

Taxonomic notes on Grewioideae (Malvaceae) in Thailand

PHONGSAKHON NARKTHAI¹ & PRANOM CHANTARANOTHA^{1,*}

ABSTRACT

Corchorus fascicularis is first reported for Thailand. *Triumfetta repens* is not currently reported from Thailand anymore, although given the overall distribution of this species it may have been overlooked. Lectotypifications of *Colona elobata*, *Columbia flagrocarpa* var. *siamensis*, *C. winitii*, *Corchorus siamensis*, *Grewia lacei* and *G. winitii* are proposed here. *Triumfetta rhomboidea* is the correct name for *T. bartramia*.

KEYWORDS: lectotype, new report, taxonomy, Tiliaceae.

Accepted for publication: 21 May 2020. Published online: 12 June 2020

INTRODUCTION

Morphological and molecular analyses in the Malvales indicated that “core Malvales” or the four traditional plant families Bombacaceae, Malvaceae, Tiliaceae and Sterculiaceae are not all monophyletic and now best classified together in a single family. Therefore, the circumscription of Malvaceae *sensu lato* has been greatly changed and expanded and now includes nine subfamilies, namely Bombacoideae, Brownlowioideae, Byttnerioideae, Dombeyoideae, Grewioideae, Helicteroideae, Malvoideae, Sterculioideae and Tilioideae (Alverson *et al.*, 1999; Bayer *et al.*, 1999); the last subfamily is not known from Thailand. The distinct characteristics of the family Malvaceae *s.l.* are inflorescences based on a unique component called “bicolor unit”, valvate sepal aestivation, trichomatous nectaries, and the occurrence of tile cells (Bayer, 1999; Vogel, 2000; Bayer & Kubitzki 2003). The “bicolor unit” is the basic repeating unit of an inflorescence which is called after *Theobroma bicolor* Bonpl., where it was first observed (Bayer, 1999). The inflorescence is determinate and bears three bracts, one of which is always sterile, whereas the others subtend lateral cymes or single flowers (Bayer, 1999).

The Grewioideae are one of the basal subfamilies in the Malvaceae phylogeny and sister to

Byttnerioideae (Bayer *et al.*, 1999; Nyffeler *et al.*, 2005). The Grewioideae are characterized by having leaf-opposed inflorescences, sepals without nectaries at the ventral base, nectaries on the clawed petal or the androgynophores, and numerous, often free, dithecal stamens (Stevens, 2001 onwards; Brunken & Muellner, 2012). The Grewioideae are composed of approximately 700 species in 25 genera (Brunken & Muellner, 2012), and are widely distributed mostly in the tropics.

The 12 Thai genera in the former Tiliaceae (Phengklai, 1986; 1993) are now placed in three different subfamilies of Malvaceae (Phuphathanaphong *et al.*, 2019), and the genus *Muntingia* L. is now classified in Muntingiaceae (Bayer *et al.*, 1998). The three subfamilies are (1) Brownlowioideae including three genera, *Berrya* Roxb., *Brownlowia* Roxb. and *Pentace* Hassk.; (2) Dombeyoideae including two genera, *Burretiodendron* Rehder and *Schoutenia* Korth.; and (3) Grewioideae including six genera, *Colona* Cav., *Corchorus* L., *Grewia* L., *Microcos* L., *Trichospermum* Blume and *Triumfetta* L. (Bayer & Kubitzki, 2003). Most species in Thailand occur in mixed deciduous and evergreen forests and open scrub. *Corchorus capsularis* L. and *C. olitorius* L. are widely cultivated for bast fibres.

¹ Applied Taxonomic Research Center (ATRC) & Center of Excellence on Biodiversity (BDC), Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

* Corresponding author: pranom@kku.ac.th

When working on the distribution of plants of the Grewioideae in Thailand, a checklist of the plants studied has required a thorough literature review, extensive visits to herbaria and analysis of type collections. It was found that *Corchorus fascicularis* Lam. is a new report, and that the former records of *Triumfetta repens* (Blume) Merr. & Rolfe were based on misidentifications. Lectotypifications of six taxa studied are required viz. *Colona elobata* Craib, *Columbia flagrocarpa* (C.B. Clarke ex Brandis) Craib var. *siamensis* Craib, *C. winitii* Craib, *Corchorus siamensis* Craib, *Grewia lacei* J.R. Drumm. ex Craib and *G. winitii* Craib. Most type specimens cited have been seen or high-resolution images were obtained from AAU, ABD, BK, BKF, BM, E, K, KKU, KYO,

L, P and TCD (herbarium acronyms follow Thiers, 2020, continuously updated).

