

***Dioscorea pseudo-tomentosa* Prain & Burkill (Dioscoreaceae); an endangered limestone endemic of central Thailand**

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ABSTRACT. *Dioscorea pseudo-tomentosa* Prain & Burkill (Dioscoreaceae) is a compound-leaved species endemic to the province of Saraburi in Central Thailand, an area threatened by the extraction of limestone. It should be regarded as endangered, and it is recommended that it be brought into cultivation in a Thai botanic garden as soon as possible to ensure its survival. The fruit of *D. pseudo-tomentosa* is described and illustrated for the first time.

INTRODUCTION

In their regional monograph of Asian *Dioscorea* (Dioscoreaceae), Prain & Burkill (1936) cited just two specimens of *D. pseudo-tomentosa* Prain & Burkill, both from the province of Saraburi. The staminate type specimen (Prain & Burkill, 1927) from Khao Sisiat A near Muak Lek and a pistillate flowering specimen from Ban Hin Lap were collected, respectively, in 1925 and 1928. Unlike many of the Thai species of *Dioscorea* they described, Prain & Burkill had access to all parts of the plants of *D. pseudo-tomentosa* except the capsules. They were therefore able to discern that the compound leaves, staminate flowers with three stamens and three staminodes and tubers borne on long “stalks” showed that it was most closely related to *D. arachidna* Prain & Burkill. They considered it to differ mainly in its pubescence, *D. arachidna* being “sparingly hairy”, in contrast to the dense tomentum of *D. pseudo-tomentosa*. Prain & Burkill (1936) also believed that the two species differed in leaflet shape, and suggested that *D. arachidna* and *D. pseudo-tomentosa* might be able to hybridise, citing a Put specimen as a possible hybrid.

Research towards a treatment of Dioscoreaceae for the Flora of Thailand has uncovered just one herbarium specimen of *D. pseudo-tomentosa* collected since 1936. A population was also discovered at Ban Ang Hin, which yielded several specimens from multiple visits. This collecting strategy allowed capsules with mature seeds to be described and illustrated below for the first time. The conservation status of the species is also considered and recommendations made regarding its protection.

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MATERIALS & METHODS

The treatment of Dioscoreaceae for the Flora of Thailand is based on examination of 1220 specimens from Thailand at the following herbaria: AAU, B, BK, BKF, BM, CMU, E, K, L, P, Biology Department, Naresuan University, Phitsanulok (PNU) and QSBG. Abbreviations (except PNU) follow Holmgren & Holmgren (1990). Comparative morphology was used to delimit species.

DESCRIPTION

Dioscorea pseudo-tomentosa Prain & Burkill, Bull. Misc. Inform. Kew 1927: 234. 1927; Prain & Burkill in Lecomte, Fl. Indo-Chine 6: 718. 1934; Prain & Burkill, Ann. Roy. Bot. Gard. (Calcutta) 14(1): 139. 1936. Type: Thailand, Saraburi, Muak Lek, Khao Sisiat A [Kao Sisiat-a], B & fl. 15 July 1925, *Nai Noe* 102 (holotype **K!**; isotype **BM!**). Figs 1–3.

