

## Taxonomic study of the genus *Actinodaphne* Nees (Lauraceae) in Thailand

MONTRI TANAROS<sup>1\*</sup>, SRUNYA VAJRODAYA<sup>2</sup> AND KONGKANDA CHAYAMARIT<sup>1</sup>

<sup>1</sup> Queen Sirikit Botanic Garden, The Botanical Garden Organization, Mae Rim, Chiang Mai 50180, Thailand

<sup>2</sup> Department of Botany, Faculty of Science, Kasetsart University, Chatuchak, Bangkok 10900, Thailand

**ABSTRACT.** A taxonomic study of the genus *Actinodaphne* Nees in Thailand is presented. Eleven species were enumerated, namely *Actinodaphne amabilis* Kosterm., *A. angustifolia* (Blume) Nees, *A. cupularis* (Hemsl.) Gamble, *A. glomerata* (Blume) Nees, *A. henryi* Gamble, *A. montana* Gamble, *A. omeiensis* (H. Liu) C.K. Allen, *A. perglabra* Kosterm., *A. sesquipedalis* (Wall. ex Kuntze) Hook.f. & Thoms. ex Meisn. var. *cambodiana* Lecomte, *A. sesquipedalis* var. *glabra* Kochummen, *A. sikkimensis* Meisn. and *Actinodaphne* sp.1.

**KEYWORDS:** Taxonomy, *Actinodaphne* Nees, Thailand

### INTRODUCTION

The genus *Actinodaphne* Nees comprises about 100 species (Kostermans, 1957; Rohwer, 1993; van der Werff, 2001), distributed from India and Sri Lanka to Myanmar, Thailand, Indo-China, Korea, Japan, Malaysia and the Solomon Islands. The genus was established by C.G. Nees von Esenbeck

in 1831 based on *A. pruinosa* from peninsular Malaysia. Since then, a total of 150 binomials have been published by various authors (Julia, 2005). The name of the genus *Actinodaphne* come from Greek: *aktinos* means ray and *daphne* means laurel which alluding to the arrangement of leaves in star-shaped whorls (Kochummen, 1989). The reports on *Actinodaphne* in Thailand are as follow: Kostermans (1974) found 2 new species, *i.e.* *A. amabilis* and *A. perglabra*. The Forest Herbarium, (2001) reported

---

\* Corresponding author: pakkiano@hotmail.com

three species of *Actinodaphne*, i.e. *A. angustifolia*, *A. henryi* and *A. montana*.

## MATERIALS AND METHODS

Taxonomic revision of the genus *Actinodaphne* in Thailand was conducted between March 2005 and March 2008. Species diversity, morphological characters, distribution and ecological data were examined and recorded. Field collections and phenological observation were made throughout the country. The herbarium specimens available in Thai herbaria were thoroughly studied and identified by consulting the taxonomic literature and by comparison with photographs of type specimens from Thai and foreign herbaria.

## TAXONOMIC TREATMENT

### ACTINODAPHNE

Nees, Wall., Pl. Asiat. Rar. 2: 61, 68. 1831.— *Iozoste* Nees, Wall., Pl. Asiat. Rar. 2: 61. 1831. Type species.— *Actinodaphne pruinosa* Nees.

*Evergreen*, dioecious, small to medium-sized tree; bole straight to moderately straight, sometimes with small steep buttresses up to 1 m high. *Bark* generally nearly smooth, furrowed or cracking and occasionally lenticillate, outer bark greyish brown to darkish brown or reddish brown, with green or

white patches; inner bark yellowish orange to yellow. *Terminal bud* perulate with imbricate scales, ellipsoid to ovoid, oblong or lanceolate; apex acute, glabrous to tomentose, sometimes covered with large green leaf-like, narrowly elliptic-oblong, elliptic-ovate, narrowly lanceolate-elliptic, glabrous to tomentose sometimes caducous scale; distinct scar of scale just above the whorls of leaves. *Leaves* simple, verticillate or subverticillate, apex acute, acuminate, caudate or cuspidate, base cuneate, attenuate or oblique, margin usually entire; chartaceous or thinly coriaceous to coriaceous, shining green or dull dark green above, glaucous beneath, midrib and secondary veins arching and looping near margin and obscure to slightly distinct or distinct on both surfaces; tertiary veins scalariform or reticulate-scalariform. *Petiole* slender to stout, 0.3–5.5 cm long, glabrous to tomentose. *Inflorescences* axillary or/and borne along twigs between whorls of leaves, fasciculate, cymose, umbellate arranged in raceme or umbellate on short peduncles, 5–8 flowers per umbel; involucre bracts caducous, leaving distinct scars at inflorescence base. *Flower* trimerous, unisexual, usually 0.3–1 cm in diam., greenish white or yellow, fragrant; perianth lobes 6, equal to subequal, imbricate, inner lobes glabrous, outer lobes glabrous to tomentose,

membranaceous, 3–5 veins inside, elliptic, ovate or oblong, apex acute. *Staminate flower*: fertile stamens 9 (–10), arranged in 3 whorls, the first and second whorls eglandular, the third whorl with two glands on each side at base, glands usually globose, cordate or sagittate; filament slender, 0.3–7.2 mm long, longer or shorter than anther, glabrous to hairy; anther elliptic to oblong, apex acute, 0.8–2.5 mm long, 4-locular, introrse. *Pistillate flower*: staminodes 9 (–10), elliptic, spatulate, linear or 3-lobed, 0.5–2 mm long, glabrous to hairy at base; ovary superior, narrowed toward the style, ellipsoid to globose, glabrous to hairy, stigma peltate or 4-lobed, style

slender to stout, 0.5–2 mm long, glabrous to hairy. *Infructescences* each bearing 1–5 fruits. *Fruits* drupe, globose, subglobose or ellipsoid, seated on enlarge perianth tube partly enclosing the fruits, the tube disc-shaped or cup-shaped, 0.3–1 cm in diam., glabrous to puberulous inside, outside hairy, margin entire or undulate; young fruit light to dark green, slightly shining, with white mottles, dark purplish red to black when mature; fruit apex apiculate, persistent or caducous, perianth persistent or caducous, with distinct scar on the perianth tube when fruiting; pedicels slender, thickened, 0.5–1.5 cm long, glabrous to tomentose.