TAXONOMIC TREATMENT

New report:

Since the publication of the genus *Corchorus* in the Flora of Thailand account by Phengklai (1993), then with four species, *C. aestuans* L., *C. capsularis*, *C. olitorius* and *C. siamensis* Craib, an additional species is recorded as new for Thailand here, *C. fascicularis*, thus bringing the total of the species numbers in the genus to five. This requires an amendment of the key to the species of *Corchorus* in the Flora of Thailand as follows.

AMENDED KEY TO THE SPECIES OF *CORCHORUS* IN THAILAND

- | | |
|-----------------------------------------------------------------------------------|------------------------|
| 1. Capsules globose or depressed-globose | C. capsularis |
| 1. Capsules cylindrical | |
| 2. Leaf base with one pair of filiform appendages | |
| 3. Capsules longitudinally ribbed | C. olitorius |
| 3. Capsules distinctly winged | C. aestuans |
| 2. Leaf base without appendages | |
| 4. Leaves ovate, with cuspidate apices; capsules pendulous | C. siamensis |
| 4. Leaves oblong, lanceolate to narrowly ovate, with acute apices; capsules erect | C. fascicularis |

Corchorus fascicularis Lam., *Encycl.* 2(1): 104. 1876; DC., *Prodr.* 1: 505. 1824; Thwaites, *Enum. Pl. Zeyl.*: 401. 1864; Masters in Oliver, *Fl. Trop. Africa* 1: 263. 1868; in Hook.f., *Fl. Brit. India* 1: 398. 1874; Trimen, *Handb. Fl. Ceylon* 1: 183. 1893; Robyns & Meijer in Dassanayake & Fosberg, *Revis. Handb. Fl. Ceylon* 7: 424. 1991; S. Andrews in Beentje & S.A.L.Sm., *Fl. Trop. E. Africa, Tiliaceae & Muntingiaceae*: 107. 2001. Type: India, without further locality and date, *Sonnerat s.n.* (holotype P [P00287790!]). Fig. 1.

Annual herb, suberect, 30–75 cm tall, with procumbent or ascending subglabrous branches; stem woody, with scaly bark, glabrous. *Leaves* oblong, lanceolate to narrowly ovate, 1–6 × 0.3–2 cm, glabrous or subglabrous, apex acute, base obtuse, margin serrate-crenulate; thinly chartaceous, pale green below; triplinerved; stipules subulate-filiform or narrowly ovate, acuminate, 3–5 mm long, persistent; petioles 3–15 mm long, puberulous. *Inflorescences* cymose fascicles, with 2–5(–8) flowers, leaf-opposed; peduncle extra-axillary, very short. *Flowers* yellow; bracts minute; pedicel less than 1 mm long, slightly longer in fruit, glabrous. *Sepals* linear-oblong or narrowly ovate, 1.5–2.5 mm long, apiculate. *Petals*

5, oblong-obovate or narrowly obovate, 2–2.5 mm long. *Stamens* 5–10; filaments 1.5–2 mm long. *Ovary* narrowly oblong-cylindrical to linear, longitudinally 3–6-ridged, densely puberulous, 3-loculed; style short, glabrous; stigma capitate. *Fruits* erect, cylindrical, sessile capsules, 3-loculed, 1–1.5 cm long, glabrescent, greyish green brown with straight or curved beak, 1–2.5 mm long; locules without transverse septa. *Seeds* many, rhomboid or wedge-shaped, ca 1.5 mm long, angular, blackish, obliquely truncate at both ends.

Thailand.— CENTRAL: Saraburi [Ban Mo, Sang Soke, 24 Jan. 1989, *Paisooksantivatana y2315-89* (BK)]; Bangkok [Chatuchak, Ladphrao areas, 19 Apr. 2010, *Pooma & Pattharahirantricin 7458* (BKF)].

Distribution.— Tropical Africa, Arabia, Pakistan, India (type), Sri Lanka, Myanmar, Australia.

Ecology.— Along roadsides. Flowering and fruiting January–April.

Vernacular.— Krachao lek (กระเจาเล็ก).

Note.— *Corchorus fascicularis* is distinct in having small, erect, fascicled capsules, the valves of which have indistinct partitions. It was first

described from India, and is a widespread weed throughout hotter areas in India (Hooker, 1874). In Thailand, it is found growing along roadsides in Bangkok and Saraburi Provinces where it may have been introduced to the area by seed contamination. Therefore, this account provides a report of the species in Thailand. According to the phylogenetic work of Benor (2018), accessions of *Corchorus fascicularis* and *C. hirtus* L. studied were nested closely together with few sequence differences among them, and they also have few morphological differences; the taxonomic status of both species needs further study.

