



## Research Article

DOI: 10.36959/771/576

# *Camellia maianhii* (Theaceae), A New Species of Red-Flowered *Camellia* from the North Central Coast Region of Vietnam

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## Abstract

*Camellia maianhii* from the North Central Coast Region of Vietnam is described and illustrated. The new *Camellia* species is tentatively placed in *Camellia* section *Archechamellia* (Theaceae). *Camellia maianhii* is most like *Camellia puhoatensis* but the morphological characteristics which differentiate it from other species in the section include pendulous pedicels; 5.5-6.5 cm diameter, nodding flowers; 14-15, red petals with both petal surfaces tomentose, and the possession of stout columellae. Information on the distribution, ecology, phenology, conservation status, and the vernacular name of the new taxon are also provided.

## Keyword

*Archechamellia*, *Camellia*, Columellae, Pedicels, Section, Vietnam

## Abbreviations

C.: *Camellia*; m: metre(s); nov.: new; sect.: section; sp.: species (singular); spp.: species (plural)

## Introduction

Currently, 103 species of *Camellia* L. (Theaceae) are documented from Vietnam [1-4]. The North Central Coast Region of Vietnam includes Hà Tĩnh, Nghệ An, Quảng Bình, Quảng Trị, Thừa Thiên Huế, and Thanh Hóa Provinces. Several *C. spp.* emanate from the North Central Coast Region including *Camellia pleurocarpa* (Gagnep.) Sealy [5], *C. calcicola* T L Ming [6,7], *C. hatinhensis* VD Luong, Ninh & LT Nguyen [8], *C. vuquangensis* Luong, Tran & LT Nguyen [8], *C. pukhangensis* ND Do, VD Luong, TS Hoang & TH Lê [9], *C. ngheanensis* ND Do, VD Luong, NS Lý, TH Lê & DH Nguyễn [10], and *C. puhoatensis* NS Lý, VD Luong, TH Lê, DH Nguyễn & ND Do [11].

In January 2016, the field team collected samples of a red-flowered *Camellia* from Xon Village, Chau Hoi Commune, Quy Chau District, Nghệ An Province. The team evaluated the mature plants in-situ, as well as germplasm in the field, and recognized that the plants and specimen material required further investigation.

Regarding *Camellia* sect. *Archechamellia* the taxonomies of Sealy [5], Chang & Bartholomew [12] and Ming & Bartholomew (2007) largely agree on the characteristics which circumscribe the sect. The taxonomists of genus *Camellia* include varying numbers of species in respective of their circumscriptions of sect. *Archechamellia* i.e., 7 spp. [5]; 3 spp. [12]; 1 sp. [13]; and 18 spp. [14]. Our study primarily used the taxonomic treatment of Sealy (1958), as we believe it to be relatively thorough and well-established. Chang and

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**Accepted:** March 03, 2023

**Published online:** March 05, 2023

**Citation:** Nguyen TT, Luong VD, Do ND, et al. (2023) *Camellia maianhii* (Theaceae), A New Species of Red-Flowered *Camellia* from the North Central Coast Region of Vietnam. J Bot Res 6(1):176-183

Bartholomew (1984), a progression from Sealy's treatment, was also consulted especially for species collected since 1958, as well as the sectional treatments of genus *Camellia*. For additional data Wen [15], Gao, et al., [13] and Ming and Bartholomew [14] were also consulted.

On balance, Despite sharing several features with *Camellia* sect. *Piquetia* (Pierre) Sealy thorough analysis of the morphology of the newly collected germplasm tentatively placed *C. maianhii* in *Camellia* sect. *Archecamellia* Sealy as described by Sealy [5]; Chang & Bartholomew [12] and Ming & Bartholomew [14]. The authors affirm this as the new species' flowers are not 'borne on short bracteate shoots in the leaf-axils' Sealy [5] like those of *Camellia* sect. *Piquetia*. The species collected from Xon Village, Chau Hoi Commune possesses many of the prescriptive, but not all the characteristics of sect. *Archecamellia* namely, terminal, solitary, pedicellate flowers; stout pedicels thickened upwards; persistent bracteoles and sepals; corolla red [14]; inner petals basally connate and adnate to filaments; stamens in 5-6 whorls; basally connate outer filaments; styles free; and ovaries 3(-4)-locular. In comparable situations Sealy (1958) considered such species as 'transitional'. We therefore consider *C. maianhii* to be a transitional species in sect. *Archecamellia* Sealy [16].