#### KEY TO THE SPECIES

1. Shoot apex with terminal buds covered with large green scales which resemble leaf-like under-sized foliage leaves, glabrous to hairy ..... 2
1. Shoot apex with terminal buds perulate with imbricate scales or not, glabrous to hairy ..... 5
2. Inflorescences cymose, terminal buds glabrous ..... **4. *A. glomerata***
2. Inflorescences umbellate on short peduncles or fasciculate, terminal buds glabrous to tomentose ..... 3
3. Petiole slender, glabrous, 1–2 cm long ..... **11. *Actinodaphne* sp.1**
3. Petiole stout, glabrous or yellowish hairy, 2–5 cm long ..... 4
4. Leaf-like scales of terminal buds narrowly elliptic-oblong, 4–5 cm long; leaf blade narrowly elliptic-oblong to narrowly lanceolate, 22–45 by 3–9 cm; petiole yellowish hairy, 2–4 cm long ..... **9a. *A. sesquipedalis* var. *cambodiana***

4. Leaf-like scales of terminal buds ovate to elliptic, 2–4 cm long; leaf blade elliptic-oblongate, 30–60 by 9–18.5 cm; petiole glabrous, 3.5–5.5 cm long ..... **9b. *A. sesquipedalis* var. *glabra***
5. Inflorescences umbellate; the umbels themselves arranged in a raceme ..... 6
5. Inflorescences umbellate; the umbels on short peduncles or fasciculate ..... 7
6. Petiole slender, glabrous to puberulous, 1–2 cm long; mature perianth tube deeply cup-shaped, margin entire, 3–4 mm in diam., glabrous inside; puberulous outside; bark smooth ..... **6. *A. montana***
6. Petiole stout, puberulous to tomentose, 2–4 cm long; mature perianth tube shallowly cup-shaped, margin entire or undulate, 7–8 mm in diam., puberulous on both sides; bark furrowed ..... **5. *A. henryi***
7. Tertiary veins finely reticulate; leaves subverticillate above, alternate below ..... **8. *A. perglabra***
7. Tertiary veins scalariform or reticulate-scalariform; leaves verticillate or subverticillate ..... 8
8. Fruit ellipsoid ..... **10. *A. sikkimensis***
8. Fruit globose or subglobose ..... 9
9. Inflorescences umbellate on short peduncles ..... 10
9. Inflorescences fasciculate ..... 11
10. Mature perianth tube deeply cup-shaped, 0.5–1 cm in diam.; inflorescence 6–7-flowered; petiole 0.5–1 cm long ..... **3. *A. cupularis***
10. Mature perianth tube shallowly disc-shaped or undulate cup-shaped, 0.5–0.6 cm in diam.; inflorescence 7–8-flowered; petiole 1.6–1.8 cm long ..... **7. *A. omeiensis***
11. Juvenile shoots whitish wooly; inflorescences borne along twigs between whorls of leaves; mature perianth tube shallowly cup-shaped, 7–8 mm in diam. .... **1. *A. amabilis***
11. Juvenile shoots rusty-tomentose; inflorescences axillary or on twigs between whorls of leaves; mature perianth tube small disc-shaped, 4–5 mm in diam. .... **2. *A. angustifolia***

**1. *Actinodaphne amabilis*** Kosterm.      Phota Luang Kao, alt. 1,000 m, February, Nat. Hist. Bull. Siam Soc. 25(3–4): 29.      fr., *Kerr* 16931 (holo K!; iso BM). 1974. Type: Thailand, Ranong, Khao

Small tree, *ca.* 10 m high. *Twigs* slender, juvenile shoots densely white woolly. *Terminal buds* perulate with imbricate scales, elliptic to ovate, 5–6 mm long, tomentose. *Leaves* verticillate of 4–5 leaves; blade elliptic-oblong to narrowly lanceolate, 9.5–19 by 2–3 cm; apex acute to acuminate; base cuneate to attenuate; margin entire; chartaceous, shining green above, densely white woolly when young, glabrous on both surfaces when mature, glaucous beneath; midrib raised on both surfaces, glabrous on both surfaces; secondary veins 6–10 pairs, at an angle of 45°–60° from the midrib, sunken above, raised beneath, arching and looping near margin; tertiary veins scalariform, obscure or slightly distinct on both surfaces. *Petiole* slender, 1–1.5 cm long, puberulous. *Inflorescences* fasciculate, minutely tomentose, 5–7 mm in diam., tomentose, borne along twigs between whorls of leaves, *Staminate flower* not seen. *Pistillate flower*: pedicels 2 mm long, whitish pilose; perianth lobes oblong-elliptic, 2–2.5 by 0.5–1 mm, glabrous inside, velutinous outside; ovary ellipsoid-ovoid, *ca.* 1 by 0.5 mm, glabrous, style stout, *ca.* 1 mm long, pilose at base, stigma peltate; staminodes 9, spatulate, 1 mm long, pilose at base. *Infructescences* each bearing 3–4 fruits. *Fruit* globose, 7–8 mm in diam.; apex apiculate; drying black; mature perianth tube shallowly cup-shaped, 7–8 mm in

diam., puberulous on both sides; pedicels slender, *ca.* 5 mm long, whitish pilose.

