Taxonomic Studies on the Genus *Phyllodium* Desv. (Leguminosae) in Thailand

WITSANU SAISORN AND PRANOM CHANTARANOTHAI*

*Applied Taxonomic Research Center, Department of Biology, Faculty of Science, Khon Kaen University, Khon Kaen 40002, THAILAND*

* Corresponding Author: Pranom Chantaranothai (chantaranothai@gmail.com)

Received: 16 February 2015; Accepted: 9 March 2015

**Abstract.**– The taxonomy of genus *Phyllodium* in Thailand was studied. The results showed that six species are enumerated. Morphological descriptions and photographs, key to species, distribution and some ecological data are given. Moreover, both pollen morphological and leaf epidermal characters of three and five species respectively are presented.

**KEY WORDS:** Taxonomy, *Phyllodium*, leaf epidermis, pollen morphology, Thailand

**INTRODUCTION**

*Phyllodium* is a small genus of the tribe Desmodieae (Leguminosae-Papilionoideae) with eight species that is distributed in India, southeastern and eastern Asia and with a few species in northern Australia. The genus name consists of two Greek words: phyllon refers to leaf and -odion refers to both likeness and smallness. Both two words refer to the primary bracts of the inflorescences that are like small leaves (Lewis et al., 2005). The genus was first described by Desvaux (1784–1856), a French botanist who named *P. pulchrum* and *P. lutescens*. Later, the genus was placed in its own section under *Dicerma* by de Candolle (1825) and under *Desmodium* by Bentham and Hooker (1865), while Baker (1879) placed it under the genus *Desmodium* as subgenus *Phyllodium*. This genus has recently been reported from Myanmar by Kress et al. (2003) and from Lao PDR by Newman et al. (2007). In the Malesian region, Gagnepain (1920) studied the genus for Indonesia, Ridley (1922) for the Malay Peninsula and Ohashi (2004) for the whole region. Moreover, the genus is revised for the flora of Asia and Pacific region (Ohashi, 1973) and Australia (Pedley, 1999). Six species of *Phyllodium* were listed in “Thai Plant Names” by The Forest Herbarium, Royal Forest Department (2014). However, there is no information on the morphology, distribution, ecology, leaf epidermis and pollen morphology of the Thai species of *Phyllodium*. Accordingly, this study aims to increase such information and in turn contribute to the advancement of the Flora of Thailand project.

**MATERIALS AND METHODS**

The study was based on herbarium specimens from the following herbaria AAU, ABD, BCU, BK, BKF, CMU, CMUB, E, K, KKU, QBG and PSU (Theirs, 2014) and field specimens collected in all Thai floristic regions. Pollen grains of three species were prepared using acetolysis as described by Erdtman (1966) and subsequently examined using an Olympus
CH30 light microscope (LM) and Leo 1450 VP scanning electron microscope (SEM). The terminology follows Walker and Doyle (1975), Erdtman (1966), Punt et al. (2007) and Hesse et al. (2009). The symmetry, aperture type and length, size, shape, amb type and exine thickness and ornamentation of pollen grains are presented. Leaf epidermis was scraped using razor blade and then it was carefully cleared using a paintbrush. The epidermis was stained with 1% safranin O for 20–30 minutes, dehydrated with 70%, 95% and absolute ethanol for 5 minutes each, immersed in xylene to absolute ethanol (1:1) and pure xylene for 5 and 10–15 minutes, respectively and mounted on slides with DePeX mounting medium. Sample slides were investigated and photographed under an Olympus CH30 LM.

1. TAXONOMIC TREATMENT

Genus Phyllodium

Shrubs. Leaves trifoliolate, alternate, petiolate, stipulate. Leaflets alternate, petiolulate, stipellate; pinnate venation distinct on lower side of leaf blade. Inflorescences terminal or axillary, pseudoracemose or compound pseudoracemose; foliaceous primary bracts with two lateral leaflet-like and a terminal bristle; simple primary bracts rarely present (only in Phyllodium insigne); secondary bract 1, at the base of pedicel. Flowers fasciculate, pedicellate; bracteoles 2, near the base of calyx tube, caducous. Calyx green, cup-shaped or campanulate with 4 teeth, persistent. Corolla papilionaceous. Stamens 10, monadelphous; anther longitudinally dehiscent. Ovary superior, 1-carpellate. Pods flat, indehiscent lomentum with (1–7)–7 articles.

Key to the species

1. Plants with foliaceous primary bracts on the lower part of inflorescence rachis……

……………………………….. 2. P. insigne
1. Plants with foliaceous primary bracts along entire inflorescence rachis and rachilla…………………………………… 2
2. Lower surface of leaflets puberulous or pubescent; pods puberulous, distinctly reticulate…………………………………… 3
2. Lower surface of leaflets tomentose; pods densely silvery sericeous, smooth…………
……………………………… 1. P. elegans
3. Lateral leaflets less than the half as long as of terminal leaflet; terminal leaflet with more than 10 lateral veins per side…………
……………………………… 4. P. longipes
3. Lateral leaflets equal to or more than the half as long as terminal leaflet; terminal leaflet with up to 10 lateral veins per side…………………………… 4
4. Pedicels 7–10 mm long; pods 3–5-articulate, rarely 1-seeded...3. P. kurzianum
4. Pedicels 3–5 mm long; pods 2-articulate, rarely 3-articulate…………………………… 5
5. Terminal leaflet with 8–10 lateral veins per side; terminal bristle of foliaceous primary bract 6–7 mm long; flowers 8.5–9 mm long; staminal tube 7–8 mm long; wings white to creamy….. 5. P. pulchellum
5. Terminal leaflet with 4–6 lateral veins per side; terminal bristle of foliaceous primary bract 9–11 mm long; flowers ca. 12 mm long; staminal tube 11–12 mm long; wings purplish red………………