Note on *Triumfetta*:

Five species of *Triumfetta* were treated in the Flora of Thailand account of the genus (Phengklai, 1993), namely *T. annua* L., *T. bartramia* L., *T. grandidens* Hance, *T. repens* (Blume) Merr. & Rolfe and *T. pilosa* Roth. After careful examination of the Thai specimens, Phengklai *et al.* 12863 (BKF),

Shimizu *et al.* T-19447 (AAU, BKF), van Beusekom *et al.* 3997 (BKF, L), all assigned to *T. repens*, it was found that they should be determined as *Urena lobata* L., and that *T. repens* therefore is not currently reported for Thailand anymore.

Linnaeus (1753) described *Bartramia indica* L. which he later transferred to *Triumfetta bartramia* (Linnaeus, 1759). However, Fosberg & Sachet (1981) noted that this is a superfluous name for *B. indica* and that *T. rhomboidea* Jacq. (Jacquin, 1760) is the correct name for both *B. indica* and *T. bartramia*.

Lectotypifications:

1. *Colona elobata* Craib, Bull. Misc. Inform. Kew 1925: 21. 1925. Type: Thailand, Loei, Dan Sai, Khao Khieo Kang (Kao Keo Kang), 10 Apr. 1922, *Kerr 5802* (lectotype **K** [K000686956!], designated here; isolectotypes **ABD** [ABDUH:2/103!], **BK** [BK257556!], **BM** [BM000630899!], **E** [E00284092!], **TCD** [TCD0013009!]).

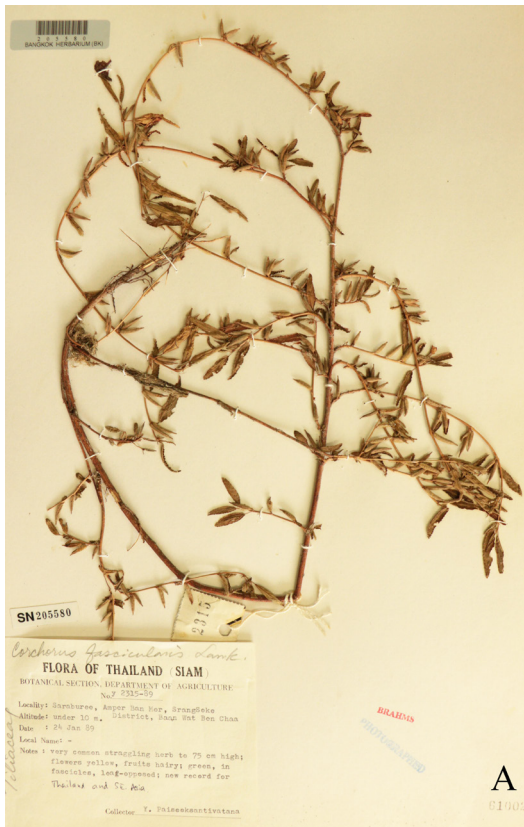


Figure 1. *Corchorus fascicularis* Lam. A. Paisooksantivatana y2315-89 (BK), B. Pooma & Paththarahirantricin 7458 (BKF). Photos by P. Narkthai.

Note.— *Colona elobata* is characterised by having leaves with triplinerved venation and an oblique and auriculate base, caducous stipules and 2–4-longitudinal winged fruits. The original description mentioned a collection of Kerr, *Kerr 5802*, which has six sheets. The specimen at **K** is chosen as lectotype because it has the most complete leaves and young flowers.

2. *Colona flagrocarpa* (C.B. Clarke ex Brandis) Craib, Fl. Siam. 1: 189. 1925.— *Columbia flagrocarpa* C.B. Clarke ex Brandis, Indian Tree: 101. 1906. Type: Bangladesh, Rungamuttea Chittagong, 5 Feb. 1873, *Clarke 19515* (holotype **K** [K000686844!]).

— *Columbia flagrocarpa* C.B. Clarke ex Brandis var. *siamensis* Craib, Bull. Misc. Inform. Kew 1911: 23. 1911.— *Colona flagrocarpa* (C.B. Clarke ex Brandis) Craib var. *siamensis* (Craib) Craib, Fl. Siam. 1: 189. 1925. Type: Thailand, Chiang Mai, Doi Suthep, 14 Nov. 1909, *Kerr 895* (lectotype **K** [K000686949!], designated here; isolectotypes **BM** [BM000630916!], **TCD** [TCD0013004!]).

