

The genus *Alysicarpus* Neck. ex Desv. (Leguminosae) in Thailand

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ABSTRACT

The three species of *Alysicarpus* known from Thailand are described with notes on their distribution and ecological data, vernacular names and photographs. They are *Alysicarpus bupleurifolius*, *A. rugosus* and *A. vaginalis*. A key for the identification of the three species is provided. A lectotype for *Alysicarpus wallichii* is selected here.

KEYWORDS: Desmodieae, Fabaceae, lectotypification, revision.

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INTRODUCTION

Alysicarpus Neck. ex Desv. (Desmodieae, Leguminosae) comprises about 30 species distributed in tropical and subtropical regions in Africa, Asia and Australia, with maximum diversity in India, South Africa and Australia (Pedley, 2001; Adema, 2003; Huang & Ohashi, 2008; Lewis *et al.*, 2005; Pokle, 2017). The genus derives from two Greek words, ‘*hylisis*’ meaning chain and ‘*carpos*’ meaning fruit, in reference to the segments of the pods (Lewis *et al.*, 2005). Necker (1793) separated out *Alysicarpus* from *Hedysarum* and was later validly published by Desvaux (1813). The generic name and type of genus, *Alysicarpus bupleurifolius*, proposed for conservation were given in the St. Louise Code (Greuter *et al.*, 2000).

In Thailand, *Alysicarpus* has been listed in two checklists by Craib (1928) and Pooma & Suddee (2014) with four and three species, respectively. However, valid scientific names and comprehensive information on the morphology, distribution and ecology of this genus in Thailand are needed for the forthcoming Flora of Thailand account.

MATERIALS AND METHODS

Fresh field collections in Thailand and specimens from the following herbaria were consulted: AAU,

ABD, BCU, BK, BKF, BM, C, CMU, CMUB, E, K, KKU, L, P, PSU, QBG and SING (herbarium acronyms follow Thiers, 2016). Morphological, ecological and distribution data, vernacular names and illustrations are also provided.

TAXONOMIC TREATMENT

ALYSICARPUS

Neck. ex Desv., J. Bot. Agric. 1: 120. 1813, **nom. cons.**; DC., Prodr. 2: 352. 1825; Benth., Fl. Austr. 2: 239. 1864; Benth. & Hook.f., Gen. Pl. 2: 450. 1865; Oliv., Fl. Trop. Afr. 2: 169. 1871. Baker in Hook.f., Fl. Brit. India 2: 157. 1876; Gagnep. in Lecomte, Fl. Indo-Chine. 2: 555. 1916; Backer & Bakh.f., Fl. Java 1: 609. 1963; Ridl., Fl. Malay Penins. 1: 604. 1967; Verdc., Fl. Trop. E. Afr., Leg. Pap. 1: 491. 1971; Polhill in Polhill & Raven, Adv. Legume Syst.: 292. 1981; Nguyen in Morat, Fl. Cambodge, Laos & Vietnam 23: 128. 1987; Prain in King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66 (2): 132. 1987; Huang & Ohashi in Wu *et al.*, Fl. China 10: 290. 2008.— *Hedysarum* L., Sp. Pl. 2: 745. 1753. *pro parte*. Type species: *Alysicarpus bupleurifolius* (L.) DC. (**typ. cons.**).

Herbs, annual or perennial. *Stems* creeping or ascending, simple or branched, glabrous or with hooked hairs and patent straight hairs, rarely with

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appressed hairs. *Leaves* 1-foliolate, chartaceous or subcoriaceous, alternate, stipulate and stipellate; stipules free or connate; venation reticulate. *Inflorescence* a pseudoraceme, terminal or axillary, each node on rachides usually with two flowers. *Flowers* bisexual, zygomorphic, pedicellate; bracts scarious, early caducous; bracteoles usually early caducous. *Calyx* campanulate, 4-lobed, glumaceous, striate with strong veins proliferated from base of lobes, rigid, persistent; lobes imbricate at base or valvate, dorsal lobes bifid at apex. *Corolla* 5, papilionaceous, not or slightly longer than calyx; standard broad, obovate or nearly orbiculate, bi-lobed at apex, incurved, clawed; wings oblong-obovate or spatulate, rounded or obtuse at apex, incurved, clawed, slightly shorter than keel; keel adhering to wings, partly connate along lower margin, boat-shaped, slightly

incurved, obtuse or rounded at apex, clawed. *Stamens* 10, diadelphous (9+1); anthers uniform. *Pistil* 1-carpellate, 1-locular; ovary superior, sub-sessile or shortly stalked, 2- to many-ovuled, glabrous to hairy; style filiform, incurved; stigma capitate. *Pods* a legume, indehiscent, swollen, constricted or not between articles; articles 2–8, quadrangular, broadly oblong or rarely ovate to sub-orbicular, surface smooth or with transversely ridged or with reticulate veins, 1 seed per article, glabrous to sparsely straight-hairy or with hooked hairs. *Seeds* 2–8, asymmetry, cubic, oblong-ellipsoid, ellipsoid or obloid, light brown to black; hilum circular.

