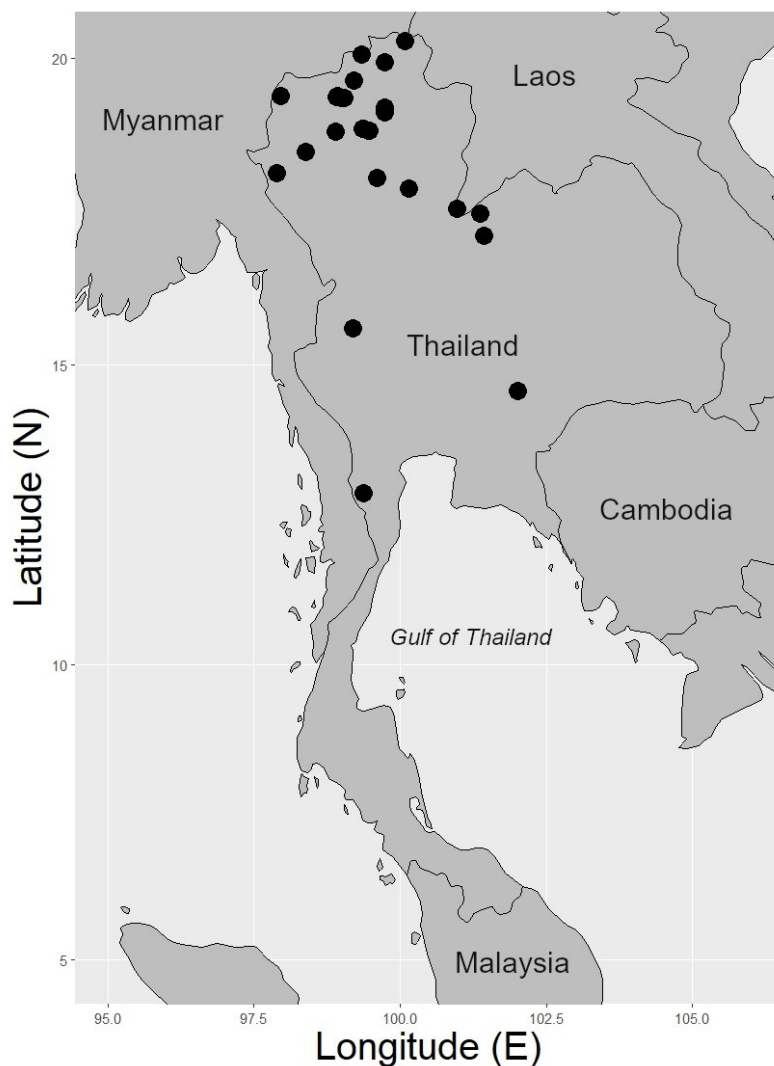


Figure 4. Distribution of *Mayodendron igneum* (Kurz) Kurz in Thailand, known from Northern, North-Eastern, Eastern, and South-Western floristic regions. Thailand floristic regions follow Flora of Thailand Vol. 4 Part 3.3 (Balslev & Chantaranonthai, 2023). Map: Pichet Chanton & Chatchai Ngernsaengsaruy.

Mae Li Village, 4 Mar. 2005, *Maxwell 05-180* (**CMUB**, **L** [L3730580]); *ibid.*, 10 Apr. 2005, *Maxwell 05-255* (**CMUB**, **L** [L3730660, L3730661, L3730662]); Huai Pu, 17 Mar. 1998, *Sirithumrong 1* (**QBG**); Doi Suthep, *Kerr 2546* (**BM**, **E**, **K**, reported by Santisuk, 1974); Chiang Mai University, Central Library, cultivated, 24 Jan. 1979, *Surinrat 209* (**CMUB**); Chiang Mai University, Sala Dham, cultivated, 23 Apr. 1988, *Maxwell 88-500* (**BKF**, **CMUB**, **L** [L3730544]); Mueang Chiang Mai, Huai

Kaao Arboretum, cultivated, 14 Feb. 1992, *Pooma 635* (**BKF**); Chiang Rai [Doi Tham Yup, Mae Kok, 9 Mar. 1924, *Garrett 157* (**BKF**, **L** [L2815400]); Chiang Saen, *Kerr 5134* (**BK**, **K**, reported by Santisuk, 1974); Mae Sai, Pong Pha, Ban Nam Cham School, cultivated, 8 Apr. 2018, *Boonthasak et al. 27* (**BKF**), 28 (**BK**); Phayao [Mueang Phayao, Doi Luang National Park, Champa Thong Waterfall, 24 May 1997, *Gardner & Sidisunthon 2133* (**CMUB**, **L** [L3730702]); Lampang [Wang Nuea, Wang

Table 2. Morphological comparison between *Mayodendron igneum* and *Radermachera hainanensis* in Thailand.

