Ann. Bot. Fennici 52: 289–295 ISSN 0003-3847 (print) ISSN 1797-2442 (online)
Helsinki 22 June 2015

Camellia sonthaiensis (Theaceae), a new species from Vietnam

Hong Truong Luu[1,*], Van Dung Luong[2], Quoc Dat Nguyen[1] & Tran Quoc Trung Nguyen[1]

[1)] *Southern Institute of Ecology, Vietnam Academy of Science and Technology, 1 Mac Dinh Chi, District 1, Ho Chi Minh City, Vietnam (*corresponding author's email: hongtruongluu@gmail.com)*
[2)] *Dalat University, 1 Phu Dong Thien Vuong Street, Da Lat City, Lam Dong Province, Vietnam*

Received 2 Jan. 2015, final version received 6 Mar. 2015, accepted 6 Mar. 2015

Luu H.T., Luong V.D., Nguyen Q.D. & Nguyen T.Q.T. 2015: *Camellia sonthaiensis* (Theaceae), a new species from Vietnam. — *Ann. Bot. Fennici* 52: 289–295.

Camellia sonthaiensis Luu, Luong, Q.D. Nguyen & T.Q.T. Nguyen (Theaceae) is described and illustrated as a new yellow-flowered species from southern Vietnam. It is morphologically compared with close species in *Camellia* sections *Archaecamellia*, *Bidoupia*, *Capitata*, *Chrysantha*, *Dalatia*, *Oboidea* and *Piquetia*. Morphological data provisionally supports its placement in *Camellia* sect. *Piquetia*.

During a field trip in 2012 to survey the local flora in Son Thai Commune (Khanh Vinh District, Khanh Hoa Province, Vietnam) we discovered a population of a distinctive *Camellia* species with arching stems, purple twigs, and long and narrowly-lanceolate leaves. In April 2013, we collected flowering specimens from the same population. The morphological characters indicated that those specimens did not represent any known *Camellia* species.

Camellia sonthaiensis Luu, Luong, Q.D. Nguyen & T.Q.T. Nguyen, *sp. nova* (Fig. 1)

TYPE: Vietnam. Khanh Hoa Province: Khanh Vinh District, Son Thai Commune, 108°44′46′′E and 12°13′09′′N, at ca. 900 m a.s.l., 14 April 2013, *Luong Van Dung*, DL 13.04.01 (holotype DLU; isotypes DLU, SGN), DL 13.04.02 to DL 13.04.04 (paratypes DLU, SGN).

ETYMOLOGY: Named after the type location, Son Thai Commune.

Shrub 2–5 m high, evergreen, with an arching stem, sparsely branched, branches slender; new shoots purple, shiny, glabrous; young branches purple, glabrous, shiny, flexuous; mature branches light brown, with longitudinally fissured bark. Leaves pendulous, glabrous, narrowly lanceolate, obtuse at base, acuminate at apex, with shallowly toothed, undulate margin; young leaves purple, shiny; mature leaves coriaceous, shiny on both sides, adaxially light green, abaxially pale green, (10)17–30 cm long, (1.8)4–5.6 cm wide; midrib prominent on both sides; secondary venation brochidodromous, with 13–18 pairs of arched veins, adaxially slightly raised, abaxially prominent; tertiary venation adaxially distinct, abaxially indistinct; leaf petioles purple and straight when young, light green and falcate when mature, partially obstructed by leaf lamina on adaxial side, adaxially channelled, glabrous, 1–1.2 cm long, 2.5–3.0 mm wide, thick, angle of attachment variable: between 30° and 90°. Flowers pedunculate, 1–3, borne on a short bracteate shoot in axils of old leaves; short shoots ca. 2 mm long,

