

Two new records and lectotypified taxa of the genus *Millettia* (Fabaceae: Millettieae) for Thailand

SAWAI MATTAPHA^{1,*}, AUAMPORN VEESOMMAI², SATHAPORN PATTHUM³ & PRANOM CHANTARANOTHAI⁴

ABSTRACT

Two species, *Millettia penicillata* and *M. pierrei*, are recorded as new for Thailand. The latter is lectotypified and its characteristics are discussed with the close genera. Illustrations, descriptions, taxonomic notes and distribution map are provided.

KEYWORDS: Flora of Thailand, Indo-China, lectotypification, taxonomy.

Accepted for publication: 19 December 2018. Published online: 18 January 2019

INTRODUCTION

Millettia Wight & Arn. was first described by Wight & Arnott (1834), based on two species; *M. rubiginosa* Wight & Arn. and *M. splendens* Wight & Arn. It was supposed that there were approximately 150 species in total, with about 60 species in Africa and Madagascar, and 40–50 in Asia (Schrire, 2005), but current molecular evidence has shown that the genus *Millettia* is not a monophyletic taxon (Hu, 2000; Hu *et al.*, 2000; Kajita *et al.*, 2001; Hu *et al.*, 2002). To date, the generic concept of the genus *Millettia* remains unresolved with its closely related genera nested within the *Millettia-Fordia* group in the core Millettieae *sensu* Schrire (2005).

We disclose two new records of the genus *Millettia*, namely *M. penicillata* Gagnep. and *M. pierrei* Gagnep., during the preparing of the account for the Flora of Thailand. The first species was previously recorded in Laos and Vietnam (Lock & Heald, 1994; Lôt & Vidal, 2001) and is reported here to occur along the Mekong river in between Loei and Nong Khai provinces. The second species was previously only found in Cambodia and Vietnam

(Lôt & Vidal, 2001), and is reported here in Trat province, near the mountainous range of the Cambodian-Thai border as a newly recorded species for Thailand. The morphological characters of *M. pierrei* are similar to some species of the genus *Fordia* Hemsl., including *F. albiflora* (Prain) U.A.Dasuki & Schot, *F. bracteolata* U.A.Dasuki & Schot, *F. leptobotrys* (Dunn) U.A.Dasuki & Schot, *F. ngii* Whitmore and *F. nivea* (Dunn) U.A.Dasuki & Schot by sharing the calyx lobes which are imbricate in bud and spindle-shaped floral buds (Dasuki & Schot, 1991). Some of these species were previously reduced within the genus *Imbralyx* R.Geesink, in a narrow sense, by Geesink (1984). Therefore, based on these characters, *M. pierrei* may be placed in either *Fordia* or *Imbralyx*, rather than in the broad circumscription of the polyphyletic genus *Millettia*. However, in this present paper, *M. pierrei* remains in *Millettia* and further investigations, using morphological and molecular data, of the species and its relatives are necessary. In addition, *M. foliolosa* Gagnep., a synonym of *M. penicillata*, and *M. pierrei* are lectotypified here.

¹ Department of Biology, Faculty of Science, Udon Thani Rajabhat University, Udon Thani 41000, Thailand.

² 8/76 Ngam Wong Wan Road 54/5, Chatuchak, Bangkok 10900, Thailand.

³ Forest Resource Management Office no. 6, Udon Thani 41000, Thailand.

⁴ Department of Biology and Center of Excellence on Biodiversity (BDC), Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand.

* Corresponding author: indigoferasawai@gmail.com

1. *Millettia penicillata* Gagnep., Notul. Syst. (Paris) 2: 362. 1913 & Fl. Indo-Chine 2: 390. 1916; Hô, Fl. Vietnam 1(2): 1129. 1991; Lock & Heald, Leg. Indoch.: 94. 1994; Lôt & Vidal, Fl. Cambodge, Laos & Vietnam 30: 127. 2001. Type: Vietnam, Nam Hà, Nam Dinh, *Mouret 43* (lectotype **P!** [P02141848], designated by Lôt & Vidal, 2001).