Slender climber to 4 m (Fig. 3A). *Tubers* (Fig. 2L, M) 3–6, to at least 20 cm long, annually replaced, slender, ca. 5 mm in diam., cylindric, spreading, often branched, some branches and possibly apices swollen, swollen parts 1.5–2.2 by 1.3–2 cm, ovoid to globose, tuber epidermis thinly chartaceous, yellowish brown, parenchyma yellowish white, with little mucilage. *Indumentum* (Fig. 1B) on all parts except on inner whorl tepals, hairs simple, 0.1–1.5 mm long, white or greyish brown. *Stems* 1.2–2.5 mm in diameter, twining to the left, annual, terete, unarmed, yellowish green or dark green. *Leaves* (Fig. 1A, 3A, D) 3-foliolate, sometimes simple on reproductive shoots, alternate, chartaceous, yellowish green or mid-green, abaxially paler; terminal blade of leaflet 3.2–8.8 by 2.5–6.1 cm, obovate to broadly obovate, base acute, apex obtuse to rounded, only single main vein reaching apex, abaxially prominent, secondary veins emerging laterally from main vein, not anastomosing; blade of lateral leaflets 2.8–8 by 2–6.3 cm, ovate to broadly ovate, usually asymmetric, base and apex obtuse to rounded, 2-nerved (Fig. 1A), only main vein reaching apex; forerunner tips 0.8–1.6 mm long, filiform, brown to dark brown, one per leaflet; *petiole* 1.2–3.8 cm long, slender, terete with an adaxial channel, colour as stem; *petiolules* 1.5–7 mm long. *Cataphylls* (Fig. 1C) 1.5–2.2 by 2.3–2.5 mm, ovate, apex 1.2–1.4 mm long, acuminate. *Bulbils* and *lateral nodal organs* absent. *Inflorescences* pendent, axes slender, terete, densely pubescent, colours as stem; all bracts and tepals chartaceous, tepals inserted on flat discoid torus, erect, free, pale green or bright yellow, apex cucullate. *Staminate inflorescences* (Fig. 1A, D, 3B, C) racemose, compound, 2.5–28 cm long, 1–2(–3) per axil, primary bracts (Fig. 1E) 1–3.1 by 0.5–0.8 mm, ovate, apex 0.5–0.7 mm long, acuminate; partial inflorescences (Weberling 1989) 1–2(–3) per axil, peduncle 2–4 mm long, axis only one per raceme 0.8–3 cm long. *Pistillate inflorescences* (Fig. 2A) spicate, simple, 1–3 per axil, peduncle 1.3–4 cm, axis 1.5–15 cm long. *Staminate flowers* (Fig. 1F) opening by small apical pore at anthesis, pedicels 0.5–0.9 mm long; floral bracts (Fig. 1J) 1–1.3 by 1.4–1.7 mm, broadly ovate, apices 0.1–0.5 mm long, acuminate; bracteoles (Fig. 1K) 1.1–1.3 by 0.8–1.1 mm, ovate, apices 0.1–0.2 mm long, acuminate; outer tepals (Fig. 1L) 1.3–1.4 by 0.8–0.9 mm, obovate, apex obtuse; inner tepals (Fig. 1M) 0.9–1.2 by 0.7–0.8 mm, obovate to obovate-spathulate, apex acute to obtuse; stamens 3 (Fig. 1G, H, L), inserted on outer tepal bases, filaments 0.2–0.35 mm long, anthers 0.25–0.35 by 0.35–0.45 mm, ovate-oblong; staminodes 3 (Fig. 1G, H, M), 0.7–0.8 mm long, narrowly oblanceolate to flattened-clavate; pistillodes (Fig. 1H) 0.5–0.9 by 0.3–0.4

mm, fused to form an erect column, 3-lobed. *Pistillate flowers* (Fig. 2B) orientated at angle of 15°–60° to axis when receptive; floral bracts (Fig. 2D) 1–1.5 by 1–1.3 mm, broadly ovate, apex 0.5–0.7 mm long, shortly acuminate; bracteoles (Fig. 2E) 0.5–0.6 by 0.6–0.7 mm, apices 0.25–0.3 mm long, acuminate; outer tepals (Fig. 2F) 0.8–1.2 by 0.6–0.7 mm, ovate to ovate-oblong, apex obtuse; inner tepals (Fig. 2G) 0.4–0.5 by 0.3–0.4 mm, oblong, apex obtuse; ovary (Fig. 2B) 2–4.5 by 1–2.8 mm, elliptic in outline, densely pubescent, pale green or yellowish green; staminodes 6 (Fig. 2C, F, G), 0.05–0.15 mm long, outer whorl staminiiform, inner whorl filiform, inserted on base of tepals; styles (Fig. 2C) 0.3–0.4 by 0.25–0.3 mm, fused to form an erect column; stigmas (Fig. 2C) 0.25–0.3 mm, recurved. *Infructescences* (Fig. 2H, 3D, E) 4.3–12.5 mm long; *capsules* (Fig. 2J, 3E) 14.5–23 by 11.5–14 mm, oblong to narrowly obovate in outline, base truncate to shallowly retuse, sinus to 1 mm deep, apex truncate to obtuse, stipe of capsule 2–3 mm long, filiform, immature capsules yellowish green or mid green, mature capsules reflexed at an angle of 120°–160° to axis, 14.5–23 by 11.5–14 mm. *Seeds* (Fig. 2J, K) 4–6 by 4–5 mm, oblong-lenticular to ovoid-lenticular, wings oblong, apex rounded, extending from base of seeds, upper wings of seeds 6.5–10 by 4.5–5.5 mm, lower wings of seeds 6–7 by 4–5 mm.

Thailand.—CENTRAL: Saraburi [Ban Hin Lap, B & fl. 18 Aug. 1929, *Put* 2404 (**BK**, **BM**, **E**, **K**), B & fl. 28 Aug. 1963, *Smitinand & Sleumer* 1105 (**BKF**, **K**), Khao Si Siat, Muak Lek, B & fl. 15 July 1925, *Nai Noe* 102 (isotype **BK**!, isotype **BM**!, holotype **K**!), Budhanimit Temple, Ban Ang Hin, Muak Lek Distr., B & fl. 30 June 2002, *Thapyai* 419, 420 & 422 (**BK**, **BKF**, **PNU**), fl. & fr. 27 Oct. 2001, *Thapyai* 226, 227 & 228 (**BK**, **BKF**, **PNU**, **QSBG**)].