6. *P. vestitum*


Shrub to 3 m high; twigs brown tomentose. *Leaves* tomentose throughout: stipules triangular, 4–6 by 1.5–3 mm, apex acuminate; petioles 0.5–2 cm long, tomentose; rachis 0.5–1 cm long. *Leaflets*: stipels linear to cuneate, ca. 2 mm long; petiolules 2–3 mm long. *Terminal leaflet* lanceolate, 5–10 by 2–6 cm, apex acute to shallowly retuse, base cuneate to rounded, margin repand; lateral veins 9–11 per side. *Lateral leaflets* ovate to asymmetrical, 3–7 by 2–4 cm, apex obtuse to shallowly retuse, base asymmetrical, margin repand. *Inflorescences* 10–50 cm long. *Foliaceous primary bracts* along entire inflorescence rachis and rachilla; stipules triangular, 3.5–4 mm long, apex acute, tomentose; stipels 2–2.5 mm long; petioles 2–3 mm long; petiolules 1–2 mm long; terminal bristle ca. 4 mm long; lateral leaflet-like suborbicular to broadly ovate, 0.5–2 cm wide, apex retuse to rounded, base asymmetrical, margin entire, both surfaces pubescent to tomentose; lateral veins 4–5 per side. *Secondary bracts* ovate, 0.6–0.8 by ca. 0.2 mm, apex acute, tomentose. *Flowers* 7.5–8 mm long in fascicles of 10–15; bracteoles linear, 0.9–1 by 0.1–0.2 mm, tomentose; pedicels 2–3 mm long, tomentose. *Calyx*: tube 2–3 mm long; teeth 1–2 mm long, apex acuminate, puberulous to pubescent. *Corolla* white; standard obovate or elliptic, 5–7 by 3–4 mm, apex obtuse, middle part rugose, upper margin auriculate, puberulous, claw 1–2 mm long; wings oblanceolate, 6–6.5 by ca. 1 mm, upper margin distinctly auriculate, claw ca. 1.5 mm long; keels 5–7 by 2–2.5 mm, puberulous, claw 2–3 mm long. *Staminal tube* 6–7 mm long; anthers ellipsoid, ca. 0.5 mm long. *Ovary* puberulous to tomentose; style 4–6 mm long, puberulous. *Pods* 3 (–4)-articulate, 1.5 (–2.5) cm long, surface smooth, densely silvery sericeous.


**Distribution.** — China, Laos, Cambodia, Vietnam, Indonesia (Java).

**Ecology.** — Evergreen, dry dipterocarp and mixed deciduous forests, 5–430 m alt. Flowering: August to November.

**Vernacular.** — Klet lin (เกล็ดลิ่น) (Ubon Ratchathani); klet pla chon (เกล็ดปลาช่อน) (Khon Kaen); klet pla mo (เกล็ดปลาหมอ) (Buri Ram, Prachin Buri, Sakon Nakhon).
Specimens examined. — BR s.n. (AAU); D. Bunpheng 146 (BKF); D.J. Collins 286 (E, K) & 1314 (ABD, K); A.F.G. Kerr 2139 (K) & 13458 (ABD, BK, E, K); H. Koyama, H. Terao & T. Wongprasert T-30761 (BKF); K. Larsen & T. Santisuk 31846

FIGURE 1. (A–C) Phyllodium elegans and (D–F) P. kurzianum.


Shrub, 2–3 m high; stems and twigs golden tomentose. Leaves: stipules triangular, 7–8 by 2.5–5 mm, apex acuminate, pubescent; petiololes (0.5–) 1.5–4 cm long, tomentose; rachis 1–3 cm long, tomentose. Leaflets: stipels narrowly triangular, 3–4 mm by ca. 1 mm, pubescent; petiololes 3–6 mm long, tomentose. Terminal leaflet lanceolate, (6–) 12–20 by 2–6 cm, apex acute to obtuse, base cuneate to rounded, margin entire, upper surface pubescent, lower surface golden tomentose; lateral veins 11–12 per side. Lateral leaflets lanceolate, 7–14 by 3–7 cm, apex acute, base asymmetrical, margin entire, upper surface pubescent, lower surface golden tomentose. Inflorescences 10–50 cm long. Foliate primary bracts on the lower part of inflorescence rachis; stipules ca. 4 by 2 mm, apex acute, pubescent; stipels 2–3 mm long; petioles ca. 4 mm long; petiololes 1–2 mm long; terminal bristle 1.3–1.5 mm long; lateral leaflet-like suborbicular, 2–4.5 by 1.5–4.5 cm, apex retuse; lateral veins 4–6 per side. Simple primary bract narrowly triangular, 5–6 by 1 mm. Secondary bract ovate, ca. 1 mm long, apex acute, pubescent. Flowers 8–11 mm long in fascicles of ca. 10 flowers; bracteoles ovate, ca. 1 mm long, apex acute, pubescent; pedicels 7–12 mm long, tomentose. Calyx: tube 4–6 mm long, pubescent; teeth acute. Corolla light yellow and purplish red; standard ca. 8 by 6 mm, apex obtuse, claw 2–3 mm long; wings oblong, ca. 8 by 2–2.5 mm, claw 2–3 mm long; keel ca. 10 by 3–4 mm, claw 2–3 mm long. Staminial tube 9–10 mm long; anthers ca. 0.5 mm long. Ovary puberulous. Pods (2–) 3–6-articulate, (1–) 2–4 by 0.5–0.6 cm; surface reticulate, puberulous.

Thailand. — NORTHERN: Mae Hong Son, Chiang Mai, Lamphun, Tak; SOUTH-WESTERN: Uthai Thani.

Distribution. — Myanmar.

Ecology. — Dry dipterocarp forest, mixed with lower montane oak and mixed deciduous forests, 110–1,500 m alt. Flowering: September to November.
Vernacular. — Kao fom (ก้าวฟ้อม), ya paep nok (หญ้าแปบนก) (Chiang Mai); pan kadang (Lamphun).

Specimens examined. — B.O.T. 60 (BCU-3 sheets); BGO-staff 9700 (QBG); C.C. Hosseus 61 (E, K); A.F.G. Kerr 1453 (K); Khantchai 694 (BKF); N. Mao s.n. (BK); J.F. Maxwell 57-1263 (BFK), 87-1263 (CMU), 90-54 (E) & 94-1226 (CMUB, BKF); R. Pooma, N. Pattharahirantricin, S. Sirimongkol & N. Silapasorn 7770 (BKF); B. Sangkhachand 18 (BK); R. Schultze-Kraft & S. Pattanavibul 33094 (K); T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham T-22441 (BFK) & T-22471 (BFK); T. Sørensen, K. Larsen & B. Hansen 5729 (BKF) & Winit 1236 (AAU, ABD, BK, K) & 1540 (K).

3. Phyllodium kurzianum (Kuntze) H.Ohashi, Ginkoana 1: 272. 1973. Fig. 1 (D–F).

Meibomia kurziana Kuntze, Rev. Gen. 1: 197. 1891. Type: not located.