— *Millettia foliolosa* Gagnep., Notul. Syst. (Paris) 2: 356. 1913 & Fl. Indo-Chine 2: 381. 1916; Lock & Heald, Leg. Indoch.: 92. 1994. Type: Laos, Paklay, *Thorel s.n.* (lectotype **P!** [P02754348], designated here; isoelectotype **P!** [P02754347]). Fig. 1.

Shrub ca 1 m high; young twigs densely hairy with ferruginous hairs. *Leaves* imparipinnate, spiral; petioles 6–15 cm long; stipules lanceolate, 10–15 mm long, outside hairy, inside glabrous, relatively persistent, particularly on terminal shoots; rachis 15–35 cm long, shallowly grooved above; ultrajugal part 2–3 cm long. *Leaflets* 9–17, opposite to sub opposite; petiolules 5–8 mm long, glabrous when mature; lamina oblong to narrowly ovate, sometimes elliptic, terminal leaflet slightly larger than lateral ones, narrowly obovate, vary in length, 5–15 × 2.5–6.5 cm, apex acuminate to caudate or cuspidate, base cuneate, margin entire, upper surface glabrescent, sparsely hairy along veins, lower surface hirsute, especially along veins, coriaceous; secondary veins 7–13-paired, distinct; stipels setaceous, ca 3 mm long. *Inflorescence* pseudoracemose, axillary, densely hairy, 8–28 cm long. *Brachyblasts* wart-like or claviform, up to 15 mm long, each bearing 7–10 (–15) flowers; bracts and bracteoles ovate to lanceolate, 5–7 mm long, light red, caducous. *Pedicels* 1.5–2 mm long, densely hairy. *Calyx* cup-shaped, ca 3 mm long; lower lobes 3, upper lobes 2, separate at apex, lobes minute, ca 1 mm long, margin hairy, outside densely hairy, inside glabrous. *Corolla* purple to light pink; standard orbicular, 8–9 × 9–10 mm, claw ca 1 mm long, apex acute to retuse, base cuneate with basal callosities adnate on the claw, basal callosities acute, margin entire, distinct red lines and pubescent on outer surface, glabrous on inner surface; wings oblong, 7–8 × 3–3.5 mm, claw ca 3 mm long, base rounded, apex acute, margin entire, glabrous on both sides; keel falcate, 7–8 × 3.5–4 mm, claw ca 3 mm long, apex rounded, margin entire, glabrous on both sides. *Stamens* diadelphous; staminal tube 7–8 mm long, glabrous; filaments 1.5–2 mm long;

anthers 0.5 × 0.5 mm. *Ovary* 7–8 mm long, densely hairy, 1–4-ovuled; style 3–4 mm long, hairy. *Pods* dehiscent, strap-like, obovate, more or less flattened, 7–10 × 1.8–2 cm, exocarp surface glabrescent, apex acute to acuminate, lower suture abruptly curved to upper suture. *Seeds* 1–4, orbicular, ca 10 × 5 mm, transversely oriented to the length of fruit.

Thailand.—NORTH-EASTERN: Loei [Pakchom, in rubber plantations and orchards near the Mekong river, alt. ca 190 m, 29 May 2018, *Mattapha 1179* (**BK, BKF, KKK, QBG**)], Nong Khai [Sangkhom, Ban Nong village near rubber plantations and the paddy field, alt. ca 200 m, 18°6'19"N 102°30'6"E, 4 Jan. 2018, *Mattapha & Patthum 1172* (**BK, BKF, KKK, QBG**)]. Fig. 3.

Distribution.—Laos, Vietnam (type).

Ecology.—Dry evergreen forest, disturbed forest in the rubber plantations and near the paddy field, ca 300 m alt. Flowering mostly in November–February, sometimes up to May; fruiting December–February.

Vernacular.—Muang lam khong (ม่วงลำโขง).

Notes.—*Millettia penicillata* is recognised in having relatively persistent stipules, particularly on the terminal shoots, distinct red lines on outer surface of the standard petals and basal callosities which are acute. The leaflets vary in length which up to 15 cm long. After we surveyed its distribution, the species appeared to grow in dry evergreen and disturbed habitats such as orchards, rubber plantations and paddy-fields, with many individuals observed in the recorded areas cited above.