Characteristics	Species	
	<i>Mayodendron igneum</i>	<i>Radermachera hainanensis</i>
Leaf type	(2–)3–4-pinnate	2–3-pinnate
Leaflet lamina texture	subcoriaceous	chartaceous
Leaflet lamina margin	entire and repand	undulate
Petiole, rachis and petiolule colour	greenish purple and green	green
Inflorescences	a short corymb-like raceme, 6–40-flowered, cauliflorous or ramiflorous, pubescent	a short thyrs (raceme-like), 2–6-flowered, terminal or ramiflorous, glabrous
Bracteoles	present	absent
Calyx	reddish purple or greenish red-purple, tubular, spathe-like, 1.5–2.5 × 0.6–0.8 cm, one side lobed up to the middle, pubescent and usually with yellow glands outside	green, campanulate, 0.8–1.7 × 0.5–0.8 cm, 2–3-lobed, glabrous, sometimes with tiny lepidote outside
Corolla	tubular-funnel-shaped, basal tube 3–4 mm diam., upper tube funnel-shaped, 5–5.5 cm long, 1.5–2.5 cm diam., straight, not bilabiate, 5-lobed, sometimes 4-lobed, lobes suborbicular, 0.9–1.1 cm diam., revolute, corolla tube and lobes glabrous on both sides	tubular-campanulate, basal tube 5–7 mm diam., upper tube campanulate, 2.5–3.5 cm long, 2.5–3.5 cm diam., widened towards the mouth, bilabiate, 5-lobed, upper lobes 2 and lower lobes 3, lobes suborbicular or broadly obovate, 1.5–2.5 × 1.5–2.2 cm, not revolute, corolla tube and lobes with glandular hairs outside, glabrous inside
Fertile stamens	4, equal or subequal (scarcely didynamous), filament straight, adnate at insertion up to the middle of corolla tube	4, didynamous, filament curved, adnate at insertion of corolla tube
Ovary colour	reddish purple	green
Young fruit colour	greenish purple	green

Thong, Doi Luang National Park, Pha Doop Cave, 14 Mar. 1991, *Maxwell* 91-277 (**CMUB**, **L** [L3731028]); Mueang Pan, Chae Son National Park, along Mae Mon Stream, at Park Headquarters, 27 Mar. 1996, *Maxwell* 96-423 (**BKF**, **CMUB**, **L** [L2815392]); Mae Ta, *Winit* 692 (**BKF**, **K**, reported by Santisuk, 1974)]; Phrae [Sung Men, Huai Rai, 27 Apr. 1943, *Chandsap* 23 (**BKF**)]; NORTH-EASTERN: Phetchabun [locality unspecified, 2 Apr. 1976, *Sangkhachand* 3103 (**L** [L2815391])]; Loei [Na Hao, Nam Hueang, 21 Mar. 1997, *BGO. Staff* 13 (**QBG**)]; Wang Saphung, Pakpuan Arboretum, cultivated, 25 Feb. 2007, *Suddee et al.* 3011 (**BKF**)]; EASTERN: Nakhon Ratchasima [Wang Nam Khiao,

Sakaerat Silvicultural Research Station, cultivated, 4 Mar. 2018, *Ngernsaengsaruy & Meeprom* 89, 90 (**BKF**)]; SOUTH-WESTERN: Uthai Thani [Ban Rai, Huai Kha Khaeng Wildlife Sanctuary, 21 Feb. 1970, *Beusekom & Santisuk* 2898 (**L** [L2815439, L2815440, L2815441])]; Phetchaburi [Kaeng Krachan, Kaeng Krachan National Park, Ban Krang Camp, 23 Jan. 2005, *Williams et al.* 1044 (**BKF**, **E** [E00375423, E00396538])]; CENTRAL: Bangkok [Kasetsart University, cultivated, 19 Mar. 1971, *Maxwell* 71-413 (**L** [L2815404, L2815405])]; Kasetsart University, Faculty of Science, cultivated, 21 Feb. 2018, *Boonthasak* 17 (**BK**)].