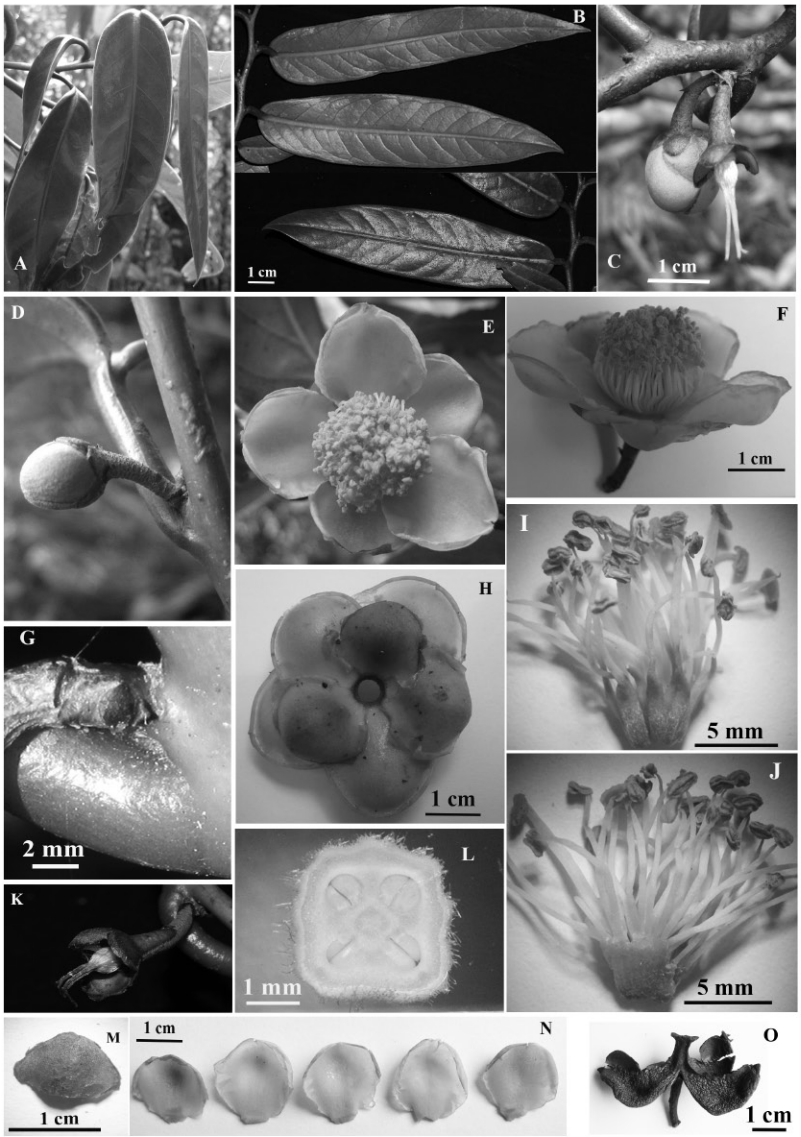

Fig. 1. *Camellia sonthaiensis*. — **A**: Young twig. — **B**: Leaves. — **C**: Flowering shoot. — **D**: Flower bud. — **E**: Open flower. — **F**: Flower, side view. — **G**: Bracts. — **H**: Arrangement of petals. — **I**: Inner stamens. — **J**: Outer stamens. — **K**: Gynoecium. — **L**: Ovary, cross-section. — **M**: Sepal. — **N**: Petals. — **O**: Open capsule.

bracts (*sensu* Sealy 1958) 3–4, triangular or ovate, concave, compacted, subtending flower, 1.5 mm long × 1.5 mm wide, glabrous; flower buds ovate, ferruginous; open flowers evenly circular, ca. 5 cm in diameter; pedicels stout, brownish green or brown, shiny or crackled and corky, 12–15 mm long, 2 mm wide at proximal end, 3 mm wide at distal end; bracteoles (*sensu* Sealy 1958) 2–3, triangular, appressed to and scattered along pedicel, hairy on outer surface, ca. 2 mm long, 1 mm wide, distinctly differentiated from sepals; sepals 5, persistent, ovate, concave, coriaceous, finely hairy on outer surface, with translucent margin, 6–12 mm long, 10–19 mm wide, centrally green, marginally light yellow, arranged in 2 whorls forming a rather loose spiral, outer whorl of 2 sepals and inner whorl of 3 sepals; petals 7, finely hairy on outer surface, with translucent margin, concave, 14–16 mm long, 16–18 mm wide, arranged in 3 whorls; outer whorl distinct with 3 petals, petals centrally green, distally light yellow; middle and inner whorls of 2 petals each, petals yellow, with revolute margins; stamens numerous, arranged