Following a thorough search of the taxonomic literature, electronic and hard-copy herbaria specimens of closely related species it was evident that the Xon Village, Chau Hoi Commune material differed significantly from all known *Camellia* species, and all published species in sect. *Archecamellia* and so it is proposed as a new species.

## Taxonomic Treatment

*Camellia maianhii* Curry, VD Luong & ND Do, **sp. nov.** - Type: Vietnam, Nghe An Province: Quy Chau District, Chau Hoi Commune, Xon Village, 200 m elevation., January 2016, Mai The Anh *Mai The Anh*, DL160103 (holotype (DLU00008050), isotype DLU!) (Figure 1 and Figure 2).

## Additional specimens examined (Paratypes)

Nghe An Province: Quy Chau District, Chau Hanh, Chau Thang Communes, 250 m elevation, June 2021, *Mai The Anh*, DL210601, DL211201(DLU!)

## Diagnosis

*Camellia maianhii* is tentatively placed in *C.* sect. *Archecamellia* Sealy as it possesses several characteristics of that sect., namely terminal, solitary, pedicellate flowers; stout pedicels that are thickened upwards; persistent bracteoles and sepals; a red corolla; inner petals basally connate and adnate to filaments; stamens in 5-6 whorls, free; outer filaments basally connate, and 3(-4)-locular ovaries [5,12,14]. The features separating *C. maianhii* from other species in sect. *Archecamellia* are its 5.5-6.5 cm diameter flowers; 14-15, red petals with both petal surfaces tomentose; and stout columellae. *Camellia maianhii* also shares morphological features with *C.* sect. *Piquetia* (Pierre) Sealy, including nodding, pedicellate flowers; stout pedicels that are thickened upwards; persistent bracteoles; persistent sepals; 8 or more petals; stamens free above union with petals; and a tomentose gynoeceium.

## Description

Shrubs, 3-5m tall; twigs white pubescent, purple. Leaves petiolate, oblong-ovate, 13-20 × 4-6 cm, thickly coriaceous, dark green, shiny, glabrous above, paler green, pubescent below, margins shallow serrate; leaf apices acuminate; leaf bases obtuse to nearly round; midribs protruding both sides, lateral veins sunken above, protruding below, 14-19 pairs of veins; petiole falcate, slightly curved, round, 0.7-1.2 cm long, pubescent. Flowers pedicellate, solitary, terminal, nodding, 5.5-6.5 cm in diameter; pedicels 0.9-1.3 cm long, stout, thickened upwards, purple; bracteoles 3(-4), broadly deltate, 4-7 mm long, 2.5-5 mm wide, purple, outer faces pubescent, ciliate, persistent. Sepals 5-6(-7), persistent, sub-orbicular or subglobose, 0.5-1.2 × 0.9-1.5 cm, purple, outer surfaces pubescent, margins membranous and ciliate. Petals 14-15, subglobose to broadly obovate, red, 1.8-5.5 × 2-3.3 cm, both sides tomentose, innermost petals basally united with outermost filaments for 1.5-1.6 cm. Androeceium 260-300 stamens in 5-6 whorls, filaments 2.5-3.5 cm long, yellow, pubescent at the base, outer filaments basally united for 2-2.2 cm; anthers 2-2.5 × 1.5-2 mm, light yellow. Gynoeceium 3-4-locular, ovaries ovate, ribbed, 6-7 × 4-5 mm, tomentose; styles 3-4, free to the base, 2.2-2.4 cm long, tomentose. Capsules subglobose, 4.8-5.3 high × 6.2-7.1 cm wide, furfuraceous, sparsely pubescent, dehiscing distally into 3-4 parts, pericarps thin, 9-11 mm thick, 1-3 seeds per locule; columellae stout, 2.8-3.2 cm long. Seeds cuneate or semi-globose, 2.1-2.9 × 0.6-0.8 cm, reddish brown, hirsute.