A genus of about 30 species, widely distributed in tropical regions of Africa, Asia and Australia. Three species are native to Thailand.

KEY TO THE SPECIES

1. Calyx lobes valvate; corolla blue, pink, purple, reddish-pink or rarely orangish-yellow; pod not or slightly constricted between articles **3. *A. vaginalis***
1. Calyx lobes imbricate at base; corolla yellow, orangish-yellow, greenish-yellow, pale yellow or white; pod constricted between articles
 2. Pods with transversely ridged veins and hooked hairs; inflorescences with flowers densely arranged; calyx outside with hooked hairs; leaflets oblong, oblong-obovate, oblong-oblancoate, linear-lanceolate or rarely broadly ovate to orbicular **2. *A. rugosus***
 2. Pods without transversely ridged veins and hooked hairs; inflorescences with flowers laxly arranged; calyx outside without hooked hairs; leaflets linear to linear-lanceolate **1. *A. bupleurifolius***

1. *Alysicarpus bupleurifolius* (L.) DC., Prodr. 2: 352. 1825; Wight & Arn., Prodr.: 233. 1834; Miq., Fl. Ind. Bat. 1: 232. 1855; Baker in Hook.f., Fl. Brit. India 2: 158. 1876; Gagnep. in Lecomte, Fl. Indo-Chine. 2: 557. 1916; Craib, Fl. Siam. 1(3): 431. 1928; Meeuwen *et al.*, Reinwardtia 6(1): 88. 1961; Backer & Bakh.f., Fl. Java 1: 610. 1963; Huang & Ohashi, Fl. Taiwan 3: 168. 1977; Nguyen in Morat, Fl. Cambodge, Laos & Vietnam 23: 130. 1987; Pedley in Dassan. & Clayton, Revis. Handb. Fl. Ceylon 10: 153. 1996 & Austrobaileya 6(1): 110. 2001; Huang & Ohashi in Wu *et al.*, Fl. China 10: 291. 2008.— *Hedysarum bupleurifolium* L., Sp. Pl. 2: 745. 1753; Burman, Fl. Ind.: 163. 1768; Roxb., Fl. Ind. 3: 346. 1832. Type: India, Plukenet, Amalth. Bot., t. 443, fig. 4. 1691 (lectotype, selected by Ali (1966)). Fig. 1.

— *Hedysarum gramineum* Retz., Observ. 5: 26. 1789; Willd., Sp. Pl. 3: 1172. 1803; Roxb., Fl. Ind. 3: 346. 1832. Type: Indonesia, Java, *H. Zollinger* 2352 (holotype P 03114398!).

Annual herb 25–120 cm tall. *Stem* erect or ascending, much branched, glabrous or with straight hairs. *Leaves*: petioles 1–4 mm long, grooved, covered with straight hairs; stipules triangular-linear, 3–3.3 by 0.5–1 mm, scarious; leaflets linear to linear-lanceolate, chartaceous, 1–7 by 2–5 mm, apex acute, apiculate, base rounded or cuneate, margin entire with appressed straight hairs; adaxial surface glabrous or with sparsely appressed straight hairs; abaxial surface with sparsely appressed straight hairs; lateral veins 7–22 pairs; petiolule 0.5–1 mm long, hairy; stipels triangular, ca 0.7 by 0.2 mm, scarious. *Pseudoraceme* terminal or axillary, 3–18 cm long, glabrous; internode 0.5–2 cm long; peduncle 0.6–2 cm long; flowers 20–40-flowered, laxly arranged; bracts ovate or elliptic-ovate, 6–8 by 2–2.5 mm, apex acuminate; pedicels 1–2.5 mm long or sub-sessile, grooved, covered with straight hairs; bracteoles early caducous. *Calyx* green or brownish-green, 7–8 mm long; tube 2–2.2 mm long; lobes imbricate, dorsal lobes lanceolate, 4.7–6 mm long, apex bifid, other lobes lanceolate to ovate, 5–6 mm long, apex

acuminate, outside glabrous, except with straight hairs margin, inside glabrous. *Corolla* yellow to orangish-yellow or greenish-yellow, sometimes with red blotch inside at base, glabrous; standard obovate or orbicular, 7–8 by 4.5–5.5 mm, apex emarginate, base attenuate, claw 0.5–2 mm long; wings oblong-obovate, 4–7 by 1–2 mm, apex rounded, base attenuate, sometimes slightly auriculate dorsally, claw 1–2 mm long; keel obovate, 5–8 by 1–1.5 mm, apex rounded, slightly incurved, base attenuate, claw 1–3 mm long. *Stamens* 6–6.5 mm long, staminal

