

Camellia phuongchiana (Theaceae, section *Piquetia*), a new species from Lam Dong Province, southern Vietnam

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Abstract. A new species of the genus *Camellia* (Theaceae, section *Piquetia*), *C. phuongchiana* from Lam Dong Province, southern Vietnam, is described and illustrated. The new species appears to be morphologically closest to *C. honbaensis* and *C. piquetiana* in the section *Piquetia*, but it differs in having more petals, with both petal surfaces densely pubescent; young branches sparsely pubescent; smaller leaves, with the leaf bases broadly acute or obtuse; longer petioles; and longer and thinner pedicels. Data on phenology, distribution, ecology, and conservation status of the new species are given, and a key to all species of section *Piquetia* is provided.

Keywords: Critically endangered, endemic, mixed evergreen broadleaf-bamboo forest, umbilicate hila.

Camellia L. is distinguished from other genera of Theaceae by relatively large, apically dehiscent capsules and wingless, semi-globose or polygonal seeds with umbilicate hila (Ming & Bartholomew, 2007). Due to the use of inconsistent classificatory systems (Sealy, 1958; Chang & Bartholomew, 1984; Gao et al., 2005; Ming & Bartholomew, 2007), the total number of *Camellia* species is uncertain and has been difficult to approximate. In the 1950's about 100 species were recognized (Sealy, 1958). More recently, the number has been estimated to be over 300 (Le et al., 2021).

Camellia species are widely distributed from Nepal, Bhutan, northeastern India, Myanmar,

China, and Japan, to Southeast Asia. The highest species diversity is found in northern Vietnam and southern China (Sealy, 1958; Ming & Bartholomew, 2007; Orel & Curry, 2015). In the mid 1990's, approximately fifty species of *Camellia* were recognized in Vietnam (Hô, 1999; Ninh, 2002; Ming & Bartholomew, 2007). Most of these species are endemic to northern Vietnam, which is a center of diversity for the genus. However, in recent years, many new species have been published from southern Vietnam, increasing the total to more than 95 species in Vietnam (Orel et al., 2014a, 2014b; Luu et al., 2015; Ninh & Luong, 2016; Luong et al., 2016a, 2016b; Luu et al., 2018; Do et al., 2019; Le et al.,

2020; Quach et al., 2021a, 2021b). These new discoveries make southern Vietnam another center of *Camellia* diversity (Orel & Curry, 2015). Most *Camellia* species found in southern Vietnam have small populations and distributions that render them extremely rare and highly endemic.

In March 2021, during a floristic survey in Gung Re Commune, Di Linh District, Lam Dong Province, several flowering and fruiting specimens of an unidentified species of *Camellia* were collected. Morphological analysis firmly placed the species in *C.* sect. *Piquetia* Pierre, as characterized by Sealy (1958) and Chang & Bartholomew (1984). These features include long thin, pendulous pedicels with two or three bracteoles; five free styles, the stamens free above a 2–3 mm basal adnation with petals, and sparsely pubescent at base; and a five-locular, tomentose ovary. Thorough examination of the literature and comparison with specimens of related species of *Camellia*, both in-hand and online, suggested that the species from Gung Re Commune was new to science. A formal description of the new species follows.

Taxonomic treatment

Camellia phuongchiana Curry, V.H. Quach, T.T. Hoang & Q.C. Truong, **sp. nov.**—Type: Vietnam, Lam Dong Province, Di Linh District, Gung Re Commune, mixed evergreen broadleaf-bamboo forest, elevation 890–950 m, 14 Mar 2021, *Quach Van Hoi & Hoang Thanh Truong VTN1705* (holotype: DLU [!]) (DLU00008051); isotype: VNM [!]. (Figs. 1 and 2.)

Diagnosis. —*Camellia phuongchiana* is distinguished from other species in *C.* sect. *Piquetia* by possession of 10–11 petals with both petal surfaces densely pubescent; young branches sparsely pubescent; leaf blades (20–)24–32(–35) × 6–8 cm, leaf apices acuminate; petioles 1.8–2 cm long; pedicels 3.5–5.5 cm long; flowers axillary, purple to light red, and with relatively short stamens (1.2–1.5 cm long).