Thailand.— NORTH-EASTERN: Loei (Phu Kra Dueng National Park); PENINSULAR: Phangnga (Khao Phota Luang Kao).

Distribution.— Thailand.

Ecology.— Lower montane rainforest, alt. 1,000–1,300 m; flowering: November; fruiting: February.

Vernacular.— Tong Lat Khon Khao (ตองลาดชนขาว).

Note.— Description of this species was referred to Kostermans (1974).

Specimens examined.— *R. Geesink et al.* 7697 (BKF).

**2. *Actinodaphne angustifolia* (Blume)** Nees in Wallich, *Pl. As. Rar.* 3: 31. 1832.— *Litsea angustifolia* Blume, *Bijdr. Fl. Ned. Ind.* 11: 566. 1826. Type: not located. Fig. 1 A.

Small to medium-sized tree, 10–12 m high, dbh 10–15 cm. *Twigs* rough, juvenile shoot rusty-tomentose. *Bark* reddish brown with green patches, lenticels grey, inner bark brownish yellow. *Terminal buds* perulate with imbricate scales, elliptic-ovate, 4–7 mm, glabrous. *Leaves* verticillate of 3–6 leaves; blade elliptic-oblong, 9–25 by 2.3–5 cm; apex acute to acuminate; base cuneate; margin entire; chartaceous, shining green above, yellowish tomentose

when young, glabrous on both surfaces when mature, glaucous beneath; midrib flat or raised above, raised beneath, glabrous on both surfaces, secondary veins 7–10 pairs, at an angle of 50°–60° from the midrib, sunken above, raised beneath, arching and looping near margin, tertiary veins scalariform, obscure or slightly distinct above, distinct beneath. *Petiole* slender, 0.5–1.3 cm long, glabrous to puberulous. *Inflorescences* fasciculate, 1–1.7 cm in diam., axillary or borne along twigs between whorls of leaves. *Staminate flower*: pedicels 2–3 mm long, glabrous to puberulous; perianth lobes ovate-elliptic, 2–2.5 by 1.5–2 mm, glabrous inside, puberulous outside; stamens 9, anther ovate-elliptic, 0.8–1.2 mm long, filament 1–1.2 mm long, sparsely hairy. *Pistillate flower*: not seen. *Infructescences* each bearing 2–3 fruits. *Fruit* subglobose, 7–8 mm in diam.; drying dark red; mature perianth tube small disc-shaped, 4–5 mm in diam., puberulous both inside and outside; pedicels slender, 3–4 mm long, glabrous.

Thailand.— EASTERN: Nakhon Ratchasima (Khao Yai National Park); SOUTH-EASTERN: Rayong (Ban Phe), Chanthaburi (Trok Nong Waterfall Substation, Nam Tok Phlio National Park), Trat (Chang Kluea); PENINSULAR: Ranong (Khao Phota Laung Kaeo), Krabi

(Dan Chumpon), Trang (Khao Chong), Yala (Banang-Sata), Narathiwat (Hala-Bala Wildlife Sanctuary).

*Distribution*.— India, Malay Peninsula, Java.

*Ecology*.— Mixed deciduous and dry evergreen forests, alt. 450–700 m; flowering: November; fruiting: February.

*Vernacular*.— Ka that (กาทัด) (Rayong), Ka thit nu (กาทิดหนู) (Trat), Rom Khao (ร่มเช้า) (Ranong).

*Specimens examined*.— *A.F.G. Kerr* 16372 (BK), 17676 (BK), 18334 (BK); *Put* 2747 (BK, K); *M. Tanaros* 5 (BKF), 8 (BKF), 9 (BKF).

**3. *Actinodaphne cupularis* (Hemsl.)** Gamble in Sargent, Pl. Wilson. 2: 75. 1914.—*Litsea cupularis* Hemsl., J. Linn. Soc. 26: 380. 1891. Type: not located.

Small to medium-sized tree, 3–12 m high. *Twigs* slender, juvenile shoot puberulent. *Terminal buds* perulate with imbricate scales, elliptic to lanceolate, 1.5–2 cm long, puberulous. *Leaves* subverticillate of 5–6 leaves, blade elliptic, 8.5–19 by 2–5 cm; apex acute; base cuneate; margin entire; chartaceous or thinly coriaceous, shining green above, glabrous or puberulent beneath when young, glabrous on both surfaces when mature, glaucous beneath; midrib sunken above, raised beneath, glabrous on both surfaces, secondary veins 6–12 pairs, at

an angle of 45°–60° from the midrib, flat above, raised beneath, arching and looping near margin, tertiary veins scalariform to reticulate, obscure or slightly distinct above, distinct beneath. *Petiole* slender, 0.5–1 cm long, glabrous to puberulous. *Inflorescences* umbellate on short peduncles, 1–1.5 cm in diam., densely tomentose, with 6–7 flowers per umbel, axillary and borne along twigs between whorls of leaves. *Staminate flower*: pedicels 3–4 mm long, yellowish tomentose; perianth lobes elliptic, 2.8–3.5 by 0.5–1.5 mm, glabrous inside, velutinous outside; stamens 9, anther oblong, 1–1.5 mm long, filament 4–5.5 mm long, villous at base. *Pistillate flower*: pedicels 3–4 mm long, yellowish tomentose; perianth lobes elliptic, 2.8–3.5 by 0.5–1.5 mm, glabrous inside, velutinous outside; ovary ovoid, ca. 1 by 0.5 mm, glabrous, style slender 1 mm long, glabrous, stigma peltate; staminodes 9, linear, 1–1.5 mm long, glabrous. *Infructescences* each bearing 1–3 fruits. *Fruit* globose, 1.2–1.4 cm in diam.; apex apiculate; red when mature, drying dark red; mature perianth tube deeply cup-shaped, 0.5–1 cm in diam., glabrous inside, velutinous outside; pedicels slender, 0.7–1.5 cm long, velutinous.