The original description of *M. foliolosa* (a heterotypic synonym of *M. penicillata*) is based on only two sheets of *Thorel s.n.*, P02754348 and P02754347 housed at Paris. Therefore, the first sheet is selected here as the lectotype because it is the most complete specimen, bearing leaves, flowers and fruits, while the latter bears only leaves and flowers.

2. *Millettia pierrei* Gagnep., Notul. Syst. (Paris) 2: 362. 1913 & Fl. Indo-Chine 2: 374. 1916; Lock & Heald, Leg. Indoch.: 94. 1994; Lôt & Vidal, Fl. Cambodge, Laos & Vietnam 30: 121. 2001. Type: Cambodia, Kampong Speu province, Mt Srâl, *Pierre 1032* (lectotype **P!** [P02141851], designated here; isoelectotypes **P!** [P02141852, P02141853]). Fig. 2.

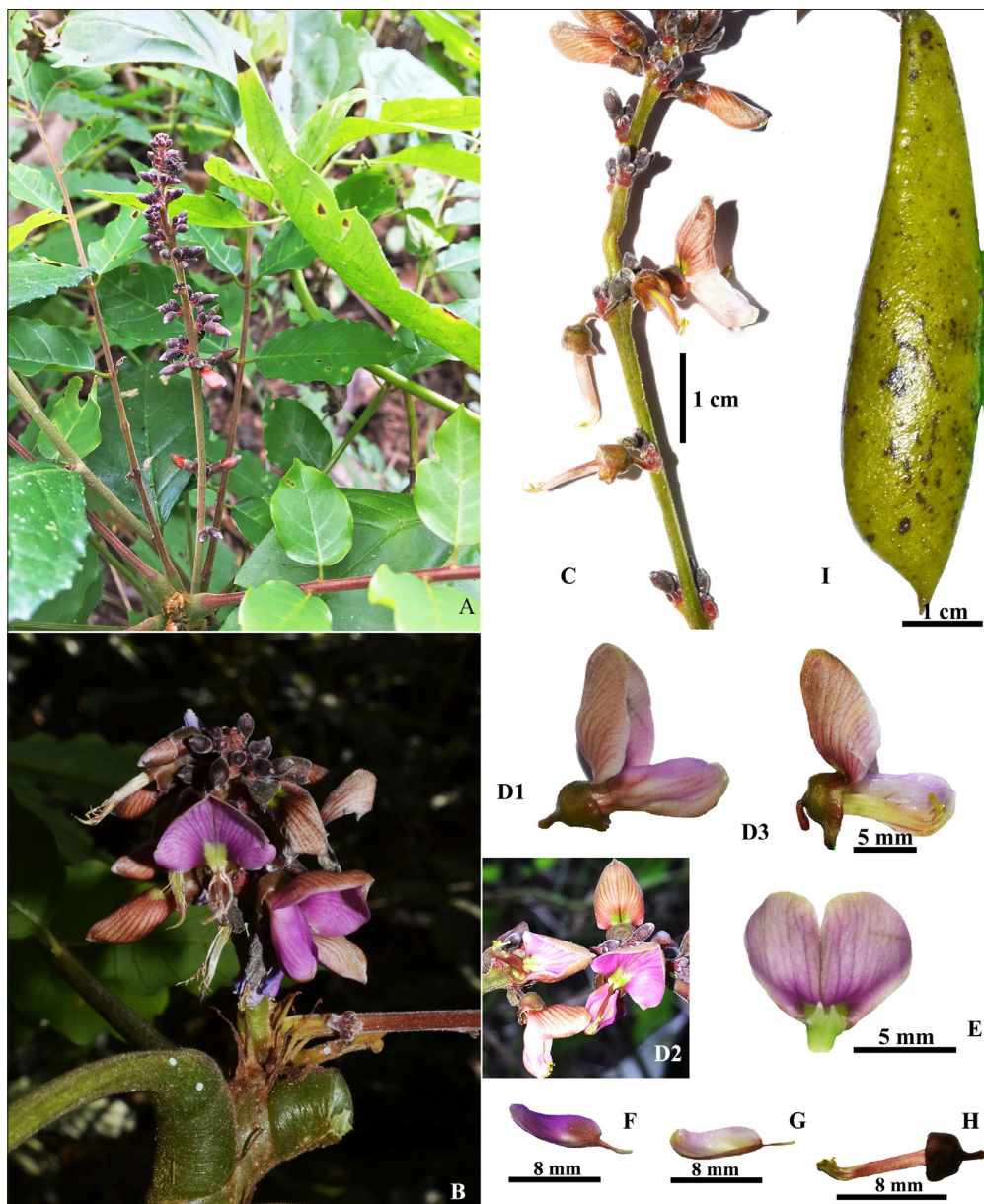


Figure 1. *Millettia penicillata* Gagnep.: A. & B. inflorescences; C. part of inflorescences showing flowers born on brachyblasts (nodes); D1–D3. flowers; E. standard showing acute apex callosities; F. wing; G. keel; H. stamens; I. fruit. Photos by S. Mattapha.



Figure 2. *Millettia pierrei* Gagnep.: A. leaves; B. inflorescences; C. infructescences; D. fruits and seeds. Photos by A. Veesommai.

Shrub to small tree ca 5 m high; young twigs densely hairy with ferruginous hairs; hairs on both leaf surfaces when young, inflorescences and pods. *Leaves* imparipinnate, spiral, drooping when young; petioles 4–10 cm long; stipules triangular, ca 2 mm long, outside densely hairy, inside glabrescent, caducous; rachis 6–17 cm long, shallowly grooved above; ultrajugal part 1–2 cm long. *Leaflets* 11–15, opposite to subopposite; petiolules 5–6 mm long, glabrescent; lamina elliptic to oblanceolate, sometimes ovate, terminal leaflet slightly larger than lateral ones, 12–21 × 4–6 cm, apex acuminate to caudate, base cuneate, margin entire, both surfaces densely hairy, glabrescent when mature, coriaceous; secondary veins 6–10-paired; stipels