Shrubs to small trees, 3–4 m tall; young branches sparsely pubescent and later glabrous. Leaves alternate; blades oblong, (20–)24–32(–35) × 6–8 cm, coriaceous, apex acuminate, base broadly acute or obtuse, adaxially dark green, shiny, and glabrous, abaxially light green, sparsely pubescent; midrib and lateral veins impressed above, prominent below, lateral veins

17–23 pairs, the margin shallow serrate; petioles falcate, slightly curved, 1.8–2 cm long, glabrous. Flowers solitary or clustered in groups of 2(–3), axillary, 3.5–3.7 cm in diameter; flower buds globose, pendulous, 0.9–1.2 cm in diameter, reddish green, pubescent; pedicel (3.5–)4–5(–5.5) cm long, thickened upwards, 0.15 cm wide proximally up to 0.35 cm wide distally, brownish green, glabrous; bracteoles 2–3, scale-like, 1.5–2 × 1.2–1.6 mm, brownish green, pubescent on both surfaces, persistent. Sepals 5, orbicular or semi-orbicular, 3–5 × 4–7 mm wide, dark red to purple, both surfaces densely pubescent, margin ciliate, persistent. Petals 10–11, purple to light red, both surfaces pubescent, in 2 whorls, outer whorl 5, orbicular, 0.8–1.5 × 1–1.3 cm, red to dark red with narrow white margins; inner whorl 5–6, broadly ovate, 1.8–2 × 1.4–1.5 cm. Stamens numerous, in 4 whorls; filaments 1.2–1.5 cm long, yellow, sparsely pubescent at base, outer filaments united and adnate to innermost petals for 2–3 mm at base; anthers small, less than 1 mm long, light yellow. Ovary 5-locular, superior, oblate, ribbed, about 3 mm diameter, tomentose; styles 5, free at the base, 1.4–1.6 cm long, tomentose. Capsules corky, flattened-globose, 5–5.5 cm in diameter, 2–2.3 cm high, 5-lobed, sparsely hairy when immature, glabrous at maturity; pericarp thin, 1.5–2 mm thick; columella stout, 1–1.2 cm long. Seeds 1–2 per locule, globose or semi-globose, 1.7–1.8 cm long, 1.9–2 cm wide, brown, glabrous (Table I).

Etymology. —The specific epithet honours the discoverer's daughter.

Vernacular name. — Vietnamese: Hồng trà phương chi (Red tea phuong chi).

Distribution and ecology. —*Camellia phuongchiana* is only known from the type locality at Gung Re Commune, Di Linh District, Lam Dong Province. It grows scattered along a stream and among rocks under the canopy of evergreen, mixed broadleaf-bamboo forest at elevations of 890–950 m.

Conservation status. —The type-population of *Camellia phuongchiana* is estimated to be fewer than 30 mature individuals distributed in an area of less than 1 km². It is predicted that additional individuals may be found by further field surveys in similar forests in the vicinity of the type-locality. However, on-going degradation and destruction of primary, moist, broadleaf forest for the development of coffee (*Coffea canephora* Pierre ex A.Froehner) plantations at the type-



FIG. 1. *Camellia phuongchiana*. **A.** Tree in habitat. **B–C.** Young branches. **D.** Flower bud. **E.** Flower, frontal view. **F.** Flower, back view. **G.** Sepals. **H–I.** Petals. **J–K.** Gynoecium. **L–M.** Fruits. **N.** Dehiscent capsule and seeds. [Images are from the holotype *VTN1705*, taken by Quach Van Hoi (A, B, C, D), Hoang Thanh Truong (E, F, G, H, I, J, K), and Truong Quang Cuong (L, M, N); the colour photomontage was prepared by Luong Van Dung.].