Distribution.— Known only from the province of Saraburi in the central plains of Thailand.

Vernacular name.— Man saeng hin (มันแสงหิน) (Hin Lap, Saraburi).

Habitat.— Open areas in open forest and scrub on limestone. Elevation ca. 100 m. Flowering June to August, fruiting September to November.

Conservation.— *Dioscorea pseudo-tomentosa* has been collected in just three localities, of which only Ban Ang Hin has yielded specimens since 1970. The limestone hills of the province of Saraburi harbour numerous endemic species and are subject to a high degree of environmental damage and destruction through limestone extraction for cement-making (Middleton & Santisuk 2001). Thus *D. pseudo-tomentosa* is endangered; probable IUCN rating EN B1ab(iii) 2ab (iii) (IUCN 2001). We recommend that material from all three known populations be brought into cultivation at Phukae Botanical Garden near Saraburi as soon as possible.

Notes.— *Dioscorea pseudo-tomentosa* differs from *D. arachidna* in its pedicellate staminate flower and densely pubescent leaves and tepals. *Dioscorea craibiana* has pedicellate staminate flowers, but glabrous leaves and the terminal leaflet has three main veins. All three species have several slender, spreading tubers with swollen branches or apices, while all other compound-leaved species in Thailand have one or two vertically oriented tubers. The specimen suspected by Prain & Burkill (1936) of being a hybrid between *D. arachidna* and *D. pseudo-tomentosa* (*Put* 4373) has proven to be *D. craibiana* based on the characters used above; there is no evidence that hybrids occur between *D. arachidna* and *D. pseudo-tomentosa*, even though they are sympatric in Saraburi.