Desmodium grande Kurz, Journ. Asiat. Soc. Beng. 43(2): 184. 1874, non E. May. Type: Burma (Myanmar), Tagoung, Anderson 168 (isotype CAL n.v.).


Desmodium kurzii Craib, Bull. Misc. Inform., Kew 1911: 37. 1911. Type: Thailand, Chiang Mai, in deciduous jungle on Doi Surhep, 300 m, A.F.G. Kerr 766 (holotype K!).

Phyllodium kurzii (Crab) Chun, Sunyatsenia 4: 213. 1940.

Shrub to 1.5 m high; young twigs 5–ridged, tomentose on and puberulous between the ridges. Leaves: stipules triangular, 4–5 by 2–3 mm, persistent, apex acuminate, puberulous; petioles 3.5–5.5 cm long, tomentose; rachis 2.5–4 cm long. Leaflets: stipels triangular, 2–3 by ca. 1.5 mm, apex acuminate, puberulous; petiolules 2.5–4 mm long. Terminal leaflet lanceolate to broadly ovate, 12–18 by 8–11 cm, apex acute, base cuneate to obtuse, margin entire or slightly repand, upper surface puberulous, lower surface pubescent; lateral veins 7–10 per side. Lateral leaflets narrowly ovate to lanceolate or asymmetrical, 9–15 by 5–9 cm, apex acute to obtuse, base asymmetrical, margin entire or slightly repand, puberulous above, pubescent below. Inflorescences 10–50 cm long. Foliaceous primary bracts along entire inflorescence rachis and rachilla; stipules triangular, ca. 4 by 1.5–2 mm, apex acuminate, puberulous; stipels ca. 0.3 mm long, puberulous; petioles 4–4.5 mm long, puberulous; petiolules ca. 1.5 mm long, puberulous; terminal bristle 1.3–1.5 cm long, puberulous; lateral leaflet-like ± ovate or suborbicular, 2–4 by 2–3 cm, apex retuse to obtuse, base asymmetrical, margin entire to shallowly repand, surface appressed puberulous; lateral veins 4–6 per side. Secondary bracts ovate, ca. 0.7 by 0.5 mm, margin ciliate. Flowers 0.8–1 cm long in fascicles of ca. 15 flowers; bracteoles ovate, ca. 0.7 by 0.5 mm, margin ciliate; pedicels 0.7–1 cm long, with hooked hairs. Calyx: tube 3.5–4 mm long; teeth ca. 1.5 mm long, externally puberulous. Corolla white to light yellow; standard broadly obovate, ca. 9 by 6 mm, apex obtuse, glabrous, claw ca. 2 mm long; wings narrowly elliptic, ca. 8 by 2 mm, claw 2–2.5 mm long, upper margin distinctly auriculate, glabrous; keels ca. 9 by 3 mm, glabrous, claw 2.5–3.5 mm long. Staminode tube ca. 1 cm long; anthers ellipsoid, ca. 0.6 mm long. Ovary puberulous; style ca. 8 mm long. Pods (1–)
3–5 articulate, 1–1.5 by 0.5–0.7 cm, distinctly reticulate, puberulous. Seeds 3.2–3.5 by 2.5–3 mm.


**Distribution.** — China, Myanmar.

**Ecology.** — Lower montane pine-oak, dry dipterocarp, mixed deciduous and pine-deciduous dipterocarp forests, 200–1,010 m alt. Flowering: July to December.

**Vernacular.** — Ket pla (เก็ดปลา) (Kanchanaburi); klet pla chon (เกล็ดปลาช่อน) (Chiang Mai, Lampang, Phitsanulok); mai klet min (ไม้เกล็ดนิ่ม) (Loei).

**Specimens examined.** — BGO. staff 19 (QBG), 119 (QBG), 1551 (QBG) & 1663 (QBG); P. Chantaranothai et al. 339 (KKU), 715 (KKU) & 1409 (KKU); C. Charoenphol, K. Larsen & E. Warncke 4886 (AAU, BKF); D.J. Collins 1859 (BK, K); B. Hansen, G. Seidenfaden & T. Smitinand 11233 (K); T. Jonganurak, N. Hemrath & J. Pithpheth 1523 (AAU, BKF); A.F.G. Kerr 766 (K); S. Krhongton 166-1 (KKU); H. Koyama, H. Terao, C. Niyomdham & T. Wongprasert T-30374 (BKF); K. Larsen 4807 (BKF); K. Larsen, S.S. Larsen, I. Nielsen & T. Smitinand 31522 (AAU, BKF); K. Larsen, T. Smitinand & E. Warncke 853 (AAU); C. Leeratiwong 98-19 (KKU), 99-61 (KKU, QBG) & 2001-7 (PSU); I. Makkan 131 (BKF); C. Maknoi 1149 (QBG); S. Mattapha 944 (KKU, QBG); J.F. Maxwell 74-1062 (AAU, BK), 87-1426 (CMUB, BKF), 91-1050 (CMUB, E), 93-1099 (CMUB), 93-1287 (CMUB, BKF-2 sheets) & 94-1255 (CMUB, BKF); G. Murata, C. Phengklai, S. Mitsuta, H. Nagamasu & N. Nantsanan T-37276 (BKF) & T-37338 (BKF); P. Nangngam 1849 (BKF); M. Norsaengsri 7175 (QBG); M. Panatkool 390 (CMUB); J.A.N. Parnell, C. Pendry, M. Jebb & R. Pooma 95-230 (BKF, K); C. Phengklai et al. 12311 (BKF); R. Pooma 259 (CMUB, BKF) & 1311 (CMUB, BKF); R. Pooma, K. Phattarakhrankanok, S. Sirimongkol & M. Poopath 5963 (BKF); Prayad 999 (BK); Put 1841 (BK, K); W. Saisorn 81 (KKU), 110 (KKU) & 157 (KKU); B. Sangkhachand 2031 (BKF); W. Sankamethawee 372 (CMUB, BKF); R. Schultz-Kraft & S. Pattanavibul 053/037-08 (K), 053/056-10 (K) & 053/057-04 (K); R. Schultz-Kraft, S. Pattanavibul & P. Sornprasitti 060/017-04 (K); T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham T-21906 (BKF); T. Smitinand 4881 (BKF, K); S. Suwannaratana 20 (CMUB); K. Warintorn 07-119 (BKF, QBG) & Winit 1489 (ABD, BK, K).

4. **Phyllodium longipes** (Craib) Schindl. in Fedde, Repert. Spec. Nov. Regni Veg. 20: 270. 1924. Fig. 2 (A–C).