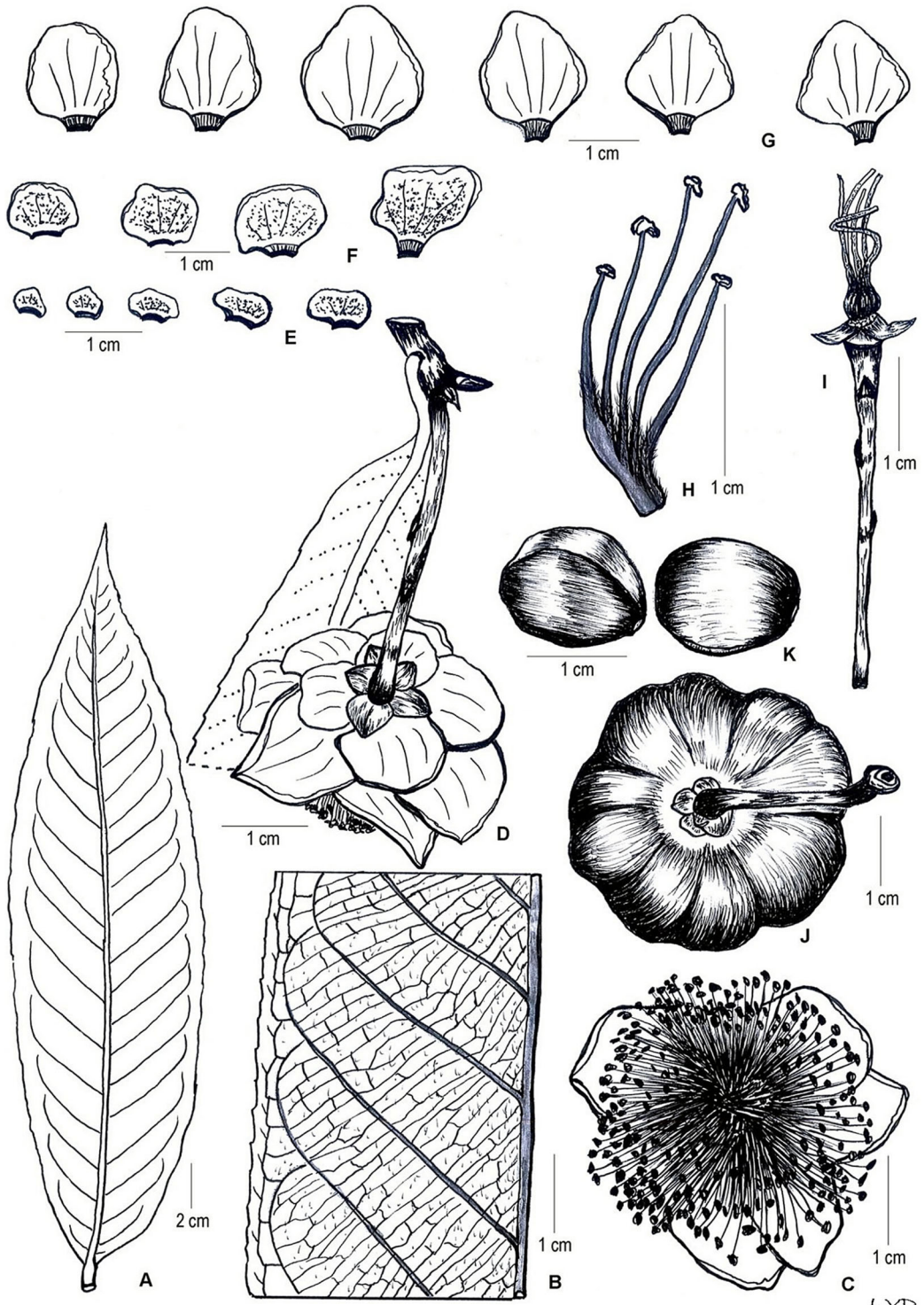


FIG. 2. *Camellia phuongchiana*. A. Leaf (adaxial view). B. Venation of leaf (abaxial view). C. Flower, frontal view. D. Flower, back view. E. Sepals. F-G. Petals. H. Filaments. I. Gynoecium and sepals. J. Fruit. K. Seed. [Drawn from holotype VTN1705, by Luong Van Dung].

TABLE I. MORPHOLOGICAL COMPARISON OF *CAMELLIA PHUONGCHIANA* WITH *C. HONBAENSIS*, *C. PIQUETIANA* AND *C. LONGII**.