Thailand.— NORTHERN: Chiang Mai (Doi Chiang Dao Wildlife Sanctuary), NORTH-EASTERN: Loei (Phu Kra

Dueng National Park), EASTERN: Nakhon Ratchasima (Khao Laem).

Distribution.— China (Yunnan).

Ecology.— Lower montane rainforest, alt. 1,300–1,500 m; flowering: October–November; fruiting: August–September.

Vernacular.— Tong Lat Doi Chiang Dao (ตองลาดดอยเชียงดาว).

Uses.— Seeds contain oils which are used for making lubricant. The roots and leaves are used as folk medicine for curing ‘Hong Kong foot’, burns and piles.

Specimens examined.— *C.F. Beusekom et al.* 9621 (BKF); *A.F.G. Kerr* 5566 (K), 9947 (K); *T. Smitinand & C. Phengklai* 11567 (BKF); *J.E. Vidal* 5202 (BKF).

**4. *Actinodaphne glomerata* (Blume) Nees, Syst. Laur. 597. 1836.— *Laurus glomerata* Blume, Cat. Gew. Buitenzorg (Blume): 66. 1823 (*in adnot.*). Type: not located.**

Small to medium-sized tree, 10–18 m high. *Twigs* slender, juvenile shoot reddish minutely pubescent. *Bark* smooth, lenticillate, dark grey. *Terminal buds* covered with large green leaf-like scales which resemble under-sized foliage leaves, elliptic-ovate, 1–2.5 cm long, glabrous. *Leaves* verticillate of 4–7 leaves; blade ovate-obovate, 13–28 by 5.5–14 cm; apex cuspidate; base oblique; margin entire; coriaceous, dark green above, reddish minutely pubescent when young, glabrous on both surfaces when

mature, glaucous beneath; midrib raised on both surfaces, glabrous above, minutely pubescent beneath, secondary veins 11–13 pairs, at an angle of 30°–40° from the midrib, raised on both surfaces, arching and looping near margin, tertiary veins scalariform, distinct on both surfaces. *Petiole* slender, 1–2 (–3) cm long, glabrous to pubescent. *Inflorescences* cymose, 1–2 cm in diam., borne along twigs between whorls of leaves, peduncle 5–7 mm long, minutely pubescent. *Staminate flower*: pedicels 3–5 mm long, pubescent; perianth lobes elliptic-ovate, 2.5–3 by 2 mm, glabrous inside, velutinous outside; stamens 9, anther ovate-elliptic, 1–1.3 mm long, filament 0.3–0.5 mm long, yellow reddish villous at base. *Pistillate flower* not seen. *Infructescences* not seen.

Thailand.— PENINSULAR: Ranong.

Distribution.— India, Malay Peninsula, Java, Sumatra.

Ecology.— Tropical to lower montane rainforests, alt. 600–1,000 m; flowering: September.

Vernacular.— Tong Lat Bai Kai Klab (ตองลาดใบไขก๊ลับ).

Specimens examined.— *A. Cuadra* A1309 (BKF); *N. Fukuoka et al.* T-35912 (BKF).

**5. *Actinodaphne henryi*** Gamble, Bull. Misc. Inform., Kew 1913: 265. 1913. Type: not located. Fig. 1 B–E.

Small to medium-sized tree, 10–20 m high, dbh 15–19 cm. *Twigs* thick, glabrous to pubescent or tomentose, juvenile shoot densely yellowish tomentose. *Bark* furrowed, greyish to brownish, inner bark yellowish. *Terminal buds* perulate with imbricate scales, oblong, 2–3.5 cm long, tomentose. *Leaves* subverticillate of 4–6 leaves; blade elliptic-lanceolate, 22–29 (–40) by 5.5–7.5 (–10) cm; apex acute to acuminate; base cuneate or oblique; margin entire; coriaceous, dull dark green above, densely yellowish tomentose when young, glabrous on both surfaces when mature, greyish silvery glaucous beneath; midrib raised on both surfaces, glabrous to puberulous on both surfaces, secondary veins 9–12 pairs, at an angle of 40°–60° from the midrib, raised on both surfaces, arching and looping near margin, tertiary veins scalariform, slightly distinct above, finely distinct beneath. *Petiole* stout, 2–4 cm long, puberulous to tomentose. *Inflorescences* umbellate arranged in raceme, borne along twigs between whorls of leaves, with 5 flowers per umbel, peduncle of each umbel 0.7–1 cm long, pubescent. *Staminate flower*: pedicels 2–2.5 mm long, yellowish tomentose; perianth lobes elliptic, 2–2.5 by 0.8–1 cm, glabrous inside, velutinous outside; stamens 9, anther oblong, 1.3–1.5 mm long, filament 3.5–4 mm long, villous. *Pistillate flower*: pedicels 2–2.5 mm long,

yellowish tomentose; perianth lobes 6, elliptic, 2–2.5 by 0.8–1 cm, glabrous inside, velutinous outside; ovary ellipsoid to ovoid, *ca.* 1 by 0.5 mm, glabrous, style stout, 0.3–0.5 mm long, glabrous, stigma peltate; staminodes 9, spathulate, 1 mm long. *Infructescences* each bearing 1–3 fruits. *Fruit* globose, 0.8–1 cm in diam., young fruit greenish with white dots, red when mature, drying dark red, mature perianth tube shallowly cup-shaped, margin entire or undulate, 7–8 mm in diam., puberulous on both sides; pedicels slender, 5–7 mm long, pubescent.