## Distribution and Ecology

*Camellia maianhii* is only known from the type-locality near Xon village, Chau Hoi Commune, Quy Chau District, Nghe An Province. This species grows on moist fertile and sandy soils derived from sandstone parent material on hill slopes and along a stream in secondary evergreen broad-leaved or mixed wood-bamboo forests, elevations of 200-800 m.

## Etymology

The specific epithet refers to the name of the discoverer of this species, Mr. Mai The Anh.

## Vernacular name (Vietnamese language)

Chèmaianh (Chè = tea; maianh = the name of the discoverer of this species).

## Phenology

This species flowers from November to January, and fruits from June to September.

## Conservation Status

*Camellia maianhii* is only known from two populations in the Quy Chau District, Nghe An Province namely, the type-locality near Xon Village, Chau Hoi Commune and the second in Chau Hanh Commune. The area of occupancy is less than 10 km<sup>2</sup> and the total population is fewer than 200 mature individuals. Due to the limited known area of occupancy and small population size we consider the IUCN category of Critically Endangered (CR B2ab (iii,v)) to be appropriate for this species [17].

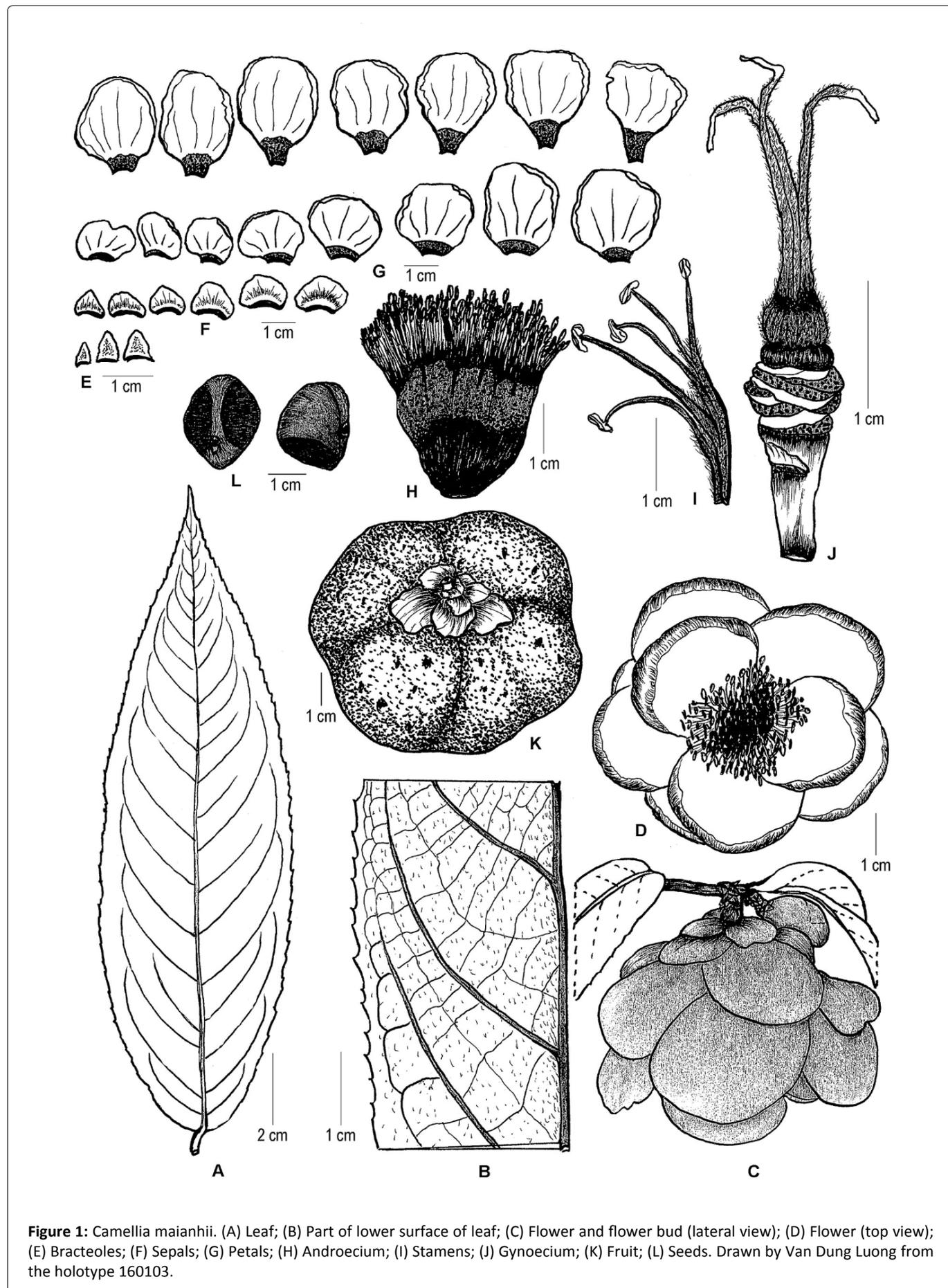




Figure 2: *Camellia maianhii*. (A) Habitat; (B) Twigs; (C) Flower (lateral view); (D) Flower (top view); (E) Fruit. Coloured plate by Mai The Anh. Images taken of holotype specimen, DL160103, by Mai The Anh.

## Taxonomic Notes

*Camellia maianhii* possesses many of the morphological features that characterize species in sect. *Archechamellia* namely terminal, solitary, and nodding flowers; stout pedicels; persistent bracteoles and sepals; inner petals basally connate and adnate to filaments; stamens in 5-6 whorls; outer filaments united at the base and 3(-4)-locular ovaries [5,12,14]. The three taxonomies currently used for the classification of *Camellia* sect. *Archechamellia* comprise a variety of species according to the emphasis the taxonomists place on the possession of specific morphological characteristics. Over the years taxonomists have placed almost fifty species into *Camellia* sect. *Archechamellia* sens. lat. The number of species that bear white or yellow-colored petals exceeds forty. When in flower these species are readily separated from *C. maianhii* by either their white or yellow-colored petals, as *C. maianhii* produces red petals.