ANATOMICAL STUDY

Leaflets and wood anatomy of *Mayodendron*

***igneum*:** A cuticle layer is deposited on the outer walls of the epidermal cells. The epidermal cells form a single layer on both surfaces, with those on the adaxial surface larger than those on the abaxial surface. The cells are irregular in shape, with undulate (wavy) anticlinal walls on both surfaces. Stomata are anomocytic, and present only on the abaxial surface. Peltate glandular trichomes are present on both surfaces. The species has bifacial leaves with the palisade mesophyll consists of a single layer of cells that is less than half of the total mesophyll thickness, and the spongy mesophyll is composed of irregularly shaped cells. The vascular bundles in the midrib are surrounded by sclerenchymatous tissue. Prismatic crystals are present in the mesophyll adjacent to the vascular bundle and in the epidermal cells on both the adaxial and abaxial leaflet surfaces (Fig. 5). In contrast, Poomsripanon *et al.* (2019) reported that the inclusions in the epidermal cells of *M. igneum* are raphide crystals. According to Santisuk (1987), the leaflets of this species have

a few scattered glands on the abaxial surface. However, in our study, a few scattered peltate glandular trichomes were observed on both surfaces.

Mayodendron igneum has diffuse-porous wood with distinct growth rings. Vessels are solitary, arranged in radial multiples of 2–5 cells, or grouped in clusters of 2–6 cells. They measure 30–85 µm diam. and 150–340 µm length. Axial parenchyma is confluent. Rays are heterocellular, typically biseriate or uniseriate, and occasionally triseriate, composed of 1–30 procumbent cells and 1–4 rows of upright cells at both ends. Occasionally, uniseriate homocellular ray composed only of upright cells (2–8 cells long) are present. Prismatic crystals are found in ray parenchyma. Fibres are non-septate (Fig. 6). According to Gasson & Dobbins (1991), the wood of *Mayodendron igneum* is diffuse porous, and growth rings are indistinct. Axial parenchyma is confluent and scanty. Rays are homocellular, uniseriate or biseriate, composed of procumbent cells up to 20 cells long. Fibres are thin- to thick-walled and non-septate.