Thailand.— NORTHERN: Chiang Mai (Doi Suthep-Pui National Park, Doi Inthanon National Park), Chiang Rai (Doi Aung Kha), Nan (Doi Phuaka National Park), Lampang (Chae Son National Park, Doi Khun Tan National Park), Sukhothai (Khao Luang), Phitsanulok (Phu Hin Rong Kla National Park, Thung Salaeng Luang National Park); EASTERN: Nakhon Ratchasima (Khao Laem, Khao Yai National Park); SOUTH-WESTERN: Uthai Thani (Huai Kha Khaeng Wildlife Sanctuary), Kanchanaburi (Tinuang Forest Protection Units, Thung Yai Naresuan Wildlife Sanctuary); SOUTH-EASTERN: Chon Buri (Khao Khiao).

Distribution.— China (Yunnan).

Ecology.— Lower montane forest, alt. 600–1,300 m; flowering: December–February; fruiting: July–August.

Vernacular.— Tong Lat (ตองลาด) (Chiang Mai), Ta thip thong (ต่าตีบทอง) (Nakhon Ratchasima), Saen ta kla yai (แสนตะกาะใหญ่) (Sukhothai).

Uses.— The wood is used for construction, furniture and industrial timber.

Specimens examined.— *K. Iwatsuki* & *N. Fukuoka* T-3967 (BKF); *A.F.G. Kerr* 1643 (K), 5374 (BK), 5931 (BK, BKF); *J.F. Maxwell* 75–1117 (BK), 88–112 (BKF), 93–1557 (BKF), 96–657 (BKF); *Put* 3517 (BK, BKF); *T. Smitinand* 2128 (BKF); *S. Sutheesorn* 1529 (BK); *Th. Sørensen et al.* 3066 (BKF), 3531 (BKF), 6619 (BKF); *M. Tanaros* 3 (BKF), 26 (BKF), 27 (BKF); *P. Thongson* 77 (QBG).

**6. *Actinodaphne montana*** Gamble, Bull. Misc. Inform., Kew 1910: 312. 1910. Type: not located. Fig. 1 F–G.

Medium-sized tree, 15–20 m high, dbh 20–30 cm. *Twigs* slender. *Bark* smooth, lenticillate, greyish brown, inner bark yellowish orange. *Terminal buds* perulate with imbricate scales, elliptic, *ca.* 8 mm, tomentose. *Leaves* verticillate of 4–5 leaves; blade oblanceolate-elliptic, 11–19 by 4.5–6.5 cm; apex acuminate to caudate; base cuneate; margin entire; thinly coriaceous, bluish green above, glabrous on both surfaces, glaucous beneath; midrib raised or flat above, raised beneath, glabrous on both surfaces, secondary veins 7–10 pairs, at an angle

of 40°–50° from the midrib, flat or sunken above, raised beneath, arching and looping near margin, tertiary veins scalariform, obscure or slightly distinct above, finely distinct beneath. *Petiole* slender 1–2 cm long, glabrous to puberulous. *Inflorescences* umbellate arranged in raceme. *Infructescences* each bearing 1–3 fruits, axillary or borne along twigs between whorls of leaves. *Fruit* subglobose, 4–5 mm in diam.; young fruit green with white dots, drying dark red black; mature perianth tube deeply cup-shaped, 3–4 mm in diam., glabrous inside, puberulous outside; pedicels thicken, 0.7–1.5 cm long, puberulous.

Thailand.—PENINSULAR: Nakhon Si Thammarat (Khao Nan), Phatthalung, Yala (Betong), Narathiwat (Bachaow).

Distribution.— Malay Peninsula.

Ecology.— Lower montane rainforest, rarely on lowlands, alt. 600–1,500 m; fruiting: July.

Vernacular.— Mae-dae-si-ka (แมดแดะสีกะ) (Malay-Pattani).

Note.— Description of this species was based on Kochummen (1989).

Specimens examined.— *A.F.G. Kerr* 7206 (BK, K); *M. Tanaros* 10 (BKF), 29 (BKF), 32 (BKF).

**7. *Actinodaphne omeiensis*** (H. Liu) C.K. Allen, *Ann. Missouri Bot. Gard.* 25: 411. 1938.— *A. reticulata* Meisn. var. *omeiensis* H. Liu, *Laur. Chine et Indoch.*:

158. 1932. Type: not located.

Small tree, 3–5 m high. *Twigs* villous when young and becoming glabrous. *Terminal buds* perulate with imbricate scales, elliptic, 1.1–2.2 cm long, glabrous to tomentose. *Leaves* subverticillate of 4–6 leaves, blade oblong to lanceolate, 12–16 (–27) by 2–4 (–6) cm; apex acute to acuminate; base cuneate to oblique; margin entire; thinly coriaceous, shining green above, glabrous on both surfaces, silvery glaucous beneath; midrib raised on both surfaces, secondary veins 9–12 (–15) pairs, at an angle of 55°–60° from the midrib, sunken above, raised beneath, arching and looping near margin, tertiary veins scalariform to indistinct reticulate, obscure on both surfaces. *Petiole* slender, 1.6–1.8 cm long, glabrous. *Inflorescences* umbellate on short peduncles, with 7–8 flowers per umbel. *Staminate flower*: pedicels *ca.* 5 mm long; perianth lobes pubescent outside; stamens 9, filament *ca.* 4 mm long, villous. *Pistillate flower* not seen. *Infructescences* each bearing 1–3 fruits. *Fruit* subglobose, 1.2 cm in diam.; mature perianth tube shallowly disc-shaped or cup-shaped, margin entire or undulate, 5–6 mm in diam., puberulous inside, glabrous to puberulous outside; pedicels thick, 6–7 mm long, glabrous to puberulous.