Shrub to 3 m high; young twigs puberulous; leaves and inflorescence bracts puberulous to pubescent on leaflet-like below or glabrescent on leaflets above. **Leaves:** stipules triangular, 3.5–5.5 by 3–3.5 mm, apex acuminate; petioles 3–5 mm long; rachis 0.8–1.5 cm long. **Leaflets:** stipels
triangular, 2–3.5 by 0.5–0.7 mm, apex acuminate; petiolules 2–4 mm long. **Terminal leaflet** lanceolate, 11–18 by 4–6 cm, apex acute to acuminate, base obtuse, margin entire or slightly repand; lateral veins 11–14 per side. **Lateral leaflets**
narrowly ovate or asymmetrical, 3–3.5 by 2–3 cm, apex acute to acuminate, base asymmetrical, margin entire. **Inflorescences** 20–150 cm long. **Foliaceous primary bracts** along entire inflorescence rachis and rachilla; stipules triangular, 3.5–4.5 by 1.2–1.5 mm, apex acuminate; stipels 1.2–2 by ca. 0.3 mm; petiolo 3–4 mm long; petiolules ca. 1 mm long; terminal bristle 0.9–1.6 cm long; lateral leaflet-like ± ovate, 2.5–3.5 by 2–3 cm, apex acute, base asymmetrical, margin entire; lateral veins 6–7 per side. **Secondary bract** ovate, 0.8–1 by 0.4–0.5 mm, apex acute. **Corolla** white; standard obovate, ca. 8 by 5–5.5 mm, apex retuse, base attenuate, claw 2–2.5 mm long; wings oblong to narrowly elliptic, 7.5–8 by 1.5–2 mm, upper margin with distinct ca. 0.8 mm long auricles; keels 8.5–9 by 3–3.5 mm, claw 3–3.5 mm long. **Pods** (2–) 4–5 articulate, (0.8–) 1.5–2 by ca. 0.5 cm, distinctly reticulate, puberulous.


**Distribution.** — China, Myanmar, Laos, Vietnam.

**Ecology.** — Dry evergreen, lower montane coniferous, lower montane oak, dry dipterocarp, dry dipterocarp mixed with lower montane oak and mixed deciduous forests, 280–1,424 m alt. Flowering: June to March.

**Vernacular.** — Klet lin (เกล็ดลิ่น) (Mae Hong Son); klet pla (เกล็ดปลา), luk lip (ลูกลีบ), luk lip ton (ลูกลีบต้น), lup lip (ลูบลีบ), lup lip ton (ลูบลีบต้น), so ho mae (โซโฮแม) (Chiang Mai).

**Specimens examined.** — BGO. staff 9 (QBG), 86 (QBG) & 7665 (QBG); K. Bragg 74 (CMU); K. Bunchuai 1273 (ABD, K), P. Chantaranothai et al. 98-37 (KKU), 770 (KKU) & s.n. (KKU); Chusie KY493 (QBG); D.J. Collins 309 (K) & 1865 (BK, K); C. Glamwaewwong 1278 (QBG); Y. Hanmontri 7 (QBG) & 11 (KKU); B. Hansen, G. Seidenfaden & T. Smitinand 11233 (BKF); K. Jatupol 07-022 (QBG) & 08-240 (PSU); T. Jonganurak, N. Hemrath & J. Rithipheth 1547 (CMUB); K. Kansuntisukmongkol 1115 (CMUB); A.F.G. Kerr 715 (ABD, K-2 sheets); F. Konta & S. Khao-Iam 11374 (BKF); F. Konta, C. Phengklai & S. Khao-Iam 4821 (BKF-2 sheets); H. Koyama, H. Terao & T. Wongprasert T-30853 (BKF) & T-31918 (BKF); K. Larsen, S.S. Larsen, I. Nielsen & T. Santisuk 31578 (AAU); K. Larsen, S.S. Larsen, C.T. Nørgaard, K. Pharsen, P. Puudjaa & W. Uerchirakan 44525 (AAU); K. Larsen, T. Smitinand & F. Warncke 666 (AAU, BKF) & 2832 (BKF); K. Larsen & E. Warncke 1832 (AAU); C. Leeratiwong 98-66 (KKU); N. Mao s.n. (BK); G. Murata, N. Fukuoka & C. Phengklai, T-17166 (BKF); G. Murata, C. Phengklai, S. Mitsuta, T. Yahara, H. Nagamasu & N. Nantasan T-41681 (BKF), T-51213 (BKF) & T-51378 (BKF); M.
Norsaengsri 6349 (QBG) & 6419 (QBG); C. Phengkhai et al. 7220 (BKF); C. Phengkhai & T. Smitinand 6126 (BKF); W. Pongamornkul 2784 (QBG) & 2791 (QBG); R. Pooma 260 (CMUB, BKF); R. Pooma, W.J.J.O. de Wilde, B.E.E. Duyfjies, V. Chamchumroon & K. Phattarahirankanok 2332 (BKF); P. Pornpongrungruang et al. 102-1 (KKU); Pradit 423 (BK); W. Saisorn 11 (KKU), 44 (KKU), 50 (KKU), 78 (KKU), 104 (KKU), 117 (KKU), 139 (KKU) & 147 (KKU); B. Sangkhachand 9 (BKF) & 180 (K); R. Schultze-Kraft, S. Pattanavibul & P. Sornprasitti 060/028-05 (K); T. Smitinand s.n. (BKF); S. Suddee 142 (BCU-3 sheets); S. Suddee, T. Jonganurak & V. Chamchumroon 3 (BKF); Suradet 200 (BKF); S. Sutheesorn 3517 (BK), 3565 (BK) & 4117 (BK); S. Tahkaru T-61650 (BKF); M.N. Tamura T-60122 (BKF); S. Tsugaru T-60057 (BKF-2 sheets, QBG); T. Wangprasert s.n. (BKF no. 104356); Th. Wangprasert et al. s.n. (CMUB, BKF-3 sheets); W. Yahnpaisahn 133 (CMUB) & S.N. (BCU).

5. Phyllodium pulchellum (L.) Desv., Journ. Bot. ser. 2, 1: 124. 1813. Fig. 2 (D–F).


Dicerma pulchellum (L.) DC., Prodr. 2: 339. 1825.

Desmodium pulchellum (L.) Benth., Fl. Hongk.: 83. 1861.

Meibomia pulchella (L.) Kuntze, Rev. Gen. 1: 197. 1891.