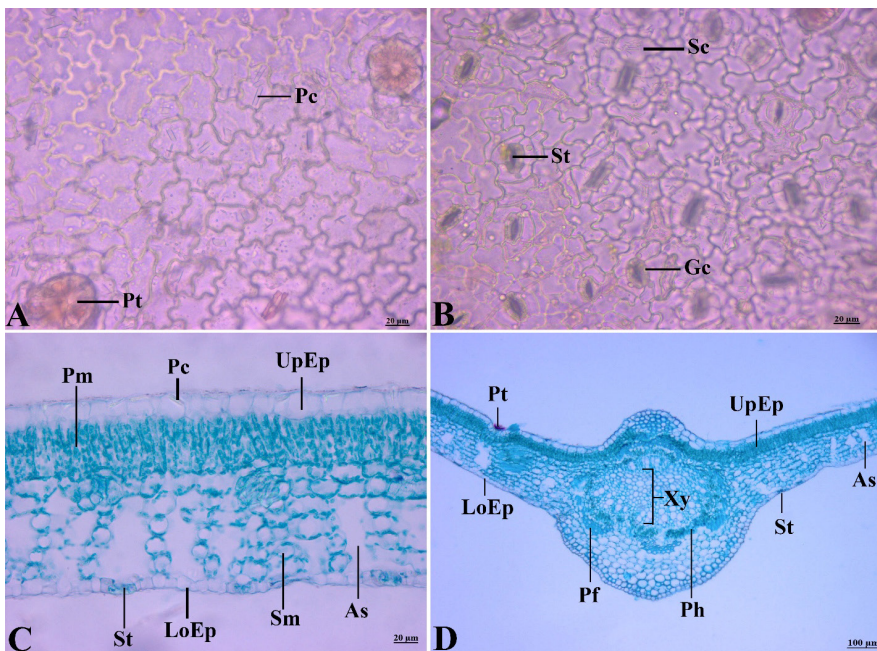


Figure 5. Leaflet anatomy of *Mayodendron igneum* (Kurz) Kurz: A. upper epidermis; B. lower epidermis; C, D. transverse section (As = air space, Gc = guard cell, LoEp = lower epidermis, Pc = prismatic crystal, Pf = phloem fibre, Ph = phloem, Pm = palisade mesophyll, Pt = peltate glandular trichome, Sc = subsidiary cell, Sm = spongy mesophyll, St = stoma, UpEp = upper epidermis, Xy = xylem).

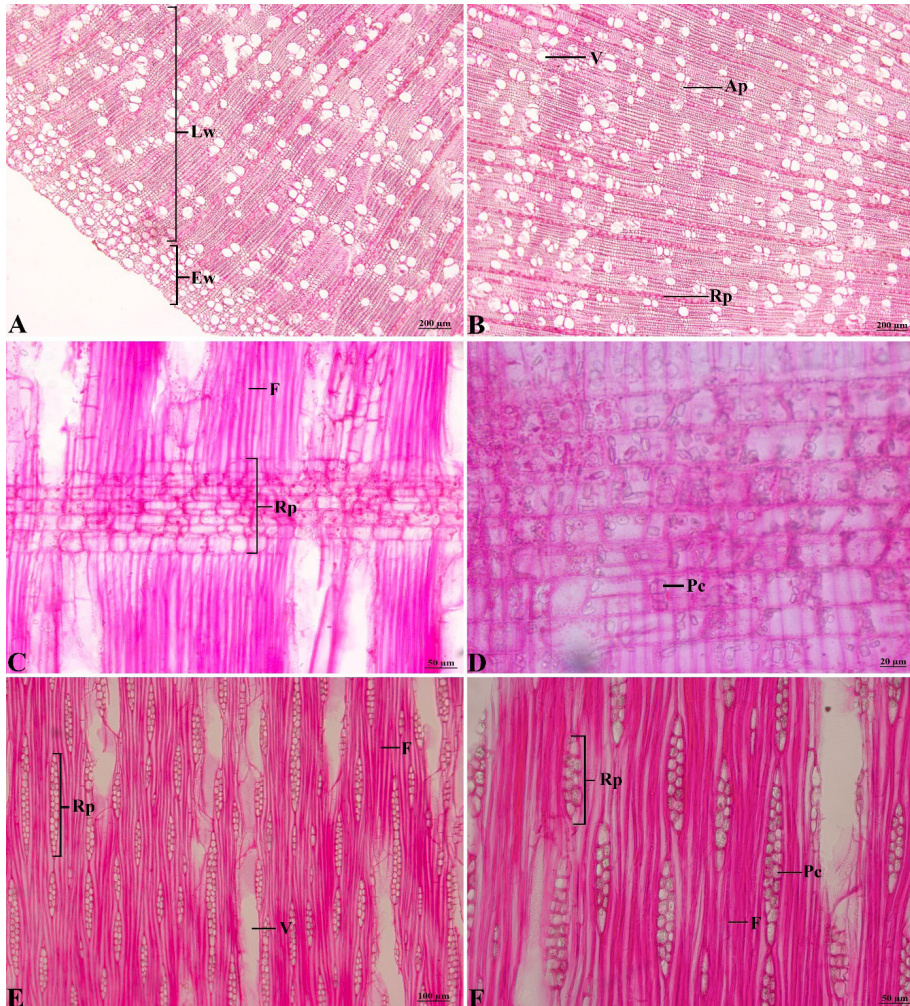


Figure 6. Wood anatomy of *Mayodendron igneum* (Kurz) Kurz: A–B. transverse sections; C–D. radial longitudinal sections, showing prismatic crystals in ray parenchyma; E–F. tangential longitudinal sections (Ap = axial parenchyma, Ew = early wood, Lw = late wood, Pc = prismatic crystal, Rp = ray parenchyma, V = vessel, F = fibre).

A comparison of leaflet and wood anatomical characters of *Mayodendron* and other genera within the paleotropical clade of the family Bignoniaceae in Thailand is presented in Table 3.