Feature	<i>C. phuongchiana</i>	<i>C. honbaensis</i>	<i>C. piquetiana</i>	<i>C. longii</i>
Leaf length (cm)	(20–)24–32(–35)	30–45	29–55	27–31
Leaf width (cm)	6–8	8.5–14	9.5–15	6–10.5
Leaf apices	acuminate	acuminate	shortly and bluntly acute	cuspidate to acuminate
Pairs of lateral veins	17–23	22–25	25–30	14–16(–18)
Petiole length (cm)	1.8–2	1.5–1.8	0.8–1(–2)	0.8–1.3
Pedicel (cm)	(3.5–)4–5(–5.5) long; 0.15 cm proximally, up to 0.35 cm wide distally, pendulous	2.8–4 long; 0.3 wide proximally, 0.7 wide distally; pendulous	shortly pedicellate, 0.8–1.1 long; very stout, nodding	2 long
Bracteoles	2–3, persistent	2–3, persistent	2–3, persistent	2–4, deciduous
Petals	in 2 whorls, densely pubescent on both surfaces	finely hairy on outer surface	densely pubescent on outer surface	in 3 whorls, finely hairy on outer surface
Petal number	10–11	9–10	8 or more	7–8
Petal colour	purple-light red	red-purplish red	pink-purple	dark orange-red with uneven whitish margin
Stamen length (cm)	1.2–1.5	1.8–2.1	2	1.5–1.8
Locule number	5	3	5(–6)	5–6
Length of stamen to style	stamens shorter than, or equal to, styles	stamens equal to, or slightly longer than styles	stamens shorter than styles	stamens shorter than styles
Styles	5, free to base, 1.4–1.6 cm long	3, free to base, 1.7–2.1 cm long	5(–6), free to base, 2.4 cm long	5–6 parted, free to base except for lower 5 mm from base, 4.5–4.7 cm long
Capsules	5-lobed, 5–5.5 cm wide, 2–2.3 cm high	3–4 lobed, 4.5–5 cm wide, 2.5–3 cm high	4–5 lobed, 5 cm wide, 2.5 cm high	not seen
Columellae	stout, 1–1.2 cm long	stout, 0.8–1.2 cm long, 6–8 mm wide	short, massive 4- or 5-angled	not seen
Seeds/locule	1–2	2	2	not seen

*Comparative data from: Pierre (1887); Sealy (1958); Richards et al. (2003); Orel et al. (2014b); Luu et al. (2018)

locality threatens the species. For these reasons, *C. phuongchiana* is provisionally assessed to be Critically Endangered (CR B2a; D) according to IUCN categories and criteria (IUCN Standards and Petitions Committee, 2019).

Phenology.—*Camellia phuongchiana* flowers from January to April and fruits from June to December.

PHYLOGENETIC AFFINITIES

Camellia phuongchiana possesses the morphological characteristics that distinguish sect. *Piquetia* from other sections of the genus, namely flowers axillary, solitary or in groups of three to five; pedicels with two or three persistent bracteoles; sepals five; petals eight or more; stamens free above the 2–3 mm basal adnation with petals; stamens sparsely pubescent at base; ovary five-

locular, tomentose, and the styles five and free (Sealy, 1958; Chang & Bartholomew, 1984).

Morphologically, *Camellia phuongchiana* is most similar to *C. honbaensis* Luu, Q. D. Nguyen & G. Tran and *C. piquetiana* (Pierre) Sealy as it shares the following features with these two species: oblong to elliptic to lanceolate leaf shape; flowers solitary or clustered in groups of up to three flowers; flower colour purple to light red, red to purplish red or pinkish-purple, respectively; bracteoles two or three, persistent; filament bases sparsely pubescent, hairy or puberulous; ovaries ribbed, tomentose, lobed, hairy (refer to Image G. Fig. 1, Luu et al., 2018) or lobulate, densely tomentose, respectively (Sealy, 1958; Chang & Bartholomew, 1984; Luu et al., 2018). However, *C. phuongchiana* is distinct from *C. honbaensis* and *C. piquetiana* in many morphological traits, including: young branches pubescent (vs.

