

CAMELLIA THUANANA (CAMELLIA SECT. CHRYSANTHA) – A NEW SPECIES FROM THE CENTRAL HIGHLANDS, VIETNAM

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Abstract

Camellia thuanana, a new species of the genus *Camellia* L. (Theaceae) is described and illustrated from the Central Highlands, Vietnam. Morphological features of this species are small flowers and pedicellate; leaves stalked, anastomosing venation, blades oblong-elliptic to elliptic, sparsely hirsute along the midrib below; pedicel very short; bracteoles 2–3, triangular; sepals 4–(5) in opposite pairs; corolla light greenish-yellow color; petals 7–8, glabrous; androecium 190–200 stamens, light yellow, in 3–4 circles; gynoecium 3, ovary ovoid and pubescent; styles 3, free to the base, and glabrous. *C. thuanana* resembles *C. thuongiana* in some morphological characteristics. *C. thuanana* is classified into sect. *Chrysantha* by styles completely free, flowers yellow, ovaries 3–5 locular, and partially connate. The IUCN Redlist Category of *C. thuanana* was assessed as Critically Endangered (CR).

Keywords: *Camellia thuanana*; Lam Dong Province; Vietnam; Yellow Camellia.

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1. INTRODUCTION

Camellia is the largest genus of the Theaceae; the number of species is estimated to be from 120 to 300 (Chang & Bartholomew, 1984; Ming & Bartholomew, 2007; Orel & Curry, 2015). The distribution of *Camellia* is centered in southern and eastern Asia with major distributions in China (about 80%) and Southeast Asia (about 20%) comprising Vietnam, Laos, Thailand, Indonesia, and Singapore (Orel & Curry, 2015; Sealy, 1958; Tran, 2002).

In 2020, Le et al. updated a checklist that included 126 species and five varieties of five genera of Theaceae in Vietnam based on the APG 4 classification system, of which 95 species and two varieties belong to *Camellia*. Tran et al. (2019) reported 52 golden *Camellia* species worldwide. Recently, five new *Camellia* species were published in two years (2020-2021): *C. bidoupensis*, *C. flosculora*, *C. ngheanensis*, *C. proensis*, and *C. puhoatensis* (Do et al., 2020; Le et al., 2021; Nguyen et al., 2020; Quach et al., 2021; Truong et al., 2020). Three new *Camellia* species as *C. bidoupensis*, *C. flosculora*, and *C. proensis*, were found in Lam Dong Province (Le et al., 2021; Quach et al., 2021; Truong et al., 2020). The number of known *Camellia* species increased to 100 by early 2021 (Do et al., 2020; Le et al., 2020; Le et al., 2021; Nguyen et al., 2020; Quach et al., 2021; Truong et al., 2020). During a field trip in November 2012 to survey camellias in Lam Dong Province, several interesting yellow flower camellias were found, and a new specimen was collected at Bao Loc at 700 to 850 m elevation. Only two individuals of this new species were found in a 1 km² area. An examination of herbarium specimens shows that this species is new to science.

2. MATERIALS AND METHODS

The description is based on measurements of mature living trees. New specimens were compared to those of closely related species in the following herbaria: DLU, HN, P, K, and NSW. Available digital images were accessed from botanical websites: <https://science.mnhn.fr>, <http://www.cvh.org.cn>, <https://avh.ala.org.au>, and <https://apps.kew.org>. The general terminology is the same as that used in Chang (1981), Chang and Bartholomew (1984), Gao et al. (2005), Ming and Bartholomew (2007), and Sealy (1958). The new specimens were compared to specimens of the closely related species, *C. thuongiana*, DL.160107 (holotype, isotype, DLU) and DL.160108 (paratype, DLU).

3. TAXONOMIC TREATMENT

- *Camellia thuanana* T.T. Hoang, *sp. nov.* (Figure 1, 2)

3.1. Type

Vietnam, Lam Dong Province, Bao Lam district, Da Ton commune, in primary broadleaf evergreen forest at elevation 700–850 m, 01 Nov. 2012, Luong Van Dung, Trinh Van Muoi, Do Cong Thuan, DL120109 (holotype, isotype DLU).