POLLEN MORPHOLOGY

The pollen grains of *M. igneum* are monads and isopolar. They are prolate-spheroidal or subprolate in shape. Pollen size is small to medium, with the polar axis ranging from 19–25 µm, and the equatorial axis from 18–23 µm. The exine sculpturing is heterobrochate and reticulate, with lumina of varying sizes: microreticulate (lumina < 1 µm) and

fine reticulate (lumina between 1–2 µm) (Fig. 7). The pollen apertures can be classified as four types:

Type 1: typical tricolpate; pollen grains with three colpi, perpendicular to the equatorial axis, apices of colpi free (Fig. 7A, B).

Type 2: 3-syncolpate with oblique colpi; pollen grains with three colpi, the ends of which fused at one or both poles, with one or more oblique colpi (Fig. 7G, H).

Type 3: 4-syncolpate; pollen grains with four colpi, adjacent pairs of colpi fused, delimiting a tennis ball-like (Fig. 7C, D).

Table 3. Comparison of leaflet and wood anatomical characters of *Mayodendron* and *Radermachera*, together with previous studies of three other genera (*Fernandoa*, *Dolichandrone*, and *Santisukia*) in the paleotropical clade of the family Bignoniaceae in Thailand.

Characteristics	Genera				
	<i>Mayodendron</i> (<i>M. igneum</i>)	<i>Radermachera</i> (<i>R. hainanensis</i>)	<i>Fernandoa</i> (<i>F. adenophylla</i>)	<i>Dolichandrone</i>	<i>Santisukia</i>
Leaflet					
Leaflet types	bifacial	bifacial	bifacial	bifacial or unifacial	bifacial or unifacial
Stomatal types	anomocytic	anomocytic	anomocytic	anomocytic	anomocytic
Crystal types in leaflets	prismatic crystals	prismatic crystals	absent	druse crystals	absent
Wood					
Vessel arrangement	diffuse-porous, solitary, arranged in radial chains of 2–5 cells or form in groups of 2–6 cells	diffuse-porous, solitary, arranged in radial chains of 2–7 cells or form in groups of 2–4 cells	diffuse-porous, solitary or form in groups of 2–4 cells	diffuse-porous, solitary or arranged in radial chains of 2–7 cells	diffuse-porous, solitary or form in groups of 2–3 cells
Vessel diameter (µm)	30–85	20–80	20–100	30–90	c. 100
Axial parenchyma patterns	confluent	confluent	confluent	banded or confluent	aliform or confluent
Ray parenchyma patterns	biseriate or uniseriate, sometimes triseriate heterocellular or uniseriate homocellular	uniseriate or biseriate heterocellular	biseriate, sometimes uniseriate heterocellular or uniseriate homocellular	uniseriate, sometimes biseriate heterocellular	biseriate, triseriate or tetraseriate heterocellular
Ray height (cells)	1–30	5–30(–56)	3–12	2–45(–60)	5–40
Ray width (rows of cells)	1–2(–3)	1–2	(1–)2	1(–2)	2–4
Crystal types in ray parenchyma	prismatic crystals	prismatic crystals	absent	absent	absent
Fibres	non-septate	non-septate	septate	septate	septate

Type 4: 6-pantocolpate; pollen grains with six colpi, three colpi perpendicular to the equatorial axis and three remaining perpendicular to the polar axis, the ends of which are fused and form a triangular area (Fig. 7E, F).

The result of the pollen morphology in this study is consistent with Santanachote (1981) in terms of pollen shape, size, aperture, and exine sculpture. However, the aperture patterns of this species are

highly variable. In addition to the basic tricolpate type, 3-syncolpate, 4-syncolpate, and 6-pantocolpate types were also observed. Similar variations are found in other eudicot families, including Gentianaceae, Fabaceae, and Clusiaceae (Pire & Dematteis, 2007). Additionally, a comparison of pollen morphological characters of *Mayodendron* and other genera in the paleotropical clade of the family Bignoniaceae in Thailand is presented in Table 4.