in 3 whorls; filaments ca. 260, lightly yellow, 13–18 mm long, basally united to each other for 3 mm, free above union, inner filaments basally sparsely hairy, outer filaments glabrous, basally united to petals for 3–5 mm, free above union; anthers yellow, 2 mm long, 1 mm wide, with two longitudinal striations, dorsifixed; styles 4 (sometimes 3), free, basally densely hairy, 9–10 mm long, 1 mm wide at base, 0.5 mm at apex, yellowish green, stigma indistinct; ovary superior, ovoidal terminating into (3)4 styles, slight longitudinal striations, yellow, finely white hairy, 4 (sometimes 3) carpellate, ca. 5 mm long, 3–4 mm in diameter, 2 ovules per locule. Mature fruits capsular, corky, 3–3.5 cm in diameter, 1.5–2 cm deep, with persistent sepals, dehiscing distally into 4 parts; columella stout, 0.8–1.1 cm long, 4–5 mm wide; seeds not seen.

Camellia sonthaiensis was found in a broad-leaved, evergreen forest on humid fertile soils, along a mountain stream. Flowers were seen for a short time in April. It appears to belong in sect. *Piquetia*, as it has salient morphological characteristics: large leaves, 1–3 nodding and pedicellate flowers borne on short shoots in the axils of the leaves, 3–4 bracts, a very stout and upward thickened pedicel, 2–3 persistent bracteoles, 5 persistent sepals, 7 petals, stamens free above the union with petals, hairy inner filaments, and a densely hairy ovary. The usually 4-locular ovary with four styles may be used to distinguish *C. sonthaiensis* from the other known species of the section, namely, *C. piquetiana*, *C. dongnaiensis, C. dalatensis* and *C. longii* (Pierre 1877, Sealy 1958, Richards *et al.* 2002, 2003, Orel 2006, 2014a, Tran & Luong 2012). However, the fact that the capsule of *C. piquetiana*, the type species of the section, was reported by Sealy (1958) to have four or five lobes and four or five locules suggests possible 4-locular ovaries in *C. piquetiana* and the section. Flowers with four to five styles are also reported for *C. piquetiana* in Richards *et al.* (2002, 2003). In fact, the new species is easily distinguishable from *C. piquetiana* and *C. longii* by the yellow flowers and smaller leaves; from *C. dalatensis* by the glabrous twigs, smaller and glabrous leaves, fewer secondary veins, glabrous petiole and fewer petals, and from *C. dongnaiensis* by the purple young leaves, lighter yellow flowers, more sepals, free inner filaments and entirely free styles.

The known species of *Camellia* sect. *Piquetia* can be distinguished using the following key:

1. Flowers red 2
1. Flowers yellow or orange 3
2. Corolla campanulate; petals 5–6 ..... *C. longii*
2. Corolla rotate; petals 8 or more ..... *C. piquetiana*
3. Twigs hairy; leaves abaxially hairy ..... *C. dalatensis*
3. Twigs and leaves glabrous 4
4. Flowers orange; sepals 3; petals 8; inner filaments fused in bottom third, glabrous; styles compound, basally fused ..... *C. dongnaiensis*
4. Flowers light yellow; sepals 5; petals 7; inner filaments free and basally hairy; styles entirely free ..... *C. sonthaiensis*

Camellia sonthaiensis also has a number of morphological characteristics in common with other *Camellia* species, especially those of sect. *Archecamellia* (*sensu* Sealy 1958, Ming 2000) and sect. *Chrysantha* (*sensu* Chang 1981, Chang & Bartholomew 1984), such as the coriaceous leaves, brown punctures and arched nerves on the abaxial surfaces, a distinct pedicel, five persistent sepals, seven yellow petals, numerous stamens, a 3–4 locular ovary and 3–4 free styles. There are however many differences (*see* Appendix). In addition, its narrowly lanceolate leaves, five hairy sepals, seven hairy petals, 3- to 4-carpellate and densely hairy ovary, and 3 or 4 hairy and entirely free styles render *C. sonthaiensis* distinct from the recently reported large-leaved and yellow-flowered *Camellia* species, including *C. capitata* (sect. *Capitata*), *C. bugiamapensis* and *C. luteocerata* (sect. *Dalatia*), *C. dilinhensis* (sect. *Oboidea*), and *C. inusitata* (sect. *Bidoupia*) (Orel & Wilson 2010, Orel *et al.* 2012, Tran & Luong 2013, Orel *et al.* 2014b).