3.2. Description

Small tree, 3–5 m high; young branches slender, pubescent, and becoming glabrous in the second year. *Leaves* stalked, anastomosing venation, *blades* oblong-elliptic to elliptic, 11–17.5 cm long and 3–4.5 cm wide; apex attenuate to nearly acuminate, base broadly cuneate, rarely rounded; widely and shallowly serrulate margins; adaxially dark-green, glabrous; abaxially pale green with scattered dark-punctate, sparsely hirsute along the midrib below, midrib and veins prominent below and impressed above clearly; lateral veins glabrous, 12–15 pairs; *petioles* short, 3–5 mm long, pubescent. *Flowers* pedicellate, 2–3 cm in diameter, solitary or 2(–3) at axils of leaves or old turions or sometimes old branches. *Pedice*l very short, thickened upward, rather nodding at old turions and old branches or suberect at the axils of leaves, 2–3 mm long, glabrous; *bracteoles* 2–3, triangular, appressed, 1–1.5 mm high and 1–2 mm wide, glabrous, caducous; *sepals* 4(–5) in opposite pairs, concave, keeled, suberect, semiorbicular to suborbicular, coriaceous, 3–5 mm long and 4–6 mm wide, glabrous outside, thickly and finely puberulous inside, persistent. *Corolla* light greenish-yellow color; *petals* 7–8, outer whorl 3, nearly rounded, 6–7 mm long and 4.5–7 mm wide, glabrous; inner whorl 4–5, broadly elliptic to broadly obovate, 11–13 mm long, and 6–9 mm wide, united with outermost filaments at the base about 2 mm, innermost petal somewhat undulate. *Androecium* 190–200 stamens, 3–4 circles, light yellow, glabrous, outermost adnate at the base for 2–3 mm to form a shallow cup, innermost free; filaments 4–8 mm long. *Gynoecium* 3, ovary ovoid, pubescent, 1.5–2 mm wide and 2–3 mm high; *styles* 3, free to the base, 5–6.5 mm long, glabrous; *stigmas* unlobed. *Capsule* not seen (Figure 1).

3.3. Phenology

Flowers during the rainy season; fruit not seen.

3.4. Etymology

The specific epithet of this species honors Mr. Do Cong Thuan, a member of the survey staff who has notably contributed to the collection, cultivation, and conservation of Vietnam's camellias.

3.5. Habitat and Ecology

Camellia thuanana was discovered at only the type locality with two individuals that are located under-canopy in an evergreen broadleaf forest at 750–800 m elevation. It grows with species of Fagaceae, Fabaceae, Anacardiaceae, Rubiaceae, and Sapotaceae.

3.6. IUCN Redlist Category

The area of occupancy for *C. thuanana* is estimated to be less than 1 km². Despite a further search of the area around the type locality, only two mature trees were found. Field trips in the habitat area did not find more individuals. As the total known population

of the species is fewer than 50 individuals, it qualifies as Critically Endangered (CR) under criterion D (IUCN Standards and Petitions Committee, 2019).