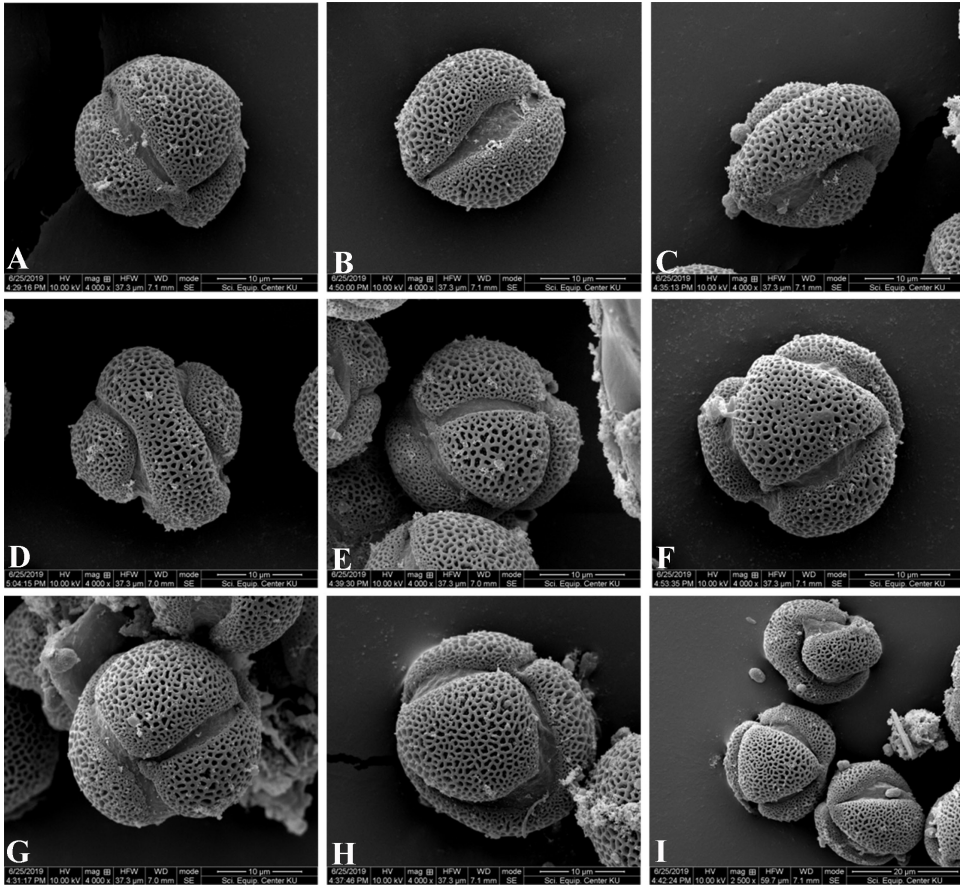


Figure 7. SEM micrographs of pollen grains of *Mayodendron igneum* (Kurz) Kurz: A, B. typical tricolpate pollen; C, D. 4-syncolpate pollen; E, F. 6-pantocolpate pollen; G, H. 3-syncolpate pollen; I. variable pollen aperture patterns.

ACKNOWLEDGEMENTS

We would like to thank the curators and staff of the following herbaria: BK, BKF, CMU, CMUB, and QBG, for their assistance during our visits and for granting access to herbarium specimens, including those available in the digital herbarium databases of E, L, and HBG. We are also grateful to the collectors of *M. igneum* specimens. Special thanks go to Pichet Chanton for providing photographs and preparing the distribution map of this species.

REFERENCES

- APG IV (2016). An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. Botanical Journal of the Linnean Society 181(1): 1–20.
- Bachman, S., Moat, J., Hill, A.W., de la Torre, J. & Scott, B. (2011). Supporting red list threat assessments with GeoCAT: geospatial conservation assessment tool. ZooKeys 150: 117–126.
- Balslev, H. & Chantaranothai, P. (eds) (2023). Flora of Thailand 4(3.3): Leguminosae-Papilionoideae. The Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation. Prachachon Co. Ltd., Bangkok, 227 pp.
- Boonthasak, W. & Ngernsaengsarua, C. (2021). The genus *Dolichandrone* (Fenzl) Seem. (Bignoniaceae) in Thailand. Biodiversitas 22(3): 1,120–1,128.
- Clarke, C.B. (1884). Bignoniaceae. In: J.D. Hooker (ed.), The Flora of British India 4: 376–386. L. Reeve & Co., London.

