

The genus *Gaertnera* (Rubiaceae) in Thailand

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ABSTRACT

Two species of *Gaertnera* in Thailand, viz. *G. junghuhniana* and *G. sralensis*, are enumerated and described. A lectotype is designated for *G. taiensis*, a synonym of *G. junghuhniana*. A key to species and data on distribution, habit and phenology are also provided.

KEYWORDS: Gaertnereae, key to species, lectotype, Rubioideae, Gentianales, taxonomy.

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INTRODUCTION

The genus *Gaertnera* Lam. (Rubiaceae) consists of small trees and shrubs. It is composed of approximately 88 species (Malcomber & Taylor, 2009; Taylor *et al.*, 2014; Jongkind, 2015, 2018; Tagane *et al.*, 2016). The genus is distributed throughout the wet tropics of Africa, Madagascar, Sri Lanka, and South-East Asia (Malcomber & Taylor, 2009). The species are found from sea level to over 2,000 m elevation in evergreen forests, in various habitats from upland vegetation on clay and loam soils to low-altitude swamps and littoral forests to laterite white sand or other substrates to high-altitude moss forests (Malcomber & Taylor, 2009). *Gaertnera* Lam., *Gaertnera* Retz. and *Gaertnera* Schreb., were implied to be treated as homonyms (ICN Art. 53.2, Turland *et al.*, 2018), while *Gaertneria* Medik. and *Gaertneria* Neck. were sufficiently alike to be confused with *Gaertnera* Lam. (ICN Art. 53.4, Turland *et al.*, 2018). All names were denominated to honour the German botanist Joseph Gaertner (1732–1791), who investigated angiosperm seed and fruit structure. *Gaertnera* Lam., published in 1792, was voted as conserved name and therefore became legitimate over *Gaertnera* Schreb., although the latter was published in 1789, it therefore was deemed illegitimate; *Hiptage* Gaertn. (Malpighiaceae), a

name published in 1790 and based on the same type as *Gaertnera* Schreb., automatically supersedes it as a legitimate name in Malpighiaceae (Rickett & Staffeu, 1960; Nicolson & Panigrahi, 1985; Wiersema *et al.*, 2018, continuously updated). *Gaertnera* Retz., published in 1791, is now treated as a synonym of *Campanula* L. (Campanulaceae). *Gaertneria* Medik., published in 1789, is a synonym of *Ambrosia* L. (Asteraceae) (Govaerts *et al.*, 2021), while *Gaertneria* Neck., published in 1790, an invalid name, is a synonym of *Gentiana* Tourn. ex L. (Gentianaceae).

The genus *Gaertnera* is morphologically diverse, and diagnostic characters for the genus are the superior fruits and the tubular sheathing stipules. The inflorescences are most commonly corymbiform but can also be thyriform, capituliform, few-flowered or reduced to a single flower. Interpetiolar stipules are either calyptrate, cylindrical or funnel-shaped with a combination of wings and/or ridges on the tube and around the petiole. Stipule apices can be truncate, lobed or lobed with many setae. Calyx lobes are either absent, small and deltoid-linear or expanded into large coloured petaloid structures (calycophylls). Flowers are either white, pink, or red and range from 2 to 30 mm length. All *Gaertnera* species have either a dioecious or distylous breeding system (Malcomber & Taylor, 2009).

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Gaertnera is one of two genera of the tribe Gaertnereae, of subfamily Rubioideae (Bremer & Manen, 2000). Kerr (1940), Malcomber & Taylor (2009), Gardner *et al.* (2015) and Tagane *et al.* (2016) indicated two species for Thailand: *G. junghuhniana* (*G. taiensis* in Kerr, 1940) and *G. sralensis* (Pierre ex Pit.) Kerr., while Puff *et al.* (2005) reported only one species of *Gaertnera* in Thailand, *G. junghuhniana* Miq. The recent research aims to elucidate the species diversity of the genus in Thailand.

MATERIAL AND METHODS

The study is based on relevant references and on the morphological studies of the collections from the herbaria: BK, BKF, BM, E, G, K, L, P, QBG (acronyms follow Thiers, 2021, continuously updated).