absent. *Inflorescences* pseudoracemose, sometimes intermediate between pseudoracemose and pseudopaniculate, axillary or on old branches, densely hairy with ferruginous hairs, 10–15 cm long. *Brachyblasts* wart-like to claviform, up to 3 mm long, each bearing 15–20 flowers; bracts on inflorescence axes or on brachyblasts triangular, ca 3 × 1 mm, densely hairy; floral bracts broadly ovate, 0.5–1 × ca 0.5 mm, apex acute, margin hairy, outside densely hairy, inside glabrescent; bracteoles similar to floral bracts but smaller, inserted at base of calyx tube, caducous. *Pedicels* 2–3 mm long, densely hairy; floral buds spindle-shaped. *Calyx* cup-shaped, 3–3.5 mm long; lower lobes 3, upper lobes 2, separate at apex, margin hairy, outside densely hairy, inside glabrous. *Corolla* purple to light pink: standard suborbicular with a yellowish patch on ventral face, 10–11 × 9–10 mm, claw ca 3 mm long, apex emarginate, base auriculate without basal callosities, auricles inflexed, margin entire, glabrous on both sides; wings slightly falcate, 10–11 × ca 4 mm, claw ca 4 mm long, base auriculate, ca 2 mm long, apex obtuse, margin entire, glabrous on both sides; keel falcate, 10–10.5 × 4–4.5 mm, claw ca 4 mm long, apex rounded, margin entire, glabrous on both sides. *Stamens* monadelphous with basal fenestrae ca 1 mm long; staminal tube 10–12 mm long, glabrous; filaments 2.5–3 mm long; anthers ca 0.5 × 0.5 mm, glabrous. *Ovary* ca 5 mm long, densely hairy, 1–3-ovuled; style 8–9 mm long, hairy at base. *Pods* dehiscent, strap-like, obovate, flattened, 10–14 × 3–4 cm, exocarp surface densely hairy with ferruginous hairs, hairs caducous in mature pods, apex acuminate, lower suture gradually curved to upper suture. *Seeds* 1–3, orbicular, ca 15 × 15 mm, transversely oriented to the length of fruits.

Thailand.— SOUTH-EASTERN: Trat [Khao Lan, alt. ca 50 m, 14 Jan. 2017, *Veesommai & Mattapha K69* (BK, BKF, KKKU, QBG)]. Fig. 3.