tube 5–5.5 mm long, free part of filaments 1–1.2 mm long; anthers yellow, oblong, 0.3–0.4 mm long. *Ovary* narrowly oblong, 1–2 mm long, glabrous or with sparse, short appressed hairs; ovules 3–8; style 3–4 mm long, incurving upward ca $\frac{1}{2}$ of its length, with sparse long straight hairs at lower part. *Pods* cylindrical, 5–15 by 1.5–2 mm, glabrous to very sparsely hairy at margin, smooth, without transversely ridged vein and hooked hairs, acuminate at apex, light green when young, becoming brown, exserted from persistent calyx, constricted between articles;



Figure 1. *Alysicarpus bupleurifolius* (L.) DC.: A. habit; B. flowers; C. young fruits; D. dried fruit (Sathaphorn & Leeratiwong 73); E. fruit surface showing smooth area (Sathaphorn & Leeratiwong 73). Photos: A–C by C. Leeratiwong and D–E by J. Sathaphorn.

articles 3–8, ovate to sub-orbicular or quadrangular, 1.5–2.5 by 1.5–2 mm, smooth or rarely with obscurely reticulate veins; stipe 9.5–12.7 mm long; persistent calyx clearly longer than first article of pod. *Seeds* cubic to ellipsoid, 0.8–1 by 0.8–1 mm, glossy, brown.

Thailand.—NORTHERN: Mae Hong Son [Tham Pla-Namtok Pha Suea NP, 19 Nov. 2013, *Lakoet 423 (QBG)*]; Chiang Mai [Doi Sutep, 12 Sept. 1909, *Kerr 808 (BM, K)*; Op Luang NP, 11 Oct. 1996, *Maxwell 96-1327 (BKF, CMUB)*; Doi Sutep, 28 Sept. 1958, *Sørensen et al. 5306 (BKF)*, 30 Sept. 1958, *Larsen 5342 (C, E)*, 21 Oct. 1987, *Maxwell 87-1242 (BKF, CMUB)*, 14 Oct. 2016, *Sattaphorn & Leeratiwong 73 (PSU)*; Fang, 8 Oct. 1973, *Boonkerd 27 (BK)*; Mae Rim, 11 Nov. 2001, *Maxwell 01-606 (CMUB)*; San Kamphaeng, 12 Oct. 1989, *Maxwell 89-223 (CMU, E, L)*; Mae Taeng, 6 Oct. 1994, *BGO. staff 2332 (QBG)*; Lamphun [Doi Khun Tan NP, 29 Nov. 1994, *Maxwell 94-1146 (BKF, CMUB)*]; Phrae [Mae Yom NP, 14 Nov. 1991, *Maxwell 91-1052 (CMUB)*]; Tak [Thararak waterfall, 21 Nov. 2005, *Pooma et al. 5747 (BKF)*; Umphang WS, 17 Oct. 2014, *Middleton et al. 5739 (BKF)*; Wang-Djao, 14 Oct. 1904, *Hosseus 102 (K)*, *Hosseus 109 (C)*]; Sukhothai [Muang, 6 Nov. 1971, *Maxwell 71-744 (BK)*]; Phitsanulok [Bang Tang, 7 Dec. 1905, *Hosseus 703 (K)*, Thung Saleang Luang NP, 22 Oct. 1984, *Murata et al. T-38492 (BKF)*; Kaeng Chet Khwae NP, 4 Oct. 2006, *Maknoi & Pongsattayapipat 1150 (QBG)*]; Nakhon Sawan [Khao Takhli, 17 Jan. 1975, *Sathasen 3150 (BK)*]; NORTH-EASTERN: Phetchabun [Nam Nao NP, 3 Nov. 2003, *Sawai 443 (KKU)*, 17 Nov. 2013, *Maknoi 4487 (QBG)*]; Sakon Nakhon [Phu Phan NP, 1 Nov. 1998, *Leeratiwong 98-31 (KKU)*, 25 Sept. 1999, *Leeratiwong 99-107 (KKU)*, *Chantaranothai et al. 831 (KKU)*]; Kalasin [Phu Phan NP, 23 Oct. 1975, *Sathasen 3497 (BK)*]; Khon Kaen [Phu Khiao, 8 Nov. 1984, *Murata et al. T-41782 (BKF, L)*]; EASTERN: Chaiyaphum [Phu Khieo WS, Oct. 1999, *Phengklai et al. 12336 (BKF)*]; Nakhon Ratchasima [Pak Thong Chai, 10 Nov. 1963, *Pradit 520 (BK)*]; Buri Ram [26 Nov. 1976, *Phengklai et al. 3440 (BKF)*, 27 Nov. 1976, *Phengklai et al. 3488 (BKF)*]; SOUTH-WESTERN: Kanchanaburi [Salak Phra WS, 28 Nov. 1971, *Beusekom et al. 4014 (BKF)*; Si Sawat, 16 Nov. 1971, *Beusekom et al. 3807 (BKF, C, K, P)*]; Phetchaburi [Bo Fai, 8 Nov. 1931, *Marcan 2730 (ABD, BM, C)*]; Prachuap Khiri Khan [Hua Hin, 11 Nov. 1918, *Kerr 16207 (BK, BM, K)*, 11 Nov.