Shrub, 1–2 m high; young twigs, leaves and inflorescence bracts puberulous. Leaves: stipules triangular, 6–7 by 2–2.5 mm, apex acuminate; petioles 0.5–1.5 cm long; rachis 1–2.5 cm long. Leaflets: stipels narrowly triangular, 3–3.5 by 0.5–0.6 mm; petiolules 2–5 mm long. Terminal leaflet ± lanceolate, 8–20 by 2.5–8 cm, apex obtuse to acute, base cuneate to obtuse, margin slightly repand; lateral veins 8–10 per side. Lateral leaflets ± ovate, (2–) 4–11 by 1–5 cm, apex acute to obtuse, base asymmetrical, margin slightly repand; lateral veins 4–6 per side. Inflorescences 10–100 cm long. Folioaceous primary bracts along entire inflorescence rachis and rachilla; stipules triangular, ca. 3.5 mm long, apex acute; stipels ca. 1.2 mm long; petioles ca. 2 mm long; petiolules ca. 1 mm long; terminal bristle 6–7 mm long; lateral leaflet-like ± orbicular, 1–1.5 cm wide. Secondary bract ovate, ca. 1 by 0.5 mm. Flowers puberulent to puberulous on bracteoles and both surfaces of the calyx, 8.5–9 mm long, born in 4–6 flowered fascicles; bracteoles ca. 1 by 0.5 mm; pedicels 3–3.5 mm long. Calyx: tube green, 3–3.5 mm long; teeth 1–1.5 mm long, apex acute. Corolla white to creamy; standard elliptic to obovate, 7.5–8 by 4–4.5 mm, apex rounded to retuse, claw 1.5–2 mm long; wings elliptic to oblong, 7–7.5 by ca. 1.5 mm, apex obtuse, upper margin auriculate, claw ca. 2 mm long; keels ca. 8.5 by 2.5–3 mm, obtuse to acute, upper margin auriculate, claw 2.5–3 mm long. Staminal tube 7–8 mm long; anthers ca. 0.5 mm long. Ovary puberulous; style 7–8 mm long. Pods 2-articulate, 8–10 by 4–4.5 mm, distinctly reticulate, puberulous.

Thailand. — NORTHERN: Chiang Mai, Chiang Rai, Phayao, Nan, Lamphun, Lampang, Phrae, Tak, Sukhothai, Phitsanulok, Kamphaeng Phet; NORTH-EASTERN: Phetchabun, Loei, Nong Khai,

Distribution. — India, Sri Lanka, China, Myanmar, Japan, Taiwan, Laos, Cambodia, Vietnam, Malaysia, Philippines, northern Australia.

Ecology. — Dry evergreen, lower montane coniferous, dry dipterocarp and dry dipterocarp mixed with lower montane oak forests, 0–1,800 m alt. Flowering: July to December.

Vernacular. — Ket lin lek (เก็ดหลิ่นเล็ก) (Sa Kaeo); klet lin (เกล็ดลิ่น) (Lamphun, Nakhon Nayok, Phetchabun, Phitsanulok, Sukhothai, Surin, Ubon Ratchathani); klet lin noi (เกล็ดลิ่นน้อย) (Sakon Nakhon); klet lin Yai (เกล็ดลิ่นใหญ่) (Nakhon Ratchasima); klet pla (เกล็ดปลา) (Nan); klet pla chon (เกล็ดปลาช่อน) (Chiang Mai, Kanchanaburi, Khon Kaen, Lop Buri, Rayong, Saraburi); klet pla mo (เกล็ดปลาหมอ) (Ratchaburi); lin ton (ต้น), ya song plong (หญ้าสองปล้อง) (Central); luk lip (ลิ่น) (Chiang Mai); luk nip ton (หญ้าหนีบต้น) (Lampang, Prachin Buri); mai hang lin (ไม้หางลิ่น), hang lin (หางลิ่น) (Surat Thani); pa pae (ปลาย) (Suay-Surin); ya klet lin (หญ้าเกล็ดลิ่น) (Northern, Peninsular).