Table 4. Comparison of pollen morphological characters of *Mayodendron*, *Radermachera*, and *Santisukia* with previous studies of two other genera: *Dolichandrone* and *Fernandoa* in the paleotropical clade of the family Bignoniaceae in Thailand.

Characteristics	Genera				
	<i>Mayodendron</i> (<i>M. igneum</i>)	<i>Radermachera</i> (<i>R. hainanensis</i>)	<i>Santisukia</i>	<i>Dolichandrone</i>	<i>Fernandoa</i> (<i>F. adenophylla</i>)
Pollen unit	monad	monad	monad	monad	monad
Pollen polarity	isopolar or apolar	isopolar	isopolar	isopolar	isopolar
Polar [P] axis length (µm)	19–25	18–23	20–35	35–65	29–55
Equatorial [E] axis length (µm)	18–23	21–26	20–30	30–57	27–54
Pollen size class	small to medium	small to medium	small to medium	medium to large	medium to large
Pollen shape	prolate-spheroidal or subprolate	oblate-spheroidal or suboblate	prolate or prolate-spheroidal	spheroidal or prolate-spheroidal	oblate, suboblate or oblate-spheroidal
Pollen aperture	tricolpate, 3-syncolpate, 4-syncolpate or 6-pantocolpate	tricolpate	tricolpate	tricolpate	tricolpate
Exine sculpturing	heterobrochate (microreticulate and fine reticulate)	microreticulate	reticulate	heterobrochate (microreticulate, fine reticulate, and medium reticulate)	reticulate

Dop, P. (1930). Bignoniacées. In: P.H. Lecomte, F. Gagnepain. & F. Pellegrin (eds), Flore Générale de l’Indo-Chine 4: 565–607. Masson et Cie, Éditeurs, Paris.

Erdtman, G. (1945). Pollen Morphology and Plant Taxonomy V. On the occurrence of tetrads and dyads. Svensk Botanisk Tidskrift Utgifven af Svenska Botaniska Foreningen 39: 286–297.

_____. (1952). Pollen Morphology and Plant Taxonomy: Angiosperms 1. Almquist and Wiksell, Stockholm, Sweden, 539 pp.

Fischer, F., Theisen, I. & Lohmann, L.G. (2004). Bignoniaceae. In: K. Kubitzki & J.W. Kadereit (eds), The Families and Genera of Vascular plants: Flowering Plants, Dicotyledons: Lamiales (except Acanthaceae including Avicenniaceae) Vol. 7, pp. 9–38. Springer-Verlag Berlin Heidelberg.

Gasson, P. & Dobbins, D.R. (1991). Wood anatomy of the Bignoniaceae, with a comparison of trees and lianas. IAWA Journal 12: 389–417.

Gledhill, D. (2002). The Names of Plants, 3rd ed. Cambridge University Press, UK, 326 pp.

IPNI (2025). International Plant Names Index. The Royal Botanic Gardens, Kew, Harvard University Herbaria & Libraries and Australian National Herbarium. <https://www.ipni.org/>. Accessed 20 August 2025.

IUCN Standards and Petitions Committee (2024). Guidelines for Using the IUCN Red List Categories and Criteria Version 16. Standards and Petitions Committee. Downloaded from <https://www.iucnredlist.org/documents/redlist-guidelines.pdf>