1928, *S.N. (C)*]; SOUTH-EASTERN: Chon Buri [Sattahip, 4 Nov. 1972, *Maxwell 72-584 (BK)*].

Distribution.—Mauritius, Pakistan, Sri Lanka, India, Nepal, Bangladesh, Myanmar, China, Taiwan, Southeast Asia through Australia.

Ecology.—In mixed deciduous, dry dipterocarp, dipterocarp-oak or scrub forest, especially along roadsides, in grass fields, disturbed, degraded, fire-damaged or edge area, open sandy or rocky places, limestone or granitic bedrock, cultivated grounds and often on heavy soils, in sunny places subject to a pronounced dry season; 0–850 m alt. Flowering and fruiting: September to January.

Vernacular.—Non plong (หนอนปล้อง) (General).

Note.—*Alysicarpus bupleurifolius* is characterized by having linear to linear-lanceolate leaflets, calyx outside without hooked hairs, yellow to orangish-yellow or greenish-yellow corolla, persistent calyx which is clearly longer than the first article of fruit and smooth fruit surface.

2. *Alysicarpus rugosus* (Willd.) DC., Prodr. 2: 353. 1825; Miq., Fl. Ind. Bat. 1(1): 233. 1855; Benth., Fl. Austr. 2: 239. 1864; Oliv., Fl. Trop. Afr. 2: 170. 1871; Baker in Hook.f., Fl. Brit. India 2: 159. 1876; Gagnep. in Lecomte, Fl. Indo-Chine. 2: 555. 1920; Craib, Fl. Siam. 1(3): 432. 1928; Meeuwen, Reinwardtia 6: 87. 1961; Backer & Bakh.f., Fl. Java 1: 610. 1963; Verdc., Fl. Trop. E. Afr., Leg. Pap. 1: 495. 1971; Nguyen in Morat, Fl. Cambodge, Laos & Vietnam 23: 132. 1987; Huang & Ohashi in Wu *et al.*, Fl. China 10: 291. 2008.—*Hedysarum rugosum* Willd., Sp. Pl. 3: 1172. 1803. Type: Guinea, *Herb. Willdenow* (holotype B B-W13757-010!). Fig. 2.

—*Alysicarpus wallichii* Wight & Arn., Prodr.: 234. 1834; Craib, Fl. Siam. 1(3): 432. 1928. Type: India, *Wallich Numer. List. 5761f* (lectotype K-W K001122048!, selected here).

Perennial herb 0.4–1 m tall. *Stems* erect, branched, glabrous or with straight hairs. *Leaves*: petioles 2–10 mm long, glabrous or with straight hairs; stipules triangular, 4–16 by 2–2.5 mm, scarious, striate with parallel-veins, persistent; leaflets oblong, oblong-obovate, oblong-oblancoelate, linear-lanceolate, or rarely broadly ovate to orbicular, subcoriaceous, 1–5 by 0.2–2.5 cm, apex acute, acuminate or obtuse, apiculate, base rounded or cordate, margins entire with appressed straight hairs;

adaxial surface glabrous; abaxial surface covered with pilose or slightly straight hairs especially on veins; lateral veins 6–8 pairs; petiioles 0.5–1 mm long with straight hairs; stipels triangular or rounded 0.5–1.5 mm long. *Pseudoraceme* terminal or axillary, 2–12 cm long, covered with hooked hairs; peduncle 1–4.7 cm long; flowers 10–24-flowered, densely arranged; bracts ovate to triangular, 1.5–5 by 0.5–3 mm, caducous; pedicels 2–4 mm long with hooked hairs; bracteoles early caducous. *Calyx* light green, 7–10 mm long; tube 1–2 mm long; lobes imbricate, dorsal lobe lanceolate to ovate, 6–9 mm, apex bifid, other lobes lanceolate to triangular, 7–8 mm, apex acute or acuminate, margins with long straight hairs, ca 1 mm long, outside with sparse hooked hairs, inside glabrous. *Corolla* white to pale yellow, orangish-yellow or pinkish-white, glabrous; standard obovate 4.5–5 by 2–3 mm long, apex retuse, base attenuate, claw 0.7–1 mm; wings oblong, 4–5 by 0.8–1, apex obtuse, base attenuate, claw 0.5–1 mm long; keel boat-shaped, 4.5–5 by 0.8–1.5 mm, incurved, apex obtuse, base attenuate, claw 1–1.5 mm long. *Stamens* 4.5–5.5 mm long, staminal tube