Specimens examined. — Amnoyperm s.n. (PSU no. 0000834); BGO. staff 1585 (QBG), 1749 (QBG), 4299 (QBG) & 9634 (QBG); P. Boonkrong 24 (K); P. Bunchlang 34 (BKF); P. Chantaranothai et al. 649 (KKU), 739 (QBG), 759 (KKU) & s.n. (KKU, QBG); P. Chantaranothai, J. Parnell & D. Simpson 90/409 (K); N. Chareonraj 10 (BCU); C. Charoenphol, K. Larsen & E. Warncke 4875 (AAU, BKF, K); C. Chermisirivathana 1559 (BK); C. Chermisirivathana & Prayad 1972 (BK); D.J. Collins 30 (AAU, BM, E, K) & 1864 (ABD, BK, K); Dee 427 (BKF); N. Fukuoka & M. Ito T-35155 (BKF) & T-84790 (BKF); H.B.G. Garrett 136 (K-2 sheets) & 1396 (K); R. Geesink, P. Hiepko & C. Phengklai 7594 (BKF, K); Y. Hammontri 12 (KKU, QBG); C.C. Hosseus 66 (E-3 sheets, K); Jitaree s.n. (PSU no. 0000832); P. Keosangsee 18 (BCU); A.F.G. Kerr 13486 (ABD, BK, E, K) & 13549 (ABD, BK, K); D. Khruesan MS813 (QBG); F. Konta & S. Khao-Iam 11251 (BKF); F. Konta, C. Phengklai & S. Khao-Iam 4498 (BKF-2 sheets); H. Koyama & C. Phengklai T-39836 (BKF); H. Koyama, H. Terao, C. Niyomdhams & T. Wongprasert T-30375 (BKF) & T-30510 (BKF); H. Koyama, H. Terao & T. Wongprasert T-30684 (BKF, QBG), T-30957 (BKF, QBG), T-31850 (BKF) & T-31920 (BKF-2 sheets); K. Larsen, S.S. Larsen, C.T. Norgaard, K. Phrasen, P. Puudja & W. Verchirakan 44517 (AAU); K. Larsen, S.S. Larsen, I. Nielsen & T. Santisuk 30785 (AAU, K), 31430 (AAU, BKF) & 31530 (AAU); K. Larsen, T. Smitinand & Warncke 1132 (AAU); C. Leeratiwong 48-68 (QBG) & 98-68 (KKU-2 sheets, QBG); M.C. Lakshanakara 273 (AAU, ABD, BK, E, K); R. Mahasombat 146 (CMUB); C. Maknoi 2690 (BKF); A. Markan 1059 (ABD, BM); S. Mattapha s.n. (KKU, QBG); J.F. Maxwell 71-706 (AAU-2 sheets), 73-500 (AAU, BK), 84-354 (BKF, PSU-2 sheets), 86-934 (BKF, CMU, PSU), 87-1306 (BKF,
CMU), 89-100 (BKF, CMU), 89-1400 (CMU, E-2 sheets), 89-1602 (CMU, E-2 sheets), 91-58 (CMU), 91-826 (CMUB, E), 91-903 (E), 92-715 (CMUB), 94-1259 (CMUB, BKF), 96-1497 (CMUB, BKF), 98-1440 (CMUB), 00-91 (CMUB, BKF), 01-570 (CMUB), 03-350 (CMUB, BKF), 04-627 (CMUB), 05-738 (CMUB) & 07-659 (CMUB, QBG-2 sheets); W. McClatchey, P. Mokkamul & C. Hobbs
WCM3269A (BKF) & WCM3426 (BKF); G. Murata, K. Iwatsuki & D. Chaiglom T-16205 (BKF); G. Murata, K. Iwatsuki & C. Phengklai T-2356 (BKF); G. Murata, C. Phengklai, S. Mitsuta, H. Nagamasu & N. Nantasan T-37257 (AAU) & T-37540 (AAU); G. Murata, C. Phengklai, S. Mitsuta, T. Yahara, H. Nagamasu & N. Nantasan T-38278 (BKF), T-50040 (BKF) & T-50763 (BKF); R. Namdaeng 43 (KKU); W. Nanakorn et al. 5092 (QBG); S. Nimanong & S. Phusomsaeng 116 (BKF, K); C. Niyomdham 4875 (BKF); M. Norsaengsri 923 (QBG), 1806 (QBG), 2841 (QBG), 2867 (QBG) & 6405 (QBG); M. Norsaengsri & N. Tathana 8393 (QBG); Y. Paisooksantivatana Y2300-88 (BK) & Y2374-89 (BK); Y. Paisooksantivatana & P. Sangkhachand Y2195-87 (BK); M. Panatkool 32 (CMUB) & 410 (CMUB); O. Petrmitr 240 (CMUB) & 415 (CMUB); C. Phengklai & T. Smitinand 6125 (BKF-2 sheets) & 6132 (BKF); C. Phengklai 191 (BKF) & 3968 (BKF-2 sheets, PSU); C. Phengklai et al. 3310 (BKF-2 sheets, PSU), 7600 (BKF-2 sheets), 13993 (BKF) & 14032 (BKF); S. Phengnaren s.n. (BKF no. 47033); P. Pisuttimarn et al. 165-1 (KKU); Ploenchit 450 (BCU, BKF); W. Pongamornkul 2 (QBG) & 50 (QBG); R. Pooma, W.J.J.O. de Wilde, B.E.E. Duypijes, V. Chamchumroon & K. Phattaradhiran-
kanok 2546 (BKF); Pradit 602 (BKF); Prayad 700 (BK), 1016 (BK) & 1097 (BK); Put 2081 (AAU, ABD, BK, E, K); P. Puutiea 760 (BKF); S. & S. 1926 (BK); S.P. et al. 88 (BKF); W. Saisorn 12 (KKU), 32 (KKU), 40 (KKU), 41 (KKU), 43 (KKU), 54 (KKU), 62 (KKU), 69 (KKU), 79 (KKU), 80 (KKU), 88 (KKU), 90 (KKU), 95 (KKU), 107 (KKU) & 122 (KKU); B. Sangkhachand 1246 (BKF, K); W. Sankamethawee 355 (CMUB, BKF); I. Schanzer 02-124 (BKF); R. Schultze-Kraft & S. Pattanavibul 024/029-01 (K), 053/001-01 (K), 053/012-05 (K), 053/014-02 (K), 053/043-05 (K), 053/050-05 (K) & 053/053-07 (K); R. Schultze-Kraft, S. Pattanavibul & P. Sornprasitti 060/006-03 (K), 060/010-06 (K), 060/019-03 (K), 060/024-04 (K), 060/027-03 (K), 060/033-01 (K), 060/035-03 (K) & 060/037-02 (K); T. Seelanan et al. 262 (BCU-2 sheets); K. Setbubra 8 (BKF); T. Shimizu, M. Hutoh & D. Chaiglom T-8766 (BKF); T. Shimizu, H. Toyokuni, H. Koyama, T. Yahara & C. Niyomdham T-21429 (BKF), T-21905 (BKF) & T-22567 (BKF); P. Sirirugsa 234 (PSU-2 sheets), s.n. (PSU no. 0000835) & s.n. (PSU no. 0000837); T. Smitinand 4888 (BKF, K); Somkhit 460 (BKF); T. Sørensen, K. Larsen & B. Hansen 403 (BKF, E); S. Suddee, T. Jonganurak & V. Chamchumroon 4 (BKF); P. Suksthathan 2805 (QBG); S. Suteesorn 100 (BK), 585 (BKF), 3109 (BK), 3472 (BK) & 4316 (BK); N. Tanaka, H. Nagamasu, A. Naiki, S. Nishida, P. Srisanga & S. Wathana HN8023 (QBG); B. Tantioowic & C. Phengklai s.n. (BKF); A. Thammathaworn 45 (KKU); W. Thephemttee et al. 25 (BCU-2 sheets); Umpai 584 (BK) & 644 (BK); Vacharapong 324 (BK); C.F. van Beusekom & C. Charoenphol 1981 (AAU, BKF, E); M. van de Bult 142 (BKF); A. Virapongse AV5 (BKF) & AV159 (BKF, KKU); K. Wangwasit 51102.3 (AAU, BKF,
Phyllodium vestitum Benth. in Jungh. & Miq., Pl. Jungh.: 217. 1853. Fig. 3 (A–B).