Note.— *Colona flagrocarpa* is characterised by leaves with dense soft indumentum on the lower leaf surface, triplinerved venation, and 3 longitudinal wings of the fruit. Craib (1911) described *Columbia flagrocarpa* var. *siamensis* based on two Kerr collections, *Kerr 895* and *895a* (**BM** [BM000630900!], **K** [K000686948!], **TCD** [TCD0013005!]). Subsequently, Craib (1925) transferred all names to the genus *Colona*. The specimen *Kerr 895* at **K** is designated as the lectotype because it has more numerous leaves and fruits.

3. *Colona winitii* (Craib) Craib, Fl. Siam. 1: 190. 1925.— *Columbia winitii* Craib, Bull. Misc. Inform. Kew 1920: 301. 1920. Type: Thailand, Lamphun (Lampun), Mae Li (Mê Lee), 17 July 1915, *Winit 340* (lectotype **K** [K000686954!], designated here; isolectotypes **ABD** [ABDUH:2/105!], **BK** [BK257557!], **K** [K000686951!]).

Note.— *Colona winitii* is a unique Thai species by having a 3-caudate leaf apex. Craib (1920) described *Columbia winitii* based on *Winit 340* which has four sheets. Later he himself (1925) made the combination for this species to *Colona winitii*. The sheet K000686954 is designated here as the lectotype of *Columbia winitii* because it has more numerous leaves and flowers

4. *Corchorus siamensis* Craib, Bull. Misc. Inform. Kew 1925: 21. 1925. Type: Thailand, Tak, Ban Na, 16 Dec. 1913, *Kerr 3040* (lectotype **K** [000512220!], designated here; isolectotypes **ABD** [ABDUH:2/95!], **BM** [BM000630959!]).

Note.— The distinguishing features of *Corchorus siamensis* are the cylindrical capsule and a leaf base without appendages. Two syntypes were cited in the protologue, *Kerr 3040* (found in **ABD**, **BM** and **K**) and *Kerr 4599* (found only in **K** [K000687607!]). *Kerr 3040* at **K** is in good condition and therefore designated as lectotype.

5. *Grewia lacei* J.R. Drumm. ex Craib, Bull. Misc. Inform. Kew 1911: 21. 1911. Type: Myanmar, Maymyo Plateau, 9 Jun. 1908, *Lace 3223* (lectotype **E** [E00273562!], designated here; isolectotypes **E** [E00273563!, E00273565!]; syntype: same locality, Oct. 1909, *Lace 3223* [**E** [E00273564!]).

Note.— *Grewia lacei* is similar to *G. hirsuta* Vahl by having oblong or lanceolate leaves, but it differs by showing an inconspicuous dentation of the leaf margin which is more or less covered by an indumentum. Two collections were cited in the protologue (Craib, 1911), namely *Kerr 677* (**TCD** [TCD0010978!]) from Doi Suthep, Chiang Mai, Thailand, and *Lace 3223* which has four sheets at **E** (E00273562, E00273563, E00273565 & E00273564) from Myanmar. The date of the first three of *Lace 3223* is 9 June 1908, but the last one is October 1909. These two collections are considered as syntypes. The sheet E00273562 is proposed here as the lectotype, because it has dissected flowers attached to it.

6. *Grewia winitii* Craib, Bull. Misc. Inform. Kew 1925: 20. 1925. Type: Thailand, Lamphun (Lampun), Mae Li (Mê Lee), 16 July 1915, *Winit 341* (lectotype **K** [K000686800!], designated here; isolectotype **ABD** [ABDUH:2/107!]).

Note.— *Grewia winitii* has many features in common with *G. sessiliflora* Gagnep. especially the pendulous inflorescence. It differs from *G. sessiliflora* by its most coarsely serrate or dentate leaf margin. This species is endemic to Thailand. Of the three collections, *Winit 341*, *341A* (**ABD** [ABDUH:2/106!], **BK** [BK257558!], **K** [K000686801!]) and *650* (**K** [K000686799!]) of *Grewia winitii* mentioned in the description, *Winit 341* at **K** is selected as the lectotype, because it is better preserved than the others.