Thailand.— SOUTH-WESTERN: Prachuap Kiri Khan (Khao Luang).

Distribution.— China.

Ecology.— Lower montane rainforest, alt. 500–1,700 m; flowering: February–March; fruiting: July–September.

Note.— Description of this species was based on Li *et al.* (2008).

Vernacular.— Tong Lat Bai Kahnan (ตองลาดไบขานาน).

Specimens examined.— *A.F.G. Kerr* 10994 (BK), 11011 (BK).

**8. *Actinodaphne perglabra* Kosterm., Nat. Hist. Bull. Siam Soc. 25(3–4): 30. 1974. Type: Thailand, Nakhon Ratchasima, Lat Bua Khao, November, buds, *Put* 4323 (holo K!).**

Tree, glabrous. *Twigs* rough, slender. *Terminal buds* not seen. *Leaves* subverticillate of 4 leaves or alternate, blade oblong-elliptic, 7–13 by 2.3–3.5 cm; apex acute to acuminate; base cuneate; margin entire; chartaceous, green polished above, glabrous on both surfaces, glaucous beneath; midrib raised or flat above, raised beneath, puberulous on both surfaces, secondary veins 6–7 pairs, thread-like, at an angle of 30°–40° from the midrib, raised on both surfaces, slightly distinct, arching and looping near margin, tertiary veins finely reticulate, distinct on both surfaces. *Petiole* slender, 3–5 mm long, glabrous. *Inflorescences* fasciculate or umbellate, peduncle near to internode solitary or short branchlet.

*Staminate flower* not seen. *Pistillate flower*: pedicels 0.3–0.5 mm long; perianth lobes ovate-elliptic, 1–1.5 by 0.5–0.7 mm, glabrous inside, glabrous to pilose outside; ovary ellipsoid, 0.5–1 by 0.3–0.5 mm, glabrous, style thick, 1 mm long, glabrous, stigma peltate; staminode not seen. *Infructescences* not seen.

Thailand.— EASTERN: Nakhon Ratchasima (Lat Bua Khao).

Distribution.— Thailand.

Ecology.— Dry evergreen forest, elevation not known; flowering: November.

Vernacular.— Tong Lat Bai Kliang (ตองลาดไบเกลี้ยง).

Note.— Description of this species was based on Kostermans (1974).

Specimens examined.— *Put* 4308 (K).

**9. *Actinodaphne sesquipedalis* (Wall. ex Kuntze) Hook.f. & Thoms. ex Meisn. in DC., Prodr. 15(1): 216. 1864.— *Luarus sesquipedalis* Wall. ex Kuntze, Rev. Gen. Pl. 2: 570. 1891. Type: not located.**

**a. var. *cambodiana* Lecomte, Nouv. Arch. Mus. Hist. Nat. Paris, sér. V. 5: 93. 1913. Type: Cambodia, *L. Pierre* 627 (holo P). Figs. 1 H–I, 2 A–B.**

Small to medium-sized tree, 10–20 m high, dbh 8–15 m. *Twigs* thick, glabrous to puberulous, juvenile shoot yellowish hairy. *Bark* smooth, dark

brown to black, inner bark orange to yellowish, buttress root *ca.* 1 m. *Terminal buds* covered with large green leaf-like scales which resemble under-sized foliage leaves, narrowly elliptic-oblong, 4–5 cm, glabrous to puberulous. *Leaves* subverticillate of 6–10 leaves; blade narrowly elliptic-oblong to narrowly lanceolate, 22–45 by 3–9 cm; apex acute; base cuneate; margin entire; coriaceous, shining green above, yellowish velutinous when young, glabrous on both surfaces when mature, glaucous beneath; midrib thick, raised on both surfaces, puberulous on both surfaces, secondary veins 9–12 pairs, at an angle of 35°–40° from the midrib, raised on both surfaces, arching and looping near margin, tertiary veins scalariform, slightly distinct above, distinct beneath. *Petiole* stout, 2–4 cm long, yellowish hairy. *Inflorescences* umbellate on short peduncles, 2–2.5 cm in diam., borne along twigs between whorls of leaves, peduncle 7–8 mm long, densely tomentose. *Staminate flower*: pedicels 3 mm long, tomentose; perianth lobes elliptic to ovate, 5–6 by 3–3.5 mm, glabrous inside, tomentose outside; stamens 9, anther oblong, 2–2.5 mm long, filament 7–7.2 mm, villous at middle. *Pistillate flower*: pedicels 3 mm long, tomentose; perianth lobes elliptic to ovate, 5–6 by 3–3.5 mm, glabrous inside, tomentose outside; ovary ovoid, *ca.* 1 by 1 mm, densely hairy, style stout, 0.2–0.3

mm long, densely hairy, stigma peltate; staminodes 9, elliptic to spatulate, 1–1.5 mm long, yellowish hairy at base. *Infructescences* each bearing 2–4 fruits. *Fruit* globose, 1.5–2 cm in diam.; apex apiculate; young fruit green with white dots, mature fruit dark purple to black; mature perianth tube shallowly cup-shaped, 1 cm in diam., velutinous inside; glabrous outside; pedicels thick, 3–5 mm long, tomentose.