4–5 mm long, free part of filaments ca 0.5 mm long, anthers yellow, oblong, 0.3–0.4 mm long. *Ovary* narrowly oblong, 1–2 mm long, glabrous or with sparsely hooked hairs at upper part; ovules 2–6; style 4 mm long, incurved at right angle. *Pods* narrowly oblong, 6–9 by 0.2–0.3 cm, covered with hooked hairs, laterally flattened, included or slightly exerted from persistent calyx, constricted between articles; articles 2–6, quadrangular, 2.5–3 by 2–3 mm, surface with prominently and transversely ridged veins; persistent calyx longer than first article of pod. *Seeds* cubic to ellipsoid, 0.9–1.5 by 1–1.2 mm, brown.

Thailand.— NORTHERN: Chiang Mai [Bo Luang-Bo Kaw, 23 Nov. 2005, *Sawai* 996 (KKU); Chiang Kham, 26 Dec. 1967, *Prayad* 1152 (BK); Doi Sutep, 13 Nov. 1922, *Kerr* 6673 (ABD, BK, BM, K); Doi Inthanon, 4 Oct. 1971, *Murata et al.* T-15772 (BKF); Mae Cham, 7 Dec. 1998, *Maxwell* 98-1432 (BKF, CMUB); Mae Rim, 21 Nov. 1996, *BGO. staff* 7855 (QBG)]; Lampang [Chae Son NP, 29 Oct. 1995, *Banoc* 29 (BKF, CMUB)]; Tak [Doi Din Gi, 9 Nov. 1988, *Paisooksantivatana* Y2290-88



Figure 2. *Alysicarpus rugosus* (Willd.) DC.: A. habit (Smitinand 4894); B. dried fruit with persistent calyx (BGO. staff 7855); C. fruit surface showing transversely ridged veins (BGO. staff 7855). Photo by J. Sattaphorn.

(BK); Doi Musoe, 30 Oct. 1962, *Kasem 221* (BK); Mae Sot, 24 Apr. 2004, *Pooma et al. 4654* (BKF), 5 Nov. 2012, *Pooma et al. 7490* (BKF); NORTH-EASTERN: Phetchabun [Lom Sak, 11 Oct. 1979, *Shimizu et al. T-18326* (BKF)]; Loei [Wang Saphung, 21 Nov. 1958, *Smitinand 4894* (BKF, K)]; Nong Khai [Ta Dua, 26 Oct. 1911, *Kerr 2199* (ABD, BM, E, K)]; CENTRAL: Saraburi [Muak Lek, 9 Nov. 1924, *Marcan 1851* (ABD, BK, BM)].

Distribution.—Africa to India, Nepal, Myanmar, China, Taiwan, Laos, Vietnam, Malaysia, Indonesia (Java, Bali) and Australia (Queensland).

Ecology.—In open, degraded or disturbed place in mixed deciduous, dry dipterocarp or dry evergreen forests, often occurring along roadsides, grassy or bamboo fields, sunny places, bound to limestone areas, granitic bedrock or agricultural areas; 300–1800 m alt. Flowering and fruiting: October to December.

Vernacular.—Non plong wai (หนอนปล้องหวาย) (General).

Note.—*Alysicarpus rugosus* differs from the other members of this genus in having pods with strongly transversely ridged veins on the surface. *Alysicarpus wallichii*, a synonym of *A. rugosus*, there was no designation of the holotype, but six specimens; *Wallich Numer. List. 5761f, 5762f, 5763a-c & 5764*, at K-W were listed in the protologue. *Wallich Numer. List. 5761f* is in good condition and therefore it is chosen here as the lectotype.

3. *Alysicarpus vaginalis* (L.) DC., Prodr. 2: 353. 1825; Wight & Arn., Prodr.: 233. 1834; Miq., Fl. Ind. Bat. 1(1): 231. 1855; Oliv., Fl. Trop. Afr. 2: 170. 1871; Baker in Hook.f., Fl. Brit. India 2: 158. 1876; Gagnep. in Lecomte, Fl. Indo-Chine. 2: 556. 1920; Craib, Fl. Siam. 1(3): 432. 1928; Meeuwen, Reinwardtia 6: 87. 1961; Backer & Bakh.f., Fl. Java 1: 610. 1963; Ridl., Fl. Malay Penins. 1: 604. 1967; Verdc., Fl. Trop. E. Afr. Leg. Pap. 1: 493. 1971; Huang & Ohashi, Fl. Taiwan 3: 168. 1977; Nguyen in Morat, Fl. Cambodge, Laos & Vietnam 23: 128. 1987; Prain in King, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 66 (2): 132. 1987; Pedley in Dassan. & Clayton, Revis. Handb. Fl. Ceylon 10: 152. 1996 & Austrobaileya 6(1): 115. 2001; Huang & Ohashi in Wu *et al.*, Fl. China 10: 291. 2008.—*Hedysarum vaginale* L., Sp. Pl. 2: 746. 1753; Willd., Sp. Pl.: 354.