Acknowledgements

The new species was discovered during the course of the project "Building a database of forest biodiversity in Khanh Hoa Province" funded by Khanh Hoa Provincial Department of Natural Resource and Environment/Khanh Hoa Agency of Environment. Observations of the species *in situ* were financed by the project TN3/T09 within Vietnam National Key Programme KHCN-TN3/11-15 (Tay Nguyen Programme no. 3). The laboratory work and preparation of this

paper were funded by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number 106-NN.03-2013.65. We are grateful to staff of the Bidoup-Nui Ba National Park, especially Pham Huu Nhan and Pham Van Cuong for their helpful cooperation. We thank Mr. Anthony Curry, Prof. Dr. Brendan Buckley and Prof. Dr. Herbert Covert for providing useful literature and Dr. Jacinto Regalado for improving the English text. We thank the two anonymous reviewers for their constructive comments that helped improve the manuscript.

References

Chang H.T. & Bartholomew B. 1984: *Camellias*. — Timber Press, Portland.

Chang H.T. 1981: A taxonomy of the genus *Camellia*. — *Acta Scientiarum Naturalium Universitatis Sunyatseni, Monogr.* Ser. 1: 1–180.

Gagnepain F. 1941: Ternstroemiacées nouvelles d'Indochine. — *Notul. Syst. (Paris)* 10: 112–131.

Hakoda N. & Tran N. 2001: Plate 426. *Camellia flava*. — *Curtis's Bot. Mag.* 18: 190–193.

Ming T.L. 2000: *Monograph of the genus Camellia*. — Yunnan Science & Technology Press, Kunming.

Ming T.L. & Bartholomew B. 2007: Theaceae. — In: Wu Z.-Y. & Raven P.H. (eds.), *Flora of China*, vol. 12: 366–478. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis.

Orel G. 2006: A new species of *Camellia* section *Piquetia* (Theaceae) from Vietnam. — *Novon* 16: 244–47.

Orel G. & Wilson P.G. 2010: *Camellia luteocerata* sp. nov. and a new section of *Camellia (Dalatia)* from Vietnam. — *Nordic J. Bot.* 28: 280–284.

Orel G. & Wilson P.G. 2012: *Camellia cattienensis*: a new species of *Camellia* (sect. Archaecamellia: Theaceae) from Viet Nam. *Kew Bulletin* 66: 565–569.

Orel G., Wilson P. & Luu H.T. 2014a: *Camellia curryana* and *C. longii* spp. nov. (Theaceae) from Vietnam. — *Nordic J. Bot.* 32: 42–50.

Orel G., Wilson P., Curry A.S. & Luu H.T. 2012: *Camellia inusitata* (Theaceae), a distinctive new species and a new section (*Bidoupia*) from Vietnam. — *Edinburgh J. Bot.* 69: 347–355.

Orel G., Wilson P.G., Curry A.S. & Luu H.T. 2013: *Camellia oconoriana* (*Theaceae*) a new species from Vietnam. — *Edinburgh J. Bot.* 70: 439–447

Orel G., Wilson P., Curry A.S. & Luu H.T. 2014b: Four new species and two new sections of *Camellia* (Theaceae) from Vietnam. — *Novon* 23: 307–318.

Pham-hoang H. 2000: Theaceae. — In: Pham-hoang H. (ed.), *Cây cỏ Việt Nam* [*An illustrated flora of Vietnam*], vol. 1: 412–434. Youth Publishing House, Ho Chi Minh City. [In Vietnamese with English summary].

Pierre L. 1887: *Flore Forestière de Cochinchine*, vol. 2: t. 119. — Octave Doin, Paris.

Pitard C.J. 1910: Ternstroemiacées. — In: Lecomte M.H. (ed.), *Flore Générale de l'Indo-Chine*, tome 1, fasc. 4: 330–352. Masson et C^{ie}, Paris.