glabrous in *C. honbaensis* and *C. piquetiana*); leaf blades are generally shorter and narrower; pairs of lateral veins generally fewer; petioles longer; pedicels generally longer; petal number generally slightly greater; petals densely pubescent on both surfaces (vs. finely hairy on outer surfaces in *C. honbaensis* and the inner petals finely hairy on the outer surfaces in *C. piquetiana*); stamens shorter; locules five (vs. three in *C. honbaensis* and five (or six) in *C. piquetiana*); styles five and 1.4–1.6 cm long (vs. three and 1.7–2.1 cm long in *C. honbaensis* and five (or six) and 2.4 cm long in *C. piquetiana*) (Table I).

Morphologically, *Camellia longii* Orel & Luu with dark orange to red flowers is also similar to *C. phuongchiana*. However, *C. phuongchiana* exhibits a number of differences from *C. longii* namely leaf blades oblong to lanceolate (vs. narrowly elliptic to narrowly oblong), leaf apices acuminate (vs. cuspidate to acuminate), the leaves

of *C. phuongchiana* typically have more lateral leaf vein pairs, longer petioles, flowers solitary or clustered in groups of two or three (vs. solitary), flowers axillary or terminal (vs. axillary), pedicels longer, petals in two whorls (vs. three whorls), petals purple-light red (vs. dark orange-red with uneven whitish margin), stamens shorter, filaments sparsely pubescent at base and positioned in 4 whorls (vs. glabrous and positioned in a tight formation with whorls indistinct), stamens shorter than or equal to styles (vs. shorter than styles); styles five, shorter, free to base, and tomentose (vs. five- or six-parted, longer, fused for 5 mm from base, thinly puberulous) (Table I). All other species in the sect. *Piquetia* bear yellow petals or yellow petals with pink petal margins and are clearly distinguished from *C. phuongchiana*, which has purple to light red petals (Orel, 2006; Ninh et al., 2012; Orel et al., 2014b, Luu et al., 2015; Quach et al., 2021a, 2021b).

KEY TO THE SPECIES OF *CAMELLIA* OF SECT. *PIQUETIA*

1. Flowers dark orange-red, purple-light red, red to purplish red or pink-purple in colour.
 2. Ovaries 3(–4)-locular; petals red to purplish red.....*C. honbaensis*
 2. Ovaries 5(–6)-locular.
 3. Petals 7(–8), dark orange to red..... *C. longii*
 3. Petals 8 or more.
 4. Petals pink to purple, densely pubescent on outer surface..... *C. piquetiana*
 4. Petals purple to light red, densely pubescent on both surfaces..... *C. phuongchiana*
1. Flowers yellow.
 5. Flowers light yellow or yellow to apricot with pigmented petal margins.
 6. Young branches and leaves glabrous; petals 8, petal margins intense pink..... *C. dongnaiensis* Orel
 6. Young branches and leaves hairy; petals 10–11(–12), petal margins dull pink.....*C. langbianensis* (Gagnep.) P.H.Hô
 5. Flowers yellow; petal margins without pink pigmentation.
 7. Young branches and leaves hairy.....*C. dalatensis* V.D. Luong, Ninh & Hakoda
 7. Young branches and leaves glabrous.
 8. Leaves cordate at base.....*C. sphanii* Q.C. Truong & V.S. Le
 8. Leaves rounded or acute at base.
 9. Leaves narrowly lanceolate; styles (3–)4, free; ovaries (3–)4-locular.....
.....*C. sonthaiensis* Luu, V.D. Luong, Q.D. Nguyen & T.Q.T. Nguyen
 9. Leaves narrowly elliptic to narrowly oblong or elliptic to oblong; styles 4–5, free to base.
 10. Peduncles/pedicels 3–5.5 cm long with 2–3 bractlets; petals 5–6.
.....*C. proensis* L.V. Dung, Doudkin & Q.V. Hoi
 10. Pedicels 2.8–3(–3.5) cm long with 1 bracteole; petaloids and petals 11.
.....*C. pentagonalema* Orel & Curry

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Declarations

Conflict of Interest

The authors have no conflicts of interest to declare, and there is no financial interest to report.

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