TAXONOMIC TREATMENT

Gaertnera Lam., Tabl. Encycl.: 1: 379, t. 167. 1792, **nom. cons.** (non *Gaertnera* Schreb., 1789, **nom. rej.** [Malpighiaceae], nec *Gaertnera* Retz. 1791, **nom. rej.** [Campanulaceae], nec *Gaertneria* Medik. 1789, **nom. rej.** [Asteraceae], nec *Gaertneria* Neck. 1790, **nom. inval.** [Gentianaceae]); Ridl. J. Straits Branch Roy. Asiat. Soc. 33: 115. 1900; Fl. Malay Penins. 2: 426. 1923; Beusekom, Blumea 15: 370. 1968 ('1967'); Puff *et al.*, Rubiaceae of Thailand: 110 & pl. 3.1.33. 2005; Malcomber & C.M. Taylor, Ann. Missouri Bot. Gard. 96: 592. 2009; C.M. Taylor *et al.*, Ann. Missouri Bot. Gard. 99: 691.

2014; S. Gardner *et al.*, Forest Trees S. Thailand 3: 1904 & 2233. 2015. Type: *Gaertnera vaginata* Lam.

— *Sykesia* Arn., Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 18: 351. 1836. Type: *Sykesia koenigii* Arn., **nom. illeg.** [= *Gaertnera vaginans* (DC.) Merr.].

— *Pristidia* Thwaites, Enum. Pl. Zeyl. 2: 149. 1859. Type: *Pristidia divaricata* Thwaites [= *Gaertnera divaricata* (Thwaites) Thwaites].

Shrubs or small trees, branches often paired and slightly supra-axillary. *Leaves* opposite decussate or rarely ternate, domatia absent or present; petiolate. *Stipules* connate, intrapetiolar, cylindrical sheath, margins often with minute filiform lobes. *Inflorescence* terminal, cymose, compound cymose, panicle, pyramidal, corymbiform, or few-flowered. *Flowers* (4–)5-merous, bisexual and heterostylous, or unisexual. *Calyx* connate at base, cup-shaped or bell-shaped, lobes truncate to triangular or ovate. *Corolla* infundibuliform, inside glabrous or pubescent at the throat, lobes valvate in bud. *Stamens* inserted on the corolla tube, included or exserted. *Ovary* half-inferior, 2-locular, with a solitary ovule in each locule; style with stigma 2-lobed exserted or included. *Fruit* a drupe, secondarily superior, globose, ellipsoid, obovoid or 2-lobed with 2 pyrenes.

A tropical African and Asian genus of approximately 70 species; two species in Thailand, mostly in Eastern, Southeastern and Peninsular Thailand.

KEY TO THE SPECIES OF GAERTNERA IN THAILAND

1. Inflorescence/infructescence corymbiform to pyramidal, loosely cymose. Peduncles up to 4 cm long. Calyx lobes truncate or triangular. Leaves 6–17 × 0.6–5 cm **1. *G. junghuhniana***
1. Inflorescence/infructescence spherical, ovoid, subcapitate, congested cymose. Peduncles up to 0.3 cm long. Calyx lobes triangular or ovate. Leaves 3.5–11 × 1–3.5 cm **2. *G. sralensis***

1. *Gaertnera junghuhniana* Miq., Fl. Ned. Ind. 2: 383. 1856; Malcomber & C.M. Taylor, Ann. Missouri Bot. Gard. 96: 626. 2009; S. Gardner *et al.*, Forest Trees S. Thailand 3: 1904 & 2233. 2015; Tagane *et al.*, Acta Phytotax. Geobot. 67: 128. 2016.— *Sykesia junghuhniana* (Miq.) Kuntze, Revis. Gen. Pl. 2: 425. 1891.— *Gaertnera vaginans* subsp. *junghuhniana* (Miq.) Beusekom, Blumea 15: 388. 1968 ('1967'). Type: Indonesia, Sumatra, Sumatera Utara, Sipirok, Sumatra alti Sipirok, Nov., *F.W. Junghuhn s.n.*

(lectotype **L** [L0537708 image!], designated by Beusekom, 1968 ('1967'): 385; isolectotype **U** [U0006010 image!]).

— *Gaertnera taiensis* Kerr, Bull. Misc. Inform. Kew 1940: 180. 1940. Type: Thailand, Trang, Khao Soi Dao, ca 300 m, 27 Apr. 1930, *A.F.G. Kerr 19137* (lectotype **K** [K000772007 image!], designated here; isolectotypes **BK** [BK257341 image!], **BM** [BM000055362 image!], **L** [L0537709 image!], **P** [P03980818 image!]).