1821; Roxb., Fl. Ind. 3: 345. 1832. Type: Sri Lanka, *Herb. Hermann* vol. 1: 27, no. 287 (lectotype BM 000621319), selected by Verdcourt (1997). Fig. 3.

— *A. nummularifolium* auct. non DC.: Craib, Fl. Siam. 1(3): 432. 1928.

Perennial herb, ascending or often prostrate, usually up to 60 cm tall. *Stems* robust, simple or copiously branched from the base, glabrous or with hooked hairs and patent straight hairs, rarely with appressed straight hairs. *Leaves*: petioles 2.5–15 mm long, grooved, glabrous or with sparsely straight hairs; stipules lanceolate-triangular, scarious or subcoriaceous, 1.3–15 by 1–4 mm, acuminate, with parallel veins, persistent; leaflets ovate-oblong, oblong-obovate or oblong-lanceolate to lanceolate on upper stem, nearly orbicular or ovate on lower stem, chartaceous to coriaceous, 0.5–6.5 by 0.2–2.5 cm, apex acute or rounded, apiculate, base cordate, subcordate or obtuse, margins entire with appressed straight hairs; adaxial surface glabrous; abaxial surface with appressed straight hairs or hooked hairs, sometimes only on veins; lateral vein 6–15 pairs; venation reticulate; petiolules 0.3–3 mm long with straight hairs; stipels triangular or rounded, 1–2 by ca 0.4 mm, scarious, glabrous or hairy. *Pseudoraceme* terminal or axillary, 1.5–7 cm long, with sparse or dense hooked hairs; internodes 2–5(–9) mm long; peduncle 1.2–2.3 cm long; flowers 6–13-flowered, laxly to densely arranged; bracts ovate to lanceolate, 2–4 by 0.5–1 mm, acuminate at apex, scarious or subcoriaceous with parallel veins, persistent; pedicels 1–4 mm long with hooked hairs; bracteoles linear-triangular 1.6–1.8 by 0.1–0.2 mm. *Calyx* green to yellowish-green, sometimes with pink at upper part, 4–6 mm long; tube 1–2.5 mm long; lobes valvate, dorsal lobe triangular to lanceolate, 1.5–4 mm long, apex slightly bifid to long bifid, other lobes triangular or lanceolate, 1.2–1.5 mm long, apex acute or acuminate, outside covered with both straight and hooked hairs, inside glabrous. *Corolla* blue, pink, purple, mauve to red or rarely orangish-yellow, glabrous; standard obovate, 5–7 by 4–5.5 mm, apex retuse, base attenuate, claw 0.4–1.5 mm long; wings oblong, 4–6.5 by 1–1.6 mm, apex obtuse, slightly incurved towards apex, base attenuate, claw 1.5–2 mm long; keel 5–7 by 0.7–1.8 mm, incurved, apex obtuse, base attenuate with dorsal auricle, claw 1.5–2 mm long. *Stamens* 5.5–6.5 mm long, staminal tube 4.5–6 mm long, free part of filaments 0.5–1 mm

long; anthers yellow, oblong to ovate, 0.2–0.3 mm long. *Ovary* oblong, 2–3 mm long, with hooked hairs, stipe 0.4–0.5 mm long; ovules 4–7; style 3.5–4 mm long, incurved at right angle. *Pods* cylindrical, 1–2.5 by 1.1–3 mm, terete, covered with sparsely to densely hooked hairs, acuminate at apex, green when young, becoming black, exserted from persistent calyx, not or slightly constricted between articles; articles 4–7, quadrangular to broadly oblong, 2.3–3.5 mm long, surface obscurely and coarsely reticulate veins; stipe 2–3 mm long; persistent calyx shorter to slightly

longer than first article of pod. *Seeds* oblong-ellipsoid to suboblong, 1–2 by 0.6–2.5 mm, slightly compressed.