Shrub, 2–4 m high, pubescent or puberolous on young twigs, leaves and inflorescence bracts; bracteoles and leaflets appressed pubescent below. *Leaves*: stipules triangular, 4–5 by 4–5 mm, apex acuminate; petioles 0.5–1.5 cm long; rachis 0.8–2 cm long. *Leaflets*: stipels triangular, 2.5–3 by *ca.* 1 mm; petiolules 2.5–3 mm long. *Terminal leaflet* ovate to elliptic, 8–11 by 5–8 cm, apex obtuse to shallowly retuse, base obtuse to rounded, margin slightly repand; lateral veins 4–6 per side. *Lateral leaflets* ± ovate, 5–8 by 3–4.5 cm, apex obtuse to shallowly retuse, base obtuse or asymmetrical, margin entire or slightly repand; lateral veins 4–5 per side. *Inflorescences* 20–100 cm long. *Foliaceous primary bracts* along entire inflorescence rachis and rachilla; stipules triangular, 2.5–3 by 2–2.5 mm, apex acute; petioles 2–3 mm long; petiolules *ca.* 0.5 mm long; terminal bristle 9–11 mm long; lateral leaflet-like broadly elliptic to suborbicular, 2–3.5 by 2–3 cm. *Secondary bract* ovate, 1.4–1.5 by 0.5–0.6 mm. *Flowers* in fascicles with 6–8 flowers, *ca.* 1.2 cm long; bracteoles ovate, *ca.* 1.2 by 0.6–0.7 mm; pedicels 4–5 mm long. *Calyx*: tube green, 5.5–6 mm long; teeth *ca.* 1.5 mm long, apex acute, both outside and inside puberulous to pubescent. *Corolla* creamy white to greenish white except wings purplish red; standard obovate, 11.5–12 by 8–8.5 mm, apex rounded, claw *ca.* 3.5 mm long; wings elliptic to oblong, 11–11.5 by 3–3.5 mm, upper margin auriculate, claw 3–3.2 mm long; keels arcuate, 12–13 by 5–5.5 mm, apex short beak-like, upper margin auriculate, outside of keel blade with a small vesicle, claw 3–3.5 mm long. *Staminal tube* 11–12 mm long; anthers *ca.* 1 mm long. *Ovary*
puberulous; style 10.5–11 mm long, base puberulous. **Pods** 2 (–3)-articulate, 11–12 by 5–5.2 mm, distinctly reticulate, puberulous. **Seeds** ca. 4 by 3 mm.

**Thailand.** — NORTHERN: Chiang Mai, Lamphun, Uttaradit; NORTH-EASTERN: Phetchabun, Udon Thani, Nong Khai, Buengkan, Sakon Nakhon, Nakhon Phanom, Khon Kaen; EASTERN: Chaiyaphum, Buri Ram, Surin, Ubon Ratchathani; PENINSULAR: Ranong, Satun.

**Distribution.** — Myanmar, Laos, Cambodia, Vietnam, Malesia (Malaya, Peninsula Malaysia).

**Ecology.** — Mixed deciduous, dry dipterocarp and dry dipterocarp mixed with lower montane oak forests, 10–900 m alt. Flowering: June to February.

**Vernacular.** — Bak klet lin (บักเกล็ดลิ่น) (Udon Thani); klet lin (เกล็ดลิ่น) (Ubon Ratchathani); klet lin yai (เกล็ดลิ่นใหญ่) (Sakon Nakhon); klet pla chon (เกล็ดปลาช่อน) (Buengkan); klet pla mo (เกล็ดปลาหมอ) (Chaiyaphum).

**Specimens examined.** — K. Bunchuai 1531 (BKF, K); G. Congdon C227 (AAU, PSU); S. Gardner & P. Sidisunthorn ST2537 (QBG); M. Greijmans 37 (CMUB); S. Indaopong 77 (AAU, BKF); A.F.G. Kerr 8230 (ABD, BK, K); H. Koyama, H. Terao & T. Wongprasert T-31134 (BKF, QBG); K. Larsen, S.S. Larsen, C. Niyomdham, P. Sirirugsa, D.D. Tirvengadum & C.T. Nørgaard 43230 (AAU, PSU); K. Larsen, S.S. Larsen, C. Niyomdham, T. Santisuk & E. Warncke 2727 (AAU, E, K); K. Larsen, T. Santisuk & E. Warncke 2161 (AAU, K); J.F. Maxwell 87-93 (AAU, BKF, CMU, PSU); W. McClatchey, P. Mokkamul & C. Hobbs WCM3626 (BKF) & WCM3680 (BKF); G. Murata, C. Phengklai, S. Mitsuta, T. Yahara, H. Nagamasu & N. Nantasang T-50645 (BKF); C. Niyomdham 4873 (BKF); C. Niyomdham & W. Ueachirakan 3530 (BKF); M. Norsaengsri 1162 (QBG) & 2870 (QBG); M. Norsaengsri & N. Tathan 8734 (QBG); C. Phengklai et al. 3601 (BKF, PSU); S. Phengnaren 267 (BKF-2 sheets); R. Pooma 1346 (CMUB, BKF); W. Saisorn 74 (KKU), 82 (KKU), 87 (KKU), 103 (KKU) & 132 (KKU); T. Santisuk 651 (AAU, K) & 785 (BKF-2 sheets, PSU); R. Schulze-Kraft & S. Pattanavibul 024/025–02 (K) & 053/017-04 (K-2 sheets); R. Schulze-Kraft, S. Pattanavibul & P. Sornprasitti 060/019-02 (K); S. Suddee 199 (BCU-3 sheets); T. Wongprasert et al. s.n. (BKF) & S.N. (BKF).

### 2. POLLEN MORPHOLOGY

The *Phyllodium* pollen is presented as monads, that are isopolar with radial symmetry, 3–colporate, small to medium sized and prolate spheroidal to subprolate (P=23–44 µm, E=21–38 µm) (Fig. 4F). Amb type is more or less circular (Fig. 4A & E). The exine is 1.1–1.25 µm in thickness. The ornamentation is reticulate at the apocolpial and mesocolpial areas and microreticulate and psilate along the aperture (Fig. 4I–K). The pore is 6–12 µm in diameter. The colpus is 17–32 µm in length, usually narrow, slightly depressed and usually extending reaching near to both poles (Fig. 4C–D & G–H). The endoapertures are lalongate (Fig. 4B). All data of each species are shown in Table 1.