Shrub or treelet, 1.5–4 m tall; branchlets terete, glabrous branching above leaves axillary. *Leaves* elliptic, elliptic-oblong, narrowly elliptic or oblanceolate, 6–17 × 0.6–5 cm, apex acuminate, cuspidate or caudate, base attenuate or cuneate; domatia absent or present; secondary veins 5–7 pairs, distinct on lower surface; petiole 0.5–2 cm long. *Stipules* chartaceous when dry, caducous or deciduous, tube 5–12 mm long with 4 ribs or none rib, apex deltate, with 4 filiform appendages 0.5–1.5 mm long, tubular glabrous on both sides. *Inflorescences* terminal, corymbiform to pyramidal, loosely cymose, many flowers, peduncle up to 4 cm long; rachis glabrous, bract and bracteoles deltate, lanceolate to linear, 1–2 mm long, glabrous. *Flowers* 5-merous, unisexual, heterostylous; pedicel 0–2 mm long. *Calyx* cup-shaped, 1–1.5 mm long, outside glabrous, hair-ring inside near base, lobes truncate to triangular, up to 0.5 mm long, apex truncate or acute. *Corolla* white or greenish white, tubes 1.5–5.5 mm long, outside glabrous, inside villous, lobes 1.5–2.5 mm long, ovate, apex acute. *Staminate flowers*: stamens inserted in upper third of corolla, 1.5 mm long; anthers narrowly oblong 1.5–2 mm long, exerted; vestigial style 0.5 mm long, included. *Pistillate flowers*: staminodal filaments inserted in upper third of corolla; staminodia included. *Style* 2.5–6.5 mm long, exerted. *Drupes* globose or didymous 6–8 × 6–9 mm, green when young, violet-black when ripe; pyrenes hemispherical or spherical, rugose.

Thailand.—PENINSULAR: Trang [Valley above Sai Rung Waterfall, camp 3, Khao Banthat Wildlife Sanctuary, Yanta Khao, 7°27'N, 99°51'E, 750 m, 15 Mar. 2006, Gardner & Chamchumroon ST2481 (BKF, 2-sheets); Khao Soi Dao, ca 300 m, 27 Apr. 1930, Kerr 19137 (BK, BM, K, L, P)].

Distribution.— Vietnam, Malaysia, Sumatra, Borneo and Sulawesi.

Ecology.— Evergreen forests; 300–800 m alt. Flowering March–May, fruiting April–June.

Note.— *Gaertnera junghuhniana* is close to *G. sralensis* but differs markedly by having a corymbiform to pyramidal inflorescence, truncate or triangular calyx lobes and peduncles up to 4 cm long. While *G. sralensis* has a spherical or subglobose inflorescence, triangular or ovate calyx lobes and peduncles up to 0.3 cm long.

Kerr (1940) described *G. taiensis* base on a single gathering, *A.F.G. Kerr 19137*, from Thailand. There are five duplicates of the type collection available at **BK**, **BM**, **K**, **L**, and **P**. Van Beusekom (1968 [‘1967’]: 386) cited the type of *G. taiensis* as “Type: *Kerr 19137*, isotype seen in **L**.” He referred to the only isotype in **L** but omitted the holotype and where it is deposited. No inadvertent lectotype (Prado *et al.*, 2015) was mentioned. Malcomber & Taylor (2009: 626) cited “TYPE: Thailand. Trang: Kao Soi Dao, 300 m, *A.Kerr 19137* (holotype, **K!**; isotypes, **BM!**, **L!**)”. They incorrectly cite “holotype” for this name. An inadvertent lectotypification is not effective under ICN Art. 7.11 (Turland *et al.*, 2018) on or after 1 January 2001. Therefore, lectotypification is still required. The duplicate K000772007 at **K** with dissected flowers is designated here as a lectotype.

2. *Gaertnera sralensis* (Pierre ex Pit.) Kerr, Bull. Misc. Inform. Kew 1940: 180. 1940; Malcomber & C.M.Taylor, Ann. Missouri Bot. Gard. 96: 653. 2009.— *Psychotria sralensis* Pierre ex Pit., in Lecomte, Fl. Indochine 3: 344. 1924.— *Uragoga sralensis* Pierre ex Pit., in Lecomte, Fl. Indochine 3: 344. 1924, **nom. nud.**, pro syn. Type: Cambodia, Samrong-tong Province, in montibus Sral, Apr. 1870, *J.B.L. Pierre 1253* (lectotype, designated by Beusekom, 1968 [‘1967’]: 386, **L** [L.4211389 image!]; isolectotypes **G** [G00369240 image!], **K** [K000772008 image!] **P** [P00753706 image!, P00753707 image!]). Fig. 1.