Distribution.— Cambodia (type), Vietnam.

Ecology.— Evergreen forest, ca 50 m alt. Flowering December–February; fruiting March–April.

Vernacular.— Muang ban that (ม่วงบรรทัด).

Notes.— *Millettia pierrei* is distinguished by its imbricate calyx lobes, calyx tube longer than lobes, monadelphous stamens and spindle-shaped floral buds. Indumentum on branches, inflorescences and fruits, is distinctive in being relatively caducous. Leaves are drooping when young. The species was believed to be endemic to Cambodia and Vietnam (Lôc & Vidal, 2001) but a collection from Trat Province, Thailand, now confirmed as *M. pierrei*, was found in the mountain range of in Phnum Samkoh Wildlife Sanctuary adjacent to the border with Cambodia.

Three sheets of *Pierre 1032* are housed at Paris, and P02141851 is chosen here as the lectotype because it is a well-preserved and complete specimen bearing leaves, both flowers and fruit, whereas two other specimens, P02141852 & P02141853, exist fruits with few flowers.

ACKNOWLEDGEMENTS

We thank the curators and staff of the following herbaria for access to material during the visit: BK, BKF, K, KKKU, P and QBG. This work was supported by the Center of Excellence on Biodiversity (Project code BDC-PG3-160013). We also express thanks to anonymous reviewers for their comments on the manuscript.

REFERENCES

- Dasuki, U. & Schot, A. (1991). Taxonomy of *Fordia* Hemsley (Papilionaceae: Millettieae). *Blumea* 36: 191–204.
- Geesink, R. (1984). *Scala Millettiearum: A Survey of the genera of the Millettieae (Legum.-Pap.) with Methodological Considerations*. Leiden University Press, the Netherlands, 131 pp.



Figure 3. Distributions of *Millettia penicillata* Gagnep. (triangle) and *M. pierrei* Gagnep. (circle) in Thailand. The map was created using QGIS version 2.14.1-Essen (QGIS Development team, 2016).

- Hu, J. (2000). Phylogenetic relationships of the tribe Millettieae and allies the current status. In A. Bruneau & P. Herendeen (eds), *Advance in Legume Systematics Vol. 9*. London, Richmond, Royal Botanic Gardens, Kew, pp. 299–310.
- Hu, J.-M., Lavin, M., Wojciechowski, M.F. & Sanderson, M.J. (2000). Phylogenetic systematics of the tribe Millettieae (Leguminosae) based on chloroplast *trnK/matK* sequences and its implications for evolutionary patterns in Papilionoideae. *American Journal of Botany* 87(3): 418–430.
- _____. (2002). Phylogenetic analysis of nuclear ribosomal ITS/5.8S sequences in the tribe Millettieae (Fabaceae): *Poecilanthus-Cyclolobium*, the core Millettieae, and the *Callerya* group. *Systematic Botany* 27(4): 722–733.
- Kajita, T., Ohashi, H., Tateishi, Y., Bailey, D. & Doyle, J. (2001). *RbcL* and legume phylogeny, with particular reference to Phaseoleae, Millettieae and allies. *Systematic Botany* 26(3): 515–536.
- Lock, J.M. & Heald, J. (1994). *Legumes of Indo-China, a check-list*. Royal Botanic Gardens, Kew, UK, 164 pp.
- Lôc, P.K. & Vidal, J.E. (2001). *Legumineuses-Papilionoideae-Millettieae*. In: P. Morat (ed.) *Flore du Cambodge, du Laos et du Vietnam* 30. Museum National D'histoire Naturelle, Paris, 191 pp.
- QGIS Development Team (2016). *QGIS Geographic Information System. Version 2.14.1-Essen*. Open Source Geospatial Foundation Project. Available at <http://www.qgis.org/en/site/>.
- Schrire, B. (2005). Millettieae. In: B. Schrire, G. Lewis & M. Lavin (eds), *Legumes of the World*. London, Richmond, Royal Botanical Gardens, Kew, pp. 367–387.
- Wight, R. & Arnott, W. (1834). *Prodromus Florae Peninsulae Indiae*. Parbury, Allen & Co., London, 480 pp.