Thailand.— SOUTH-EASTERN: Chanthaburi (Chang Sae Waterfall Ranger Station), Trat (Mu Ko Chang National Park).

Distribution.— Cambodia.

Ecology.— Tropical rainforest to dry evergreen forest, alt. 100–400 m; flowering: June–July; fruiting: January–April.

Vernacular.— Tong Lat Bai Yao (ตองลาดไผ่ขาว).

Specimens examined.— *A.F.G. Kerr* 17766 (BKF); *M. Tanaros* 1 (BKF), 2 (BKF), 22 (BKF).

**b. var. *glabra*** Kochummen, Gard. Bull. Singapore 43: 23. 1992. Type: not located. Fig. 2 C–E.

Small to medium-sized tree, 10–12 m high, dbh 10–15 cm. *Twigs* thick, glabrous to pubescent, juvenile shoot yellowish pubescent. *Bark* smooth, dark brown or black, inner bark yellowish.

*Terminal buds* covered with large green leaf-like scales which resemble under-sized foliage leaves, ovate to elliptic, 2–4 cm, glabrous to pubescent. *Leaves* subverticillate of 5–8 leaves; blade elliptic-oblongate, 30–60 by 9–18.5 cm; apex cuspidate; base cuneate to oblique; margin entire; coriaceous, shining green above, glabrous to yellowish pubescent when young, glabrous on both surfaces when mature, glaucous beneath; midrib thick, raised on both surfaces, glabrous on both surfaces, secondary veins 12–16 pairs, at an angle of 40°–60° from the midrib, raised on both surfaces, arching and looping near margin, tertiary veins scalariform, slightly distinct above, distinct beneath. *Petiole* stout, 3.5–5.5 cm long, glabrous. *Inflorescences* fasciculate, 0.8–1 cm in diam., borne along twigs between whorls of leaves. *Staminate flower* not seen. *Pistillate flower*: pedicels 0.5–1 mm long, tomentose; perianth lobes 6, ovate, 2.6–2.8 by 2–2.5 mm, glabrous inside, tomentose outside; ovary ovoid, ca. 0.6 by 0.6 mm, glabrous, style stout, 0.5 mm long, glabrous, stigma peltate, 4-lobed; staminodes 9, elliptic to spatulate, 0.5–0.7 mm long, pilose at base. *Infructescences* each bearing 1–3 fruits. *Fruit* globose, 1–1.2 cm in diam.; apex apiculate; young fruit green with white dots, mature fruit dark purple to black; mature perianth tube shallowly cup-shaped, 7–8 mm in diam., glabrous

on both sides; pedicels thick 4–5 mm long, glabrous.

Thailand.—PENINSULAR: Ranong (Khao Phota Luang Kaeo), Trang (Khao Chong), Yala (Banang-Sta), Narathiwat (Hala-Bala Wildlife Sanctuary).

Distribution.—Malay Peninsula.

Ecology.—Tropical rainforest to dry evergreen forest, alt. 100–400 m; flowering: June–July; fruiting: July–August.

Vernacular.—Kan Rom (กำรรม) (Narathiwat).

Specimens examined.—*A.F.G. Kerr* 7327 (BKF); *K. Larsen & S.S. Larsen* 33591 (BKF); *B. Nimanong & S.P.* 1625 (BKF); *S. Phusomsaeng et al.* 1528 (BKF); *T. Santisuk* 1185 (BKF); *M. Tanaros* 16 (BKF).

**10. *Actinodaphne sikkimensis* Meisn.** in DC., Prodr. 15(1): 213. 1864. Type: not located. Fig. 2 F–H.

Small to medium-sized tree, 6–20 m high, dbh 20–30 cm. *Twigs* slender, juvenile shoot pubescent. *Bark* grey to brown, cracking, inner bark yellowish brown. *Terminal buds* perulate with imbricate scales, elliptic-oblongate, 0.8–1 cm long, velutinous. *Leaves* subverticillate of 4–6 leaves; blade lanceolate-elliptic, 10–14 by 2–4 cm; apex acuminate to caudate; base cuneate; margin entire; chartaceous, greenish and

almost shining above, velutinous when young, glabrous on both surfaces sometimes puberulous beneath when mature, glaucous beneath; midrib sunken above, raised beneath, puberulous on both surfaces, secondary veins 8–12 pairs, at an angle of 30°–50° from the midrib, raised on both surfaces, arching and looping near margin, tertiary veins reticulate-scalariform, slightly distinct above, distinct beneath. *Petiole* slender, 0.5–1 cm long, puberulous. *Inflorescences* fasciculate, 0.6–1.2 cm in diam., axillary or borne along twigs between whorls of leaves. *Staminate flower*: pedicels 3 mm long, velutinous; perianth lobes elliptic-oblong, 3–3.2 by 1–1.2 mm, glabrous inside, velutinous outside, stamens 9 (–10), anther oblong, 2 mm long, filament 4 mm long, villous. *Pistillate flower*: pedicels 3 mm long, velutinous; perianth lobes elliptic-oblong, 3–3.2 by 1–1.2 mm, glabrous inside, velutinous outside; ovary ovoid, ca. 1 by 1 mm, glabrous, style slender, 0.5–1 mm long, glabrous, stigma peltate; staminodes 9 (–10), 3-lobed, 2 mm long, glabrous. *Infructescences* each bearing 1–5 fruits. *Fruit* ellipsoid, 7–8 mm in diam.; apex apiculate; young fruits green, mature fruits red, drying black; mature perianth tube shallowly cup-shaped, 7–8 mm in diam., glabrous on both sides; pedicels thick, 0.7–1.5 cm long, puberulous.