Shrub or treelet, 1–3 m tall; branchlets terete, glabrous branching above leaves axillary. *Leaves* elliptic, narrowly elliptic or, oblanceolate, chartaceous, 3.5–11 × 1–3.5 cm, apex acuminate, cuspidate or rarely acute, base attenuate or cuneate; glabrous or sparsely pubescent on lower surface, domatia absent or present; secondary veins 4–7 pairs, distinct on lower surface, petiole 0.4–1.3 cm long. *Stipules* thinly chartaceous when dry, caducous or deciduous, tube 4–11 mm long with 4 ribs, apex with 4 appendages 0.5–1.5 mm long filiform, tubular glabrous on both surfaces. *Inflorescences* terminal, spherical, ovoid, congested-cymose, many-flowered, peduncle up to 0.3 cm long; glabrous, bract and bracteoles deltate, lanceolate to linear, up to 2 mm long, glabrous. *Flowers* 5-merous, heterostylous; pedicel absent to 2 mm long. *Calyx* cup-shaped, tube ca 0.5 mm long, glabrous outside,



Figure 1. *Gaertnera sralensis* (Pierre ex Pit.) Kerr. A. leaves and inflorescence; B. long-styled flowers; C. leaves and inflorescence bud; D. stipule (Photographs: A–B by Voradol Chamchumroon; C–D by Teerawat Srisuk).

hair-ring inside, lobes triangular to ovate, 0.5–1.5 mm long, apex acute. *Corolla* white or creamy white, tubes 1.5–5.5 mm long, outside glabrous, inside villous, lobes 2.5–3.5 mm long, oblong, apex acute. *Short-styled flowers*: stamens inserted in upper third of corolla; anther narrowly oblong 1.5–2 mm long, fully exserted; style 0.5–0.7 mm long, included. *Long-styled flowers*: stamens inserted in upper third of corolla; anthers narrowly oblong 1.5–2 mm long,

slightly exserted; style 1.7–6 mm long, exserted. *Drupes* globose 5–8 × 6–8 mm, green when young and turning blue-black or violet-black when ripe; pyrenes hemispherical or spherical, rugose.

Thailand.— EASTERN: Nakhon Ratchasima [Khao Kieo, Khao Yai National Park, 14° 45' N, 102° E, 1,200 m, 18 Oct. 1969, *van Beusekom & Charoenpol 1739* (BKF, L); 1,175 m, 7 Sept. 2002, *Maxwell 02-314* (BKF); SOUTH-EASTERN: Prachinburi [Khao

Kieo, Khao Yai National Park, 1,200 m, 7 July 1966, *Larsen et al.* 58 (**BKF, L**); Chantaburi [Khao Sabap, ca 600 m, 7 Jan. 1930, *Kerr* 17996 (**L, P**)]; Trat [Khao Kuap, ca 700 m, 25 Dec. 1929, *Kerr* 17764 (**BM, K, L, P**); 900 m, 26 Dec. 1929, *Kerr* 17798 (**BM, K, P**); 20 May 1930, *Put* 2864 (**L**); 22 May 1930, *Put* 2939 (**BK, BM, K, L, P**)]; PENINSULAR: Nakhon Si Thammarat [Khao Luang, ca 800 m, 29 Apr. 1928, *Kerr* 15454 (**BK, P**); 18 May 1968, *van Beusekom & Phengkklai* 839 (**BKF, L**)]; Yala [Khao Pee Saad, Bala-Hala, 1,000–1,250 m, 1 May 1998, *Niyomdham & Puudjaa* 5496 (**BKF, 2-sheets**); 1,000–1,250 m, 1 May 1998, *Niyomdham & Puudjaa* 5497 (**BKF, 2-sheets**); Khao Han Kut, 1,250 m 27 Mar. 1998, *Niyomdham* 5349 (**BKF, 2-sheets**); 1,300 m, 27 Mar. 1998, *Niyomdham* 5374 (**BKF, 2-sheets**)].

Distribution.— Cambodia, Vietnam, Malay Peninsula.

Ecology.— Evergreen forest; 800–1,300 m alt. Flowering April–July, fruiting May–October.

Note.— *Gaertnera sralensis* is distinguishable from the other Thai *Gaertnera* by the congested-cymose inflorescence and the shorter peduncle.

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