Richards G., Orel G., Harland C. & Jones S. 2002: The elusive *Camellia piquetiana*. — *Intern. Dendrol. Soc. Yearbook* 2002: 137–141.

Richards G.D., Orel G., Harland C. & Jones S. 2003: The rediscovery of *Camellia piquetiana*, a short communication. — *Intern. Camellia J.* 35: 54–56.

Rosmann J.C. 1999: Une nouvelle espèce de *Camellia* (Theaceae) du Viêt-Nam. — *Adansonia* 21: 319–322.

Sealy J.R. 1958. *A revision of the genus Camellia*. — Royal Horticultural Society, London.

Tran N. & Luong V.D. 2012: *Camellia dalatensis*: a new species and precious gene should be conserved. — *VNU J. Sci., Nat. Sci. & Technol.* 28(2S): 34–36.

Tran N. & Luong V.D. 2013: *Camellia dilinhensis*: a new species from Vietnam. — In: Li J.Y., Li Z.H., Luo Y.J. & Fan Z.Q. (eds.), *Proceedings of the 3rd International Academic Forum on Yellow Camellias, Nanning, Guangxi, China, 21–23 February*: 79. International Camellia Society, Nanning, Guangxi, China.

Yang S.H., Nguyen H., Zhao D.W. & Shui Y.M. 2014: Rediscovery of *Camellia tonkinensis* (Theaceae) after more than 100 years. — *Plant Div. & Resources* 36: 585–589.

Appendix. Comparison of selected characteristics of *Camellia sonthaiensis* and its morphologically close species. Data are from sources given in the first column under the species names.

Species	Leaf lamina	Flowers	Sepals	Petals	Stamens	Ovary	Styles
C. cattienensis (Orel & Wilson 2012)	glabrous, dull green, with distinct orange-coppery sheen when young, deep green when mature, narrowly obovate, 44 cm long, 14 cm wide, base auriculate	solitary, axillary, occasionally terminal, upright, intensely orange, with randomly distributed, clearly defined areas of dark-brown pigmentation	6, glabrous, pink to light green in the middle, light yellow distally, maturing to light brown	8, orange, with narrow white margins	fused in bottom third, glabrous	5-carpellate, each carpel bilocular, tomentose	compound, proximally 5-parted, but fused at the base, glabrous (?)
C. dalatensis (Tran & Luong 2012)	adaxially glabrous, abaxially hairy, oblong, 40–45 cm long, 8–11 cm wide, base cordate	1–3, axillary, yellow	5, yellow	8–10, yellow	outer filaments united basally	4–5-carpellate, pubescent	4–5, pubescent
C. dilinhensis (Tran & Luong 2013)	glabrous, deep green, oblong-elliptic or elliptic, 16–24.5 cm long, 5.5–9.5 cm wide, base cuneate	1–3, axillary, light yellow	5, light yellow, glabrous,	8–9, light yellow, glabrous	free above the union with petals, glabrous	3-carpellate, hairy	proximally, glabrous distally, light yellow to white, proximally fused for 4–5 mm
C. dongnaiensis (Orel *et al.* 2013)	glabrous, dull green, with distinct orange-coppery sheen when young, deep green when mature, narrowly obovate, 44 cm long, 14 cm wide	solitary, axillary, occasionally terminal, graduated yellow-apricot in color, with a distinct and intense pink margin	3, glabrous, pink to light green in the middle, light green distally, maturing to light yellow	8, yellow-apricot with intense pink margin, glabrous	fused in bottom third, glabrous	5(6)-carpellate, each carpel bilocular, tomentose	compound, proximally 5(6)-parted, but fused at the base, glabrous (?)
C. flava (Pham-hoang 2000)	glabrous adaxially, pubescent or villose abaxially, oval or oblong-elliptic or oblong oval, 6–15 cm long, 2–8 cm wide, base shallowly cordate	solitary, axillary, yellow	5, densely grey-velutinous on outer surface, glabrous to grey-velutinous on inner surface	9–13, yellow, puberulous	outer filaments fused into a column up to 9 mm long, glabrous, inner filaments free, densely hairy	5-carpellate, densely yellow-tomentose	5, free to base, densely yellow-hairy except for apical 2 mm

continued

Table 1. Continued.