ACKNOWLEDGEMENTS

We would like to thank the directors and staff of herbaria mentioned above for their help during our visits. This work was also facilitated by the herbarium images and data available as well as the Biodiversity Heritage Library. We also thank Dr Xavier Aubriot, University of Paris-Saclay who arranged for the image of the holotype of *Corchorus fascicularis*, and Dr David Simpson for his advice on the genus *Triumfetta*.

REFERENCES

- Averson, W.S., Whitlock, B.A., Nyffler, R., Bayer, C. & Baum, D.A. (1999). Phylogeny of the core Malvales: evidence from *ndhF* sequence data. *American Journal of Botany* 86: 1474–1486.
- Bayer, C. (1999). The bicolor unit – homology and transformation of an inflorescence structure unique to core Malvales. *Plant Systematics and Evolution* 214: 187–198.
- Bayer, C., Chase, M.W. & Fay, M.F. (1998). Muntingiaceae, a new family of Dicotyledons with Malvaceae affinities. *Taxon* 47: 37–42.
- Bayer, C., Fay, M.F., de Bruijn, A.Y., Savolainen, V., Morton, C.M., Kubitzki, K., Alverson, W.A. & Chase, M.W. (1999). Support for an expanded family concept of Malvaceae within a circumscribed order Malvales: a combined analysis of plastid *atpB* and *rbcL* DNA sequences. *Botanical Journal of the Linnean Society* 129: 267–303.
- Bayer, C. & Kubitzki, K. (2003). Malvaceae. In: K. Kubitzki (ed.), *The Families and Genera of Vascular Plants 5, Malvales, Capparales and Non-Betalain Caryophyllales*: 225–311. Springer, Berlin.
- Benor, S. (2018). Molecular phylogeny of the genus *Corchorus* (Grewioideae, Malvaceae *s.l.*) based on nuclear rDNA ITS sequences. *The Crop Journal* 6: 552–563.
- Brunken, U. & Muellner, A.N. (2012). A new tribal classification of Grewioideae (Malvaceae) based on morphological and molecular phylogenetic evidence. *Systematic Botany* 37: 699–711.
- Craib, W.G. (1911). II. List of Siamese plants with descriptions of new species. *Contributions to the Flora of Siam (with plates)*. *Bulletin of Miscellaneous Information Kew* 1911: 7–60.
- Craib, W.G. (1920). *Contributions to the Flora of Siam. Additamentum IX. Bulletin of Miscellaneous Information Kew* 1920: 300–395.
- _____. (1925). *Florae Siamensis Enumeratio* 1(1). Siam Society, Bangkok.
- Fosberg, F.R. & Sachet, M.-H. (1981). *Polynesian Plant Studies* 6–18. *Smithsonian Contribution to Botany* 47: 1–38.
- Hooker, J.D. (1874). *The Flora of British India* 1(2). L. Reeve & Co. Ltd., London.
- Jacquin, N.J. (1760). *Enumeratio Systematica Plantarum*. Theodor Haak, Lugduni Batavorum [Leiden].
- Linnaeus, C. (1753). *Species Plantarum*. Impensis Laurentii Salvii, Holmiae [Stockholm].
- _____. (1759). *Systema Naturae* ed. 10, 2. Impensis Laurentii Salvii, Holmiae [Stockholm].
- Nyffeler, R., Bayer, C., Alverson, W.A., Yen, A., Whitlock, B.A., Chase, M.W. & Buam, D.A. (2005). Phylogenetic analysis of the Malvadendrina clade (Malvaceae *s.l.*) based on plastid DNA sequences. *Organisms, Diversity and Evolution* 5: 109–123.
- Phengkklai, C. (1986). Study in Thai Flora Tiliaceae. *Thai Forest Bulletin (Botany)* 16: 2–118.
- _____. (1993). Tiliaceae. In: T. Santisuk & K. Larsen (eds), *Flora of Thailand* 6(1): 10–80. Royal Forest Department, Bangkok.
- Phuphathanaphong, L., Chayamarit, K. & Pattharahirantcin, N. (2019). Malvaceae subfam. Malvoideae. In: K. Chayamarit & H. Balslev (eds), *Flora of Thailand* 14(2): 261–338. Royal Forest Department, Bangkok.
- Stevens, P.F. (2001 onwards). *Angiosperm Phylogeny Website*. Version 14, July 2017 [and more or less continuously updated since]. <http://www.mobot.org/MOBOT/research/APweb/> (accessed 17 Feb. 2020).
- Thiers, B. (2020, continuously updated). *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/> (accessed 17 Feb. 2020).
- Vogel, S. (2000). The floral nectaries of Malvaceae sensu lato – a conspectus. *Kurtziana* 28: 155–171.