Thailand.—NORTHERN: Mae Hong Son [9 Sept. 1974, *Larsen & Larsen* 34278 (**L, P**)]; Chiang Mai [6 Nov. 1910, *Kerr* 1535 (**BM**); Doi Sutep, 14 Nov. 1911, *Kerr* 1535B (**ABD, BM, K**), 4 Nov. 1958, *Sørensen et al.* 6046 (**C**); Chom Thong, 3 Dec. 1991, *Maxwell* 91-1081 (**E**); Samoeng, 3 Oct. 1996, *BGO staff* 7697 (**QBG**); Fang, 22 Feb. 1958, *Sørensen et al.* 1517 (**C, E**); Hot, 23 Sept. 1958, *Sørensen et al.*



Figure 3. *Alysicarpus vaginalis* (L.) DC.: A. habit; B. inflorescence showing purplish pink flowers; C. orangish-yellow flowers; D. young fruits; E. dried fruit with persistent calyx (*Satthaphorn & Leeratiwong* 74); F. fruit surface showing obscurely coarsely reticulate veins (*Satthaphorn & Leeratiwong* 74). Photos: A–B & D–F by J. Satthaphorn and C by C. Leeratiwong.

5196 (**BKF, C**); San Pa Tong, 16 Mar. 1981, *Hawnjahn 45 (CMUB)*; Ban An, *S.N. (K)*; Phayao [Kwan Phayao, 2 Jul. 1994, *BGO staff 1061 (QBG)*]; Lamphun [Doi Khun Tan NP, 30 Oct. 1994, *Maxwell 94-1152 (BKF, CMUB)*]; Pa Sang, 12 Oct. 1996, *BGO staff 7728 (QBG)*]; Lampang [Thoen, 8 Nov. 2010, *Pooma et al. 7646 (AAU, BKF)*]; Mae Tha, 15 Jan. 2012, *Maxwell 12-29 (CMUB, QBG)*]; Tak [Mae Sot, 25 Nov. 1995, *Pooma & Maxwell 1294 (BKF, CMUB)*]; 25 Aug. 1996, *BGO staff 223 (QBG)*]; Sukhothai [Thung Saliam, 18 Nov. 2015, *Maknoi 8421 (QBG)*]; Phitsanulok [Ban Rom Klao, 17 Nov. 2009, *Norsaengsri & Intamusik 6088 (QBG)*]; Chat Trakan; Pha Mo I Daeng, 31 Jan. 2012, *Maknoi 4530 (QBG)*]; Nakhon Sawan [23 Sept. 1971, *Murata et al. T-14824 (BKF)*]; NORTH-EASTERN: Phetchabun [Lom Sak, 4 Nov. 1966, *Prayad 515 (BK)*]; Nam Nao NP, 19 Aug. 2004, *Sawai 646 (KKU)*]; Loei [Huai Nam Phak, 1 Sept. 2008, *Maknoi 2729 (BKF)*]; Nong Khai [Tha Bo, 17 Dec. 2015, *Muangyen et al. 552 (QBG)*]; Sakon Nakhon [Nam Pung Dam, 17 Oct. 1990, *Chantaranothai & Parnell 90/870 (K, KKU)*]; Phu Phan NP, 1 Nov. 1998, *Leeratiwong 98-31 (KKU)*, 15 Nov. 1999, *Leeratiwong 99-66 (KKU)*]; Kalasin [Ban Non Buri, 11 Nov. 2014, *Kertsawang 3389 (QBG)*]; Khon Kaen [30 Oct. 1973, *Boonkerd 52 (KKU)*]; More Din Daeng, 13 Aug. 1975, *Hormchurn 101 (KKU)*; **KKU** campus, 10 Nov. 2001, *Namdaeng 49 (KKU)*; 12 Nov. 1976, *BR s.n. (KKU)*, 12 Aug. 1985, *Thaownonggiw s.n. (KKU)*]; EASTERN: Chaiphaphum [Ban Lad, 11 Oct. 1965, *Sithisan 500 (BK)*, *Sutheesorn 590 (BK)*]; Nakhon Ratchasima [Khao Yai NP, 20 Jul. 1973, *Murata et al. T-16512 (BKF, K)*]; Pak Thong Chai, *Charoenphol et al. 4534 (BKF, L, K, KYO, P)*, 2 Sept. 1948, *Prapat 176 (BKF)*]; Buri Ram [Khao Phanom Rung, 3 Oct. 1984, *Murata et al. T-37246 (BKF, L)*, 3 Oct. 1984, *Murata et al. T-37268 (BKF)*]; SOUTH-WESTERN: Kanchanaburi [Ban Sadao, 2 Nov. 1979, *Shimizu et al. T-21374 (BKF)*]; Hui Dok, 26 Nov. 1957, *Smitinand 3867 (BKF)*; Salak Phra WS, 28 Nov. 1971, *Beusekom et al. 3996 (BKF, C, K, KYO, P)*; Don Slab, 15 Oct. 2014, *Tanning 650 (QBG)*; 3 Sept. 1926, *Tikyu s.n. (BKF)*]; Ratchaburi [29 Nov. 1970, *Maxwell 70-97 (BK)*]; Prachuap Khiri Khan [Klong Wan, 21 Nov. 1964, *Chermisrivathana 129 (BK)*]; CENTRAL: Sing Buri [12 Dec. 1952, *Saisithi 3 (BCU)*]; Lop Buri [20 Oct. 1984, *Murata et al. T-38224 (BKF)*]; Ang Thong [25 Dec. 1828, *Put 2555 (BK, BM, C, E, K,*