- Johansen, D.A. (1940). *Plant Microtechnique*. McGraw-Hill, New York, 523 pp.
- Kermanee, P. (2008). *Techniques of Plant Tissue*. Kasetsart University, Bangkok, 289 pp. (in Thai).
- Kurz, S. (1871). On some new or imperfectly known Indian plants. *Journal Asiatic Society of Bengal Part 2, Natural History* 40(1): 45–78.
- _____. (1875). Lord Mayo's Tree (*Mayodendron*), A New Genus from Martaban. Preliminary Report on the Forest and other Vegetation of Pegu, Appendix D t. 1. C.B. Lewis, Baptist Mission Press, Calcutta.
- _____. (1877). Bignoniaceae. In: *Forest Flora of British Burma* 2: 228–239. The Superintendent of Government Printing, Calcutta.
- Meeprom, N., Ngernsaengsaruy, C. & Boonthasak, W. (2022). A taxonomic revision of *Santisukia* Brummitt (Bignoniaceae) in Thailand. *Kew Bulletin* 77(2): 555–567.
- Metcalf, C.R. & Chalk, L. (1957). *Anatomy of the Dicotyledons: Leaves, Stem, and Wood in Relation to Taxonomy, with Notes on Economic Uses* 1. Oxford University Press, Oxford, 1,459 pp.
- Ngernsaengsaruy, C., Meeprom, N., Boonthasak, W., Attasook, Y. & Thunthawanich, R. (2023). A taxonomic revision of Thai *Fernandoa* Welw. ex Seem. (Bignoniaceae). *PhytoKeys* 235: 249–270.
- Olmstead, R.G., Zjhra, M.L., Lohmann, L.G., Grose, S.O. & Eckert, A.J. (2009). A molecular phylogeny and classification of Bignoniaceae. *American Journal of Botany* 96(9): 1,731–1,743.
- Pire, S.M. & Dematteis, M. (2007). Pollen aperture heteromorphic in *Centaurium pulchellum* (Gentianaceae). *Grana* 46: 1–12.
- Pooma, R. & Suddee, S. (eds) (2014). *Tem Smitinand's Thai Plant Names, Revised Edition* 2014. Office of the Forest Herbarium, Forest and Plant Conservation Research Office, Department of National Parks, Wildlife and Plant Conservation, Bangkok, 828 pp.
- Poomsripanon, T., Srinual, A. & Kesonbua, W. (2019). Leaf epidermal anatomy and classification of some Bignoniaceae species in Thailand. *Thai Journal of Botany* 11(2): 129–150.
- POWO (2025). *Plants of the World Online*. Facilitated by the Royal Botanic Gardens, Kew. Published on the internet; <https://powo.science.kew.org/>. Accessed 20 August 2025.
- Punt, W., Hoen, P.P., Blackmore, S., Nilsson, S. & Thomas, A.L. (2007). Glossary of pollen and spore terminology. *Review of Palaeobotany and Palynology* 143: 1–81.
- Radcliffe-Smith, A. (1998). *Three-language List of Botanical Name Components*, Whistable Litho Ltd., Kent, UK, 143 pp.
- Santanachote, K. (1981). *A Palynological Study of the Thai Bignoniaceae*. M.Sc. Thesis, Chulalongkorn University, Bangkok. (in Thai).
- Santisuk, T. (1974). Bignoniaceae. *Thai Forest Bulletin (Botany)* 8: 1–48.
- _____. (1987). Bignoniaceae. In: T. Smitinand, & K. Larsen (eds), *Flora of Thailand* 5(1): 32–66. The Forest Herbarium, Department of National Parks, Wildlife and Plant Conservation. Chutima Press, Bangkok, Thailand.
- Santisuk, T. & Vidal, J.E. (1985). Bignoniaceae. In: J.-F. Leroy (ed.), *Flore du Cambodge du Laos et du Vietnam* 22: 1–71. Muséum National d'Histoire Naturelle, Paris.
- Simpson, M.G. (2010). *Plant Systematics*, 2nd ed. Elsevier Academic Press, Burlington, MA, USA, San Diego, CA, USA, 752 pp.
- Stearn, W.T. (1992). *Botanical Latin: History, Grammar, Syntax, Terminology and Vocabulary*, 4th ed. Redwood Books, Trowbridge for David & Charles Publishers, England, 546 pp.
- Thiers, B. (2025, continuously updated). *Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff*. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/>. Accessed 20 August 2025.
- Turland, N.J., Wiersema, J.H., Barrie, F.R., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Knapp, S., Kusber, W.H., Li, D.Z., Marhold, K., May, T.W., McNeill, J., Monro, A.M., Prado, J., Price, M.J. & Smith, G.F. (2018). *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017*. Glashütten: Koeltz Botanical Books, *Regnum Vegetabile* 159.

- van Steenis, C.G.G.J. (1976). Conspectus of the genera *Radermachera* and *Fernandoa* in Indo-Malesia (Bignoniaceae). *Blumea* 23(1): 121–138.
- Zhang, Z.-Y. & Santisuk, T. (1998). Bignoniaceae. In: C.Y. Wu, P.H. Raven & D.Y. Hong (eds), *Flora of China* 18: 213–225. Science Press, Beijing; Missouri Botanical Garden Press, St. Louis.