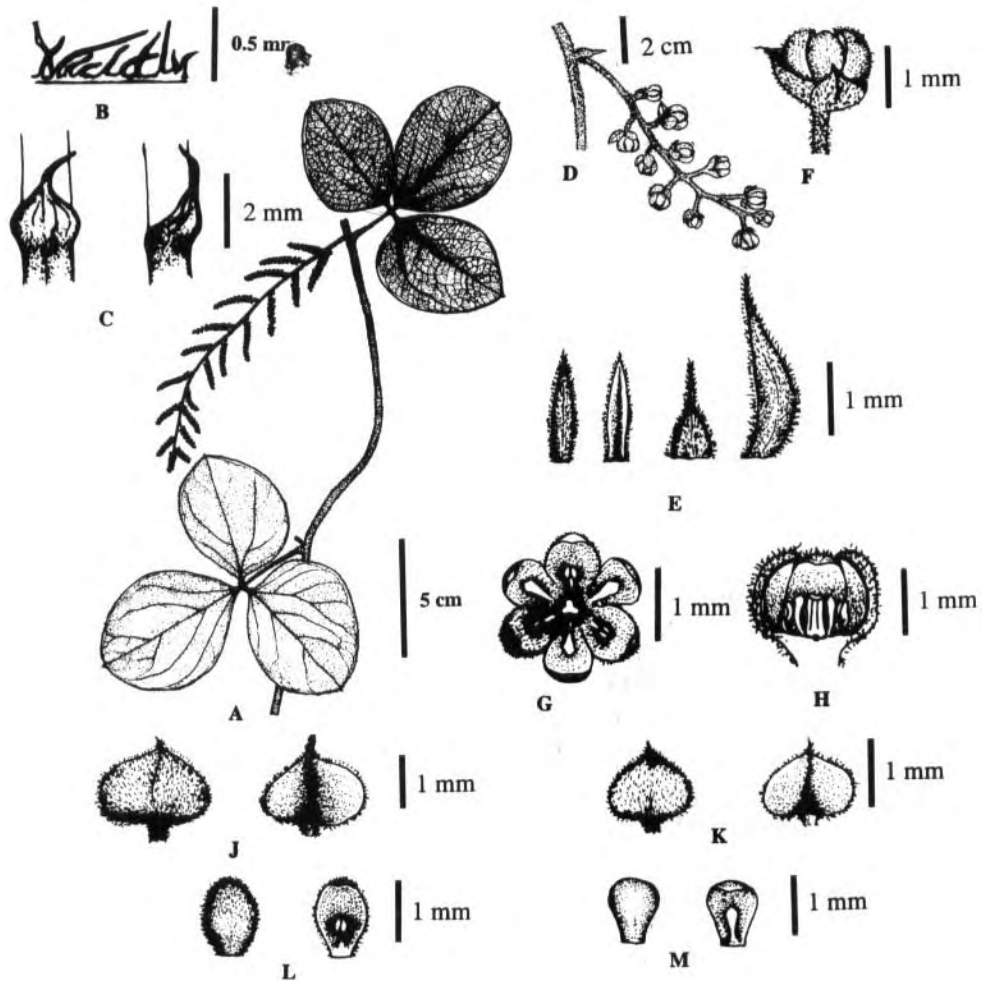


Figure 1. *Dioscorea pseudo-tomentosa* (staminate plant): A. habit with inflorescence; B. hairs; C. cataphyll; D. partial inflorescence; E. primary bracts, showing some of the variation in shape and size; F.-L. flower; F. side view, showing floral bract and bracteole; G. view from above, tepals opened; H. longitudinal section showing stamens, staminodes and pistillode; J., K. floral bract and bracteole dorsal and ventral surfaces respectively; L., M. outer and inner tepal dorsal and ventral surfaces respectively, showing position of stamen (outer) and staminode insertion. (A.-B., D.-M. from *Nai Noe* 102, C. from *Put* 2404. Drawn by C. Thapyai.

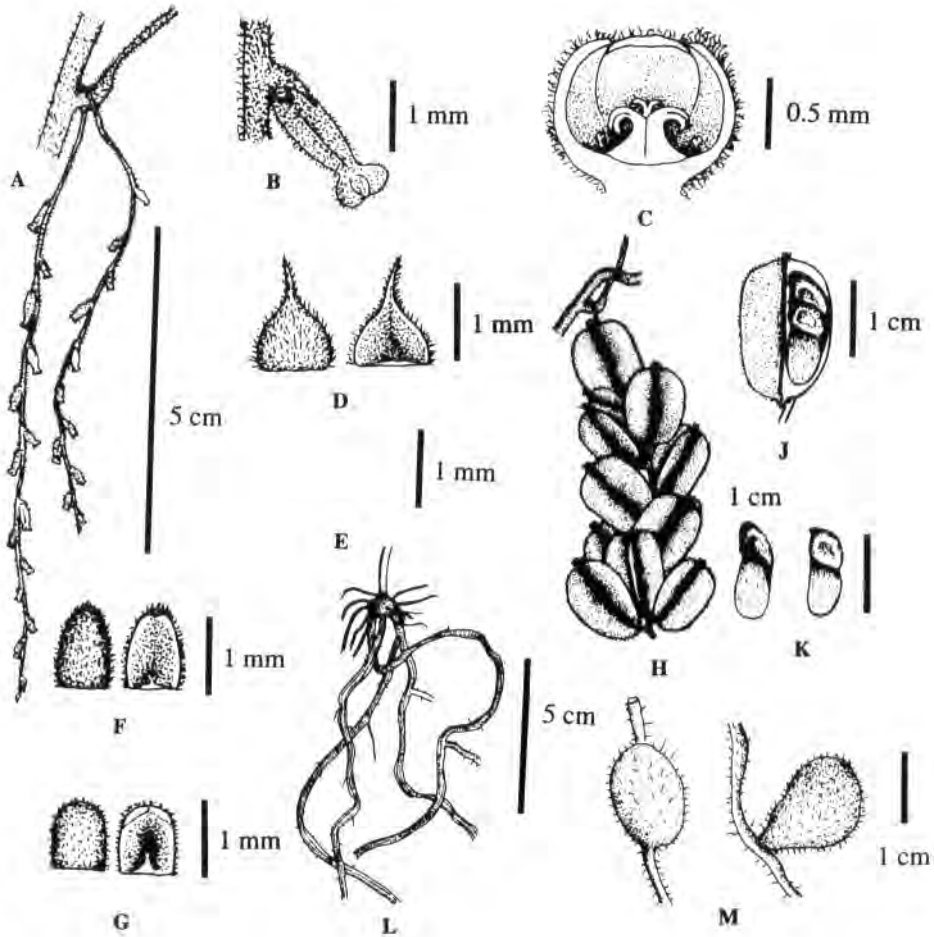


Figure 2. *Dioscorea pseudo-tomentosa* (pistillate plant): A. inflorescences; B.–G. flower; B. side view showing ovary, floral bract and bracteole; C. longitudinal section (excluding ovary) showing staminodes, style and stigmas; D., E. floral bract and bracteole dorsal and ventral surfaces respectively; F., G. outer and inner tepal dorsal and ventral surfaces respectively, showing position of staminode insertion; H. infructescence; J. mature capsule, longitudinal section showing seed position in locule; K. seeds; L. underground organs, showing woody crown, crown roots and slender, spreading, branching part of tubers; M. swollen tuber branches. A.–G., L., M. from *Put* 2404; H.–K. from *Thapyai* 227. Drawn by C. Thapyai.



Figure 3. *Dioscorea pseudo-tomentosa* colour photographs: A. habit with immature staminate inflorescences; B. immature staminate inflorescence; C. mature male inflorescences; D. immature infructescence; E. infructescence with dehiscent capsules. Photograph by C. Thapyai.

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