### 3. LEAF EPIDERMIS

The epidermal cells in the genus *Phyllodium* are jigsaw-like, irregular and polygonal. Anticlinal walls of epidermal cell are shallowly to slightly undulate, curved and straight (Fig. 4L–M). There are three
types of trichomes, including multicellular uniseriate hairs, hooked hairs and stalked gland with unicellular heads (Fig. 4O–Q) and stomata are found as two types, paracytic and anomocytic (Fig. 4N). All anatomical data of the five Thai species of *Phyllodium* are shown in Table 2.
DISCUSSION AND CONCLUSIONS

All species of *Phyllodium* are recognized by their foliaceous primary bracts as described in the key to the species and the descriptions of the individual species. *Phyllodium insigne* has foliaceous primary bracts on the lower part of inflorescence rachis. This character is used for the first couplet of the key which is quite different from Ohashi (1973). However, he separated *P. insigne* from others and placed it under the subgenus *Prainia* H.Ohashi, according to the character of primary bracts. Certain species such as *P. longipes* and *P. kurzianum* are quite variable in size of leaves and leaflets. However, the ratios between length and width of these clearly

### TABLE 1. Pollen of three species of *Phyllodium* in Thailand. Measurements present low, high and mean values (\( \bar{X} \)) and standard deviation (S.D.).

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Aperture length (µm)</th>
<th>Axis length (µm)</th>
<th>P/E</th>
<th>Shape</th>
<th>Size</th>
<th>Amb type</th>
<th>Exine Thickness (µm)</th>
<th>Ornamentation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Colpus ( \bar{X} \pm S.D. )</td>
<td>Porus ( \bar{X} \pm S.D. )</td>
<td>P (( \bar{X} \pm S.D. ))</td>
<td>E (( \bar{X} \pm S.D. ))</td>
<td></td>
<td></td>
<td>(( \bar{X} \pm S.D. ))</td>
<td></td>
</tr>
<tr>
<td><em>P. elegans</em></td>
<td>17–19 (18.00±0.82)</td>
<td>6–8 (7.27±0.75)</td>
<td>23–24 (23.83±0.41)</td>
<td>21–22 (21.50±0.55)</td>
<td>1.11</td>
<td>Ps Ss Ci</td>
<td>1.78±0.30</td>
<td>Re Re Mi Psi</td>
</tr>
<tr>
<td><em>P. longipes</em></td>
<td>25–27 (25.70±0.82)</td>
<td>7–12 (9.14±1.55)</td>
<td>30–35 (31.60±1.35)</td>
<td>25–29 (27.55±1.37)</td>
<td>1.15</td>
<td>Sp Ms Ci</td>
<td>1.55±0.28</td>
<td>Re Re Mi Psi</td>
</tr>
<tr>
<td><em>P. vestitum</em></td>
<td>29–32 (30.50±2.12)</td>
<td>6.5–7 (6.75±0.35)</td>
<td>41–44 (42.50±1.05)</td>
<td>28–38 (33.88±3.52)</td>
<td>1.25</td>
<td>Sp Ms Ci</td>
<td>1.94±0.50</td>
<td>Re Re Mi Psi</td>
</tr>
</tbody>
</table>

AA = an area along the aperture, Amb = the outline of a pollen grain in polar view, Ap = apocolpium, Ci = circular, E = equatorial axis, Me = mesocolpium, Mi = microreticulate, Ms = medium size, P = polar axis, P/E = ratio of polar and equatorial axes, Ps = prolate spheroidal, Psi = psilate, Re = reticulate, Ss = small size, Sp = subprolate.

### TABLE 2. Leaf anatomical data of five species of *Phyllodium* in Thailand

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Upper epidermis</th>
<th>Lower epidermis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shape of epidermal cell</td>
<td>Shape of anticlinal wall</td>
</tr>
<tr>
<td><em>P. elegans</em></td>
<td>jigsaw-like</td>
<td>undulate</td>
</tr>
<tr>
<td><em>P. kurzianum</em></td>
<td>jigsaw-like</td>
<td>undulate</td>
</tr>
<tr>
<td><em>P. longipes</em></td>
<td>jigsaw-like, irregular</td>
<td>undulate</td>
</tr>
<tr>
<td><em>P. pulchellum</em></td>
<td>jigsaw-like</td>
<td>±undulate, straight</td>
</tr>
<tr>
<td><em>P. vestitum</em></td>
<td>irregular, jigsaw-like, polygonal</td>
<td>±undulate, curved, straight</td>
</tr>
</tbody>
</table>

= absent, An = Anomocytic, Ho = Hooked hair, Mu = Multicellular uniseriate hair, Pa = Paracytic, St = Stalked gland with unicellular head
identify them. In this respect study agrees with previous studies of Ohashi (1973) and The Forest Herbarium, Royal Forest Department (2014). Compared to Myanmar (Kress et al., 2003) and Lao PDR (Newman et al., 2007) *Phyllodium* is more species rich in Thailand. In Thailand, the five species are widely distributed in at least four floristic regions (northern, north-eastern, eastern and peninsular) and there is merely one species, *P. insigne* distributed in a small area of northern and upper of south-western floristic regions. They are distributed in both evergreen and deciduous forests, viz. dry evergreen, lower montane oak, lower montane pine-oak, lower montane coniferous, mixed deciduous and dry dipterocarp forests at an altitude up to 1,800 meters above sea level.

The pollen of the genus *Phyllodium* can be characterized as isopolar, radially symmetric and 3-colporate. On the basis of the pollen morphology, it would appear that the genus is most close to the other genera in the subfamily Papilionoideae such as *Butea*, *Indigofera*, *Kunstleria*, *Lathyrus*, *Meizotropis*, *Spatholobus* and genera in tribe Millettieae (Wu and Huang, 1995; Ridder-Numan and van der Ham, 1997; Hsu and Huang, 2001; Güneş, 2011). However, the species are difficult to separate based on pollen morphology, although there are some slight differences. The pollen of *Phyllodium* generally confirms previous work of Ohashi (1973) and Chen and Huang (1993).

In general, the leaf epidermis of *Phyllodium* is quite similar to that of other genera in the subfamily Papilionoideae as described by Metcalfe and Chalk (1957). Some characters such as multicellular uniseriate and hooked hairs, stalked gland and three types of stomata basically confirm the observations of Lackey (1978) who studied on leaf anatomy of tribe Phaseoleae. Although the leaf epidermis of this genus cannot be used for species identification, its characters are useful in the classification and identification at higher taxonomic levels.

**ACKNOWLEDGEMENTS**

We are very grateful to the directors, curators and staff of AAU, ABD, BCU, BK, BKF, CMU, CMUB, E, K, KKU, QBG and PSU for their facilities and to Mr. Teerawat Srisuk for the photo of *P. elegans*. This work was supported by The Khon Kaen University’s Graduate Research Fund Academic Year 2012, Science Achievement Scholarship of Thailand and Applied Taxonomic Research Center and Department of Biology, Faculty of Science, Khon Kaen University.

**LITERATURE CITED**