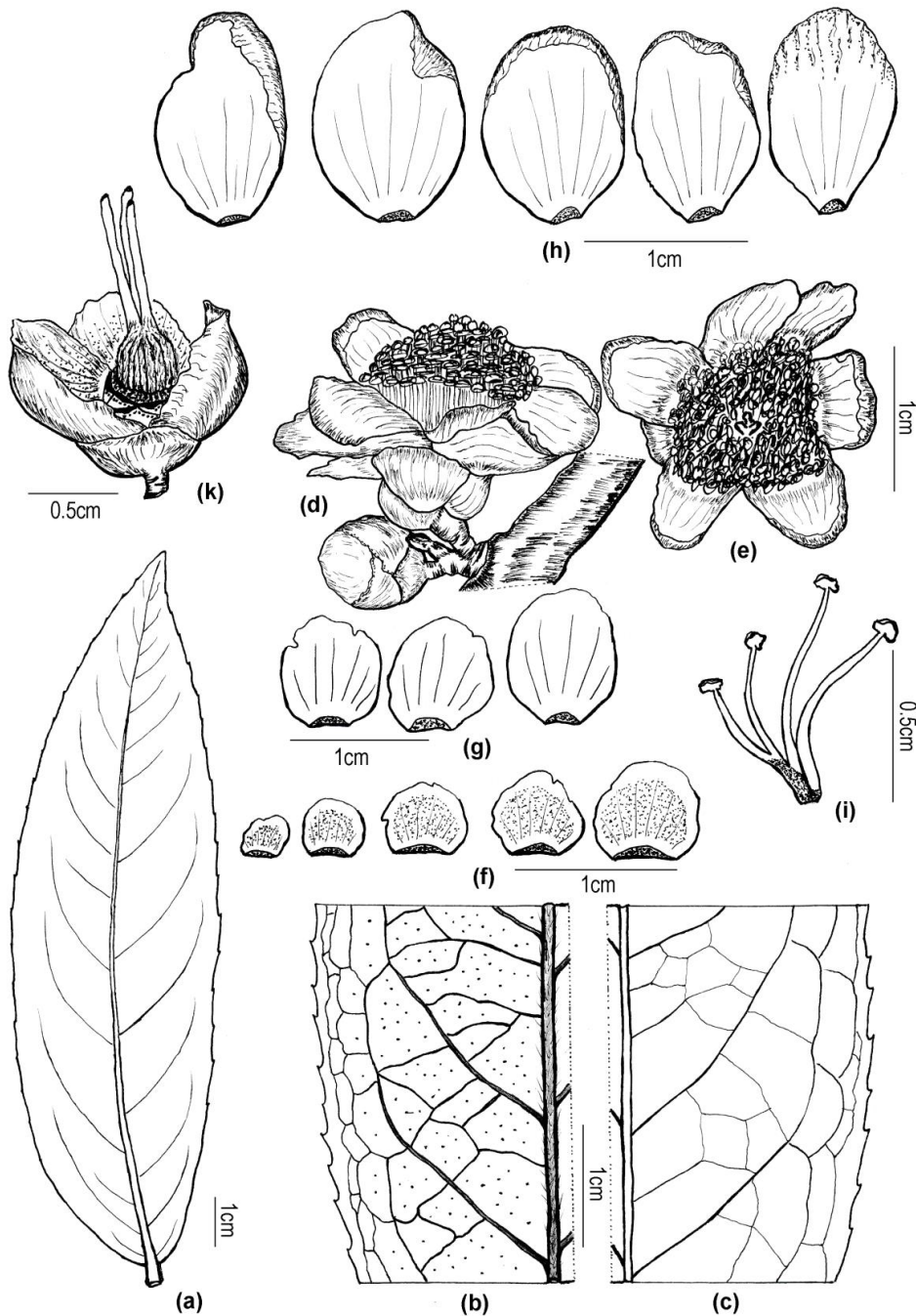


Figure 1. *Camellia thuanana*

Note: (a) Leaf; (b) Abaxial surface of leaf (apart); (c) Adaxial surface of leaf (apart); (d) Flower and flower bud (lateral view); (e) Flower (top view); (f) Sepals; (g) Petals (outer whorl); (h) Petals (inner whorl); (i) Stamens; (k) Sepals and gynoecium.

Source: Drawn by Luong Van Dung.

4. DISCUSSION

Camellia thuanana has pedicellate form, flowers axillary, solitary or 3 in clusters, elongated pedicels, bracteolate spirally, bracteoles clearly on pedicel and differentiated from petals, leathery sepals of subgenus *Thea* (Chang, 1981; Ming & Bartholomew, 2007). Therefore, *C. thuanana* is classified in subgenus *Thea*.

C. thuanana contains features typical of sect. *Chrysantha* by Chang (1981) such as styles completely free, flowers yellow, ovaries 3–5 locular, partially connate (Chang, 1981; Chang & Bartholomew, 1984). The complexity of sect. *Chrysantha* was discussed in further detail by Minh and Zhang (1993). Most species of sect. *Chrysantha* with yellow flowers were transferred to other sections, mainly sect. *Archechamellia*, with six species and two varieties (Ming & Zhang, 1993). Ming and Bartholomew (2007) combined sect. *Chrysantha* into sect. *Archechamellia*. In 2009, sect. *Chrysantha* was found to be paraphyletic because all golden camellias were combined into a single clade by the molecular analysis of *Camellia*, which was only accomplished by sampling from China and Taiwan together with *C. gilbertii* from Vietnam and *C. assamica* from Thailand (Vijayan et al., 2009). Orel and Curry (2015) still accept sect. *Chrysanthae* Sealy as an independent section (sect. *Chrysantha*). We accept *C. thuanana* belong to sect. *Chrysantha* by Chang (1981) because of the morphological features and molecular analysis of Vijayan et al. (2009).