Species	Leaf lamina	Flowers	Sepals	Petals	Stamens	Ovary	Styles
C. krempfii (Gagnepain 1941, Sealy 1958, Pham-hoang 2000)	glabrous, oblong, 28–31.5 cm long, 6–7.5 cm wide, base cordate	solitary, axillary, white (?)	10–13, basally united for 7–9 mm above the union with petals, puberulous on lower half, glabrous above	10, white (?), grey-velutinous on outer surface	outer filaments united for 7–8 mm, forming a fleshy cup	5-carpellate, hairy	5, free to base, hairy
C. longii (Orel *et al.* 2014b)	glabrous, dark purple to lilac to red, sometimes almost brown, lamina narrow elliptic to narrow oblong, 27.0–31.0 cm long, 6.0–10.5 cm, slightly coriaceous	axillary or terminal, solitary, red	5, red, finely hairy on outer surface	7–8, red, hairy on outer surface	basally joined for 1.0–1.2 cm, glabrous	4–6-carpellate, densely, finely tomentose	proximally fused for ca 5.0 mm, 5–6-parted distally, finely pubescent, proximally, glabrous
C. oconoriana (Orel *et al.* 2013)	glabrous, dull, of soft lilac colour when young, green when mature, lamina very narrowly elliptic to narrowly elliptic, 30–36.5 cm long, 8–8.5 cm wide, slightly coriaceous	solitary or 2, always axillary, yellow with dark pink-lilac to purple blush	2, glabrous, of yellow-green colour, with pink randomly distributed pigmentation	5–6, yellow, with dark pink-lilac to purple blush	proximally fused for c.6 mm, forming a bright orange, ring-like structure	4–5-carpellate, unevenly rotund, finely and densely tomentose	compound, 3–5-parted, finely hairy proximally, glabrous distally, light yellow to white, proximally fused for 4–5 mm
C. piquetiana (Pierre 1877, Pham-hoang 2000, Richards *et al.* 2002, 2003)	glabrous, dark green, oblong-elliptic, 29–50 cm long, 9.5–12.5 cm wide, base obtuse or round	1–3 on short bracteate shoots in leaf axils, pink, suffused with purple	5, pubescent on outer surface, glabrous on inner surface	7 or more, pink, marginally purple	united one another for 3–5 mm, inner filaments basally puberulous, outer filaments glabrous	5(6)-carpellate, densely tawny-tomentose	4–6, free to base, densely pubescent

C. tonkinensis (Pitard 1910, Pham-hoang 2000, Tran & Luong 2013)	glabrous, sparsely puberulous along the midrib base, dark green, elliptic or oblong-elliptic, 9–13.5 cm long, 2.5–5 cm wide, papery, base round	solitary, axillary or subterminal, pale yellow	5, light yellow, yellow puberulous	9–12, pale yellow, glabrous	puberulent, outer filaments united for 4 mm	3-carpellate, pale yellow tomentose	3, free to base, pale yellow tomentose
C. vidalii (Rosmann 1999)	glabrous, green, oblong-elliptic or elliptic, 35–40 cm long, 6–8 cm wide, base round or angular	up to 3, terminal or axillary, light or chromium yellow	5, yellow (?), glabrous	9–10, light or chromium yellow, glabrous	glabrous, outer filaments united, inner filaments free	5-carpellate, hirsute	5, free to base, pubescent
C. sonthaiensis (this study)	glabrous, purple when young, green when mature, lamina narrowly lanceolate, (10) 17–30 cm long, (1.8) 4–5.6 cm wide, coriaceous, base obtuse and revolute	1–3 flowers borne on a very short bracteate shoot in the axils of old leaves, yellow	5, finely hairy on outer surface, with translucent margin	7, yellow, finely hairy on outer surface, with translucent margin	free above the union with petals, basally hairy on inner filaments	3 (sometimes) to (mostly) 4-carpellate, hairy	3 (sometimes) to (mostly) 4, 14–15 mm long, free to base, basally densely hairy