Thailand.— NORTHERN: Nan (Doi Phuoka National Park), Phitsanulok (Phu Hin Rong Kla National Park); NORTH-EASTERN: Loei (Phu Luang Wildlife Sanctuary, Phu Kra Dueng National Park).

Distribution.— India (Sikkim).

Ecology.— Lower montane forest, near streamside, alt. 1,000–1,400 m; flowering: November–January; fruiting: March–July.

Vernacular.— Tong Lat Sikkim (ตองลาดสีกขิม).

Specimens examined.— *L.B., E.C. Abbe & T. Smitinand* 9428 (BKF, K); *P. Srisanga et al.* 2278 (QBG); *M. Tanaros* 7 (BKF), 18 (BKF), 20 (BKF), 31 (BKF).

### 11. *Actinodaphne* sp.1. Fig. 2 I.

Medium-sized tree, ca. 18 m high, dbh 30 cm. *Twigs* slender, juvenile shoots densely pale brown tomentose. *Terminal buds* covered with large green leaf-like scales which resemble under-sized foliage leaves, narrowly lanceolate to narrowly elliptic, 0.7–1.3 cm, tomentose. *Leaves* subverticillate of 5–7 leaves, blade lanceolate-elliptic to oblanceolate, 10–16.5 by 3.5–5 cm; apex acute; base cuneate-oblique; margin entire; thinly coriaceous, shining green above, puberulous beneath when young, glabrous on both surfaces when mature, glaucous beneath, midrib raised above, sunken beneath, glabrous on both surfaces, secondary veins 6–10 pairs, at an angle

of 50°–60° from the midrib, sunken above, arching and looping near margin, tertiary veins reticulate-scalariform, obscure or slightly distinct on both surfaces. *Petiole* slender, 1–2 cm long, glabrous. *Inflorescences* umbellate on short peduncles, borne along twigs between whorls of leaves, peduncle 5–7 mm long, velutinous. *Staminate flower* not seen. *Pistillate flower*: pedicels 3–4 mm long, velutinous, perianth lobes elliptic, 2.5–3 by 1.5–2 cm, glabrous inside, velutinous outside, ovary ovoid, *ca.* 1 by 1 mm, villous, style thick, 0.5–1 mm long, villous, stigma peltate, 4-lobed; staminodes 9, spatulate, 1–1.3 mm long, glabrous to pilose at base. *Infructescences* each bearing 1–3 fruits. *Fruit* globose, 2 mm in diam., young fruit green, mature fruit red; mature perianth tube deeply cup-shaped, 3 mm in diam., glabrous inside, pubescent outside; pedicels slender, 5–7 mm long, velutinous.

Thailand.— PENINSULAR: Krabi (Khao Phanom Benja National Park).

Distribution.— Thailand.

Ecology.— Lower montane rainforest, alt. 500–900 m; flowering: April; fruiting: June.

Vernacular.— Tong Lat Phanom Benja (ตองลาดพนมเบญจา).

Note.—*Actinodaphne* sp. cannot be placed within any existing species due a lack of data and incomplete specimens.

It is found at Khao Phanom Bencha National Park, Krabi Province. It has a unique characteristic, which do not match any descriptions of existing species. Further studies are needed and this species might be a new species to science.

Specimen examined.— *M. Tanaros* 21(BKF).

### ACKNOWLEDGEMENTS

Our fieldwork was supported by TRF/BIOTEC Special Program for Biodiversity and Training grants BRT R\_146008 (Study on Thai Lauraceae: Taxonomy Distribution and Economic Uses headed by Dr. Kongkanda Chayamarit).

### REFERENCES

- Julia, S. 2005. A synopsis of the genus *Actinodaphne* Nees (Lauraceae) in Sabah and Sarawak, Malaysia. **Gardens' Bulletin Singapore** 57: 69–100.
- Kochummen, K.M. 1989. Lauraceae. In: **Tree Flora of Malaya**. F.P.S. Ng (Ed.), Vol. 4, pp. 98–178. Longman, Kuala Lumpur.
- Kostermans, A.J.G.H. 1957. Lauraceae. **Communication (Pengumuman) of the Forest Research Institute** 57: 1–64.
- \_\_\_\_\_. 1974. New species and combination of Lauraceae from Thailand. **Natural History Bulletin of the Siam Society** 25: 29–44.
- Li, S., Li, X.-W., Li, J., Huang, P., Wei, F.-N., Cui, H. & van der Werff, H. 2008. Lauraceae. In: **Flora of China**. Z. Y. Wu, P. H. Raven

& D. Y. Hong (Eds.), Vol. 7, p. 163. Science Press, Beijing and Missouri Botanical Garden Press, St. Louis.

Rohwer, J.G. 1993. Lauraceae. In: **The Families and Genera of Vascular Plants**. K. Kubitzki (Ed.), Vol. 2, p. 388. Springer, Heidelberg.

The Forest Herbarium, Royal Forest Department. 2001. **Thai Plant Names Tem Smitinand**, Revised Edition. Prachachon Co. Ltd., Bangkok.

van der Werff, H. 2001. An annotated key to the genera of Lauraceae in the Flora Malesiana Region. **Blumea** 46: 152–140.



**FIGURE 1.** A. *Actinodaphne angustifolia*, B.–E. *A. henryi*, F.–G. *A. montana*, H.–I. *A. sesquipedalis* var. *cambodiana*.



FIGURE 2. A.–B. *Actinodaphne sesquipedalis* var. *cambodiana*, C.–E. *A. sesquipedalis* var. *glabra*, F.–H. *A. sikkimensis*, I. *Actinodaphne* sp.1.