Recently, many new *Camellia* species with yellow flowers were described from Vietnam, five of which (*C. ngheanensis*, *C. puhoatensis*, *C. thuongiana*, *C. tuyenquangensis*, and *C. velutina*) were placed in sect. *Chrysantha* of Chang's system (Do et al., 2020; Le et al., 2017; Luong et al., 2016; Nguyen et al., 2020; Pham et al., 2019) while the others were placed in several new sections, such as *C. dilinhensis* (sect. *Obvoidea*), *C. pukhangensis* (sect. *Archechamellia*), *C. vuquangensis* (sect. *Ovoidea*), and *C. flosculora* (sect. *Thea*) (Do et al., 2019; Le et al., 2021; Nguyen et al., 2018; Tran & Luong, 2013). In this article, we provisionally place *C. thuanana* into sect. *Chrysantha* (Chang, 1981) based on typical features, such as styles completely free, flowers yellow, ovaries 3–5 locular, partially connate (Chang, 1981; Chang & Bartholomew, 1984).

Taxonomic Remarks: *C. thuanana* resembles *C. thuongiana* in morphological characteristics, such as mainly axillary and solitary flowers, semiorbicular to suborbicular sepal shape, petals and filaments glabrous, ovary 3 loculi and pubescent, styles 3 and glabrous (Figure 2). The new species differs from *C. thuongiana* by its oblong-elliptic leaves with hirsute along the midrib below, leaf apex attenuates, shorter and pubescent petiole, smaller flowers, sepals puberulous inside, 7–8 petals, 3–4 circles and shorter stamen, nearly rounded petal, and freestyle to the base. A morphological comparison of *C. thuanana* and *C. thuongiana* is given in Table 1.



Figure 2. *Camellia thuanana*

Note: (a) Habit; (b) Young branch with buds; (c) Leaf (adaxial view); (d) Flower (lateral view); (e) Flower (top view); (f) Sepals; (g) Petals; (h) Androecium; (i) Sepals and gynoecium.

Source: Photos and colored plate by Luong Van Dung.

Table 1. Morphological comparison of *C. thuongiana* and *C. thuanana*

Characters	<i>Camellia thuanana</i>	<i>Camellia thuongiana</i>
Leaf blade	Oblong-elliptic to elliptic	Elliptic to oblong-elliptic
Leaf size	11–17.5 cm long, 3–4.5 cm wide	9–17 cm long, 4–6.5 cm wide
Leaf apex	Attenuate to nearly acuminate	Acuminate to long caudate
Leaf base	Cuneate or rarely rounded	Broadly cuneate or nearly rounded
Veins	12–15 pairs	12–13 pairs
Midrib	Hirsute	Glabrous
Petiole	3–5 mm long, pubescent	8–11 mm long, glabrous
Flowers	Axillary; solitary or 2(–3) at axils of leaves or old turions or old branches	Axillary and terminal; solitary or 2–3(–4) at the ends of branches or axils of leaves
Flower diameter	2–3 cm	4.5–5 cm
Pedicel	2–3 mm; glabrous	8–10 mm long; glabrous
Bracteoles	2–3, triangular	3–4, dentate to elliptic
Sepal number	4(–5)	5
Sepal shape and size	Semiorbicular to suborbicular; 3–5 mm long; 4–6 mm wide	Semiorbicular to suborbicular; 6–10 mm long; 7–11 mm wide
Sepal hairiness	Glabrous outside, puberulous inside	Glabrous
Petal number	7–8	11–13
Petal shape	Nearly rounded to broadly elliptic or obovate	Suborbicular to elliptic or obovate
Petal size	0.6–1.1 mm long, 4.5–1.3 mm wide	1.4–2.2 cm long, 1.3–1.5 cm wide
Petal hairiness	Glabrous	Glabrous
Stamens	190–200, 3–4 circles	290–340, 6–7 circles
Filaments	4–8 mm long, glabrous	1.3–1.4 cm long, glabrous
Ovary	Ovoid, 3 loculi, pubescent	Ovoid, 3 loculi, pubescent
Styles	3, free to the base, 5–6.5 mm long, glabrous	3, free to ½ from the base, 8–9 mm long, glabrous

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