P)]; Saraburi [Praputtachay NP, 24 Oct. 2004, *Petrmitr 580 (BKF, CMUB)*]; Pathum Thani [12 Mar. 1958, *Smitinand 438 (K)*]; Bangkok [26 Nov. 1918, *Kerr s.n. (BM)*, 6 Oct. 1919, *Kerr 3805 (K)*, 1 Jan. 1923, *Kerr s.n. (BM)*, 8 Aug. 1928, *Kerr s.n. (BM, BK)*, 26 Nov. 1928, *Kerr s.n. (K)*]; Bang Khen, 12 Nov. 1954, *Boonbrahm 11 (BK)*, 3 Nov. 1982, *Paisooksantivatana 1184-82 (BK)*; Chulalongkorn University, 22 Oct. 1954, *Boonkong 19 (BCU)*; Phra Khanong, 3 Aug. 1961, *Pantuwatana 52 (BCU)*; 7 Mar. 1958, *Sørensen et al. 1990 (C, P)*; 12 Mar. 1958, *Sørensen et al. 2065 (C)*; 29 Oct. 1922, *Marcan 1039 (ABD, BM, C)*, 13 Nov. 1927, *Kerr 13525 (BK, BM, K)*, 8 Oct. 1928, *Kerr s.n. (BK)*, 26 Nov. 1928, *Kerr s.n. (BK)*, *Smith 206 (BK)*, Nov. 1931, *Smith 183 (BK)*, 10 Oct. 1958, *Smitinand 5402 (BKF)*, 12 Mar. 1958, *Smitinand 4439 (BKF)*, 13 Mar. 1958, *Smitinand 4438 (BKF)* 12 Mar. 1958, *Sørensen et al. 2065 (BKF)*]; SOUTH-EASTERN: Sa Kaeo [Aranyaprathet, 14 Sep. 1930, *Put 3114 (BK, BM, C, K, P)*]; Prachin Buri [Khao Yai NP, 13 Jul. 1966, *Larsen et al. 372 (BKF, C, P)*]; Chon Buri [Ang Sila, 5 Sept. 1958, *Wisessan 9 (BCU)*; Si Racha, 5 Sept. 1958, *Tosumtara 7 (BCU)*; 16 Nov. 1926, *Put 478 (ABD, BK, BM, E, K)*; Rayong [30 Aug. 1969, *Maxwell s.n. (E, L)*; Phae Arboratum, 23 Nov. 1979, *Shimizu et al. T-23327 (BKF)*; Phak Chong, *Wessumritt & Norsaengsri 9 (QBG)*, 23 Oct. 2007, *Wessumritt 28 (QBG)*; 19 Nov. 1987, *Smitinand s.n. (BKF)*]; Chanthaburi [Khao Soi Dao, 21 Mar. 2011, *Pruesapan KP-2011-36 (BK)*]; PENINSULAR: Phuket [Kamala beach, 8 Jul. 1979, *Niyomdham 233 (BKF, C)*]; Trang [Khao Chong, 15 Jan. 2003, *Chantaranothai s.n. (KKU)*]; Songkhla [Hatyai, 8 Sept. 1991, *Tuntibunpakul 4 (PSU)*; Kao Seng, 20 Sept., *Kumlungdee 15 (C)*; Muang, 28 Aug. 1995, *Heedkeaw 8 (PSU)*, 19 Sept. 1997, *Pulsak 13 (PSU)*; Prince of Songkla University, 4 May 1986, *Maxwell 86-278 (BKF, CMU, PSU)*; Rattaphum, 15 Oct. 2012, *Jamnongjit 52 (PSU)*; Satengpra, 18 Dec. 1983, *Siriruga 729 (PSU)*].

Distribution.— Tropics to subtropics of the Old World, introduced in tropical America and Australia.

Ecology.— Weedy on waste grounds, roadsides, agricultural areas, grassy fields, disturbed areas, fire-damaged areas, preferring rather dry soil and appearing in natural forest areas; 0–1000 m alt. Flowering and fruiting: throughout the year.

Vernacular.— Khat saek (คัตแซก) (Prachin Buri), thua lisong na (ถั่วลิสงนา) (Bangkok), ya klet hoi yai (หญ้าเกล็ดหอยใหญ่) (Ang Thong), ya plong wai (หญ้าปล้องหวาย) (Chon Buri).

Note.— *Alysicarpus vaginalis* is easily recognized by its valvate calyx lobes, colour of the corolla which are blue, pink, purple, reddish-pink or rarely orangish-yellow, pods without or with slightly constricted between articles and persistent calyx which is shorter to slightly longer than first article of pod.

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