Morphologically *Camellia granthamiana* Sealy and *C. puhoatensis* appear close to the new species despite the production of white- or yellow-colored petals by the respective species [5,11]. Other characteristics separating *Camellia maianhii* from the preceding two species, include leaf size 13-20 × 4-6 cm (Vs. 7-11.5 × 2.7-4.5 cm for *C.*

*granthamiana* and 17-23 × 5-6.5 cm for *C. puhoatensis*); greater number of pairs of lateral veins 14-19 (Vs. 6-7 for *C. granthamiana* and 10-13 for *C. puhoatensis*); generally longer pedicels 0.9-1.3 cm (Vs. sessile for *C. granthamiana* and 0.7-1 cm for *C. puhoatensis*); number of bracteoles and sepals 8-9 (-11) (Vs. 12 or more perules for *C. granthamiana* and 8-9 for *C. puhoatensis*); flower diameter 5.5-6.5 cm (Vs. 10-14 cm for *C. granthamiana* and 4.5-6 cm for *C. puhoatensis*); petals tomentose on both sides (Vs. trace pubescence abaxially on outer petals for *C. granthamiana* and petals abaxially pubescent for *C. puhoatensis*); greater petal number 14-15 (Vs. 8-10 for *C. granthamiana* and 12-13 for *C. puhoatensis*); stamens pubescent at base (Vs. glabrous for *C. granthamiana* and glabrous for *C. puhoatensis*); locule number 3-4 (vs. 5 for *C. granthamiana* and 3(-4) for *C. puhoatensis*); styles 3-4, free ((Vs. 5, connivent at base, apically dividing into 5 recurved arms for *C. granthamiana* and 3(-4), free for *C. puhoatensis*); filaments longer than styles (Vs. filaments equal in length to styles for *C. granthamiana* and filaments longer than styles for *C. puhoatensis*); ovaries ovate, ribbed and tomentose (Vs. globose-ovoid and tomentose for *C. granthamiana* and ovoid, with slight longitudinal striations, and pubescent for *C. puhoatensis*) (Table 1).

**Table 1:** Diagnostic characters for selected species of *Camellia* sect. *Archechamellia* and *Camellia annamensis* sect. *Piquetaia*.

Characters	<i>C. maianhii</i>	<i>C. amplexicaulis</i>	<i>C. cattienensis</i>	<i>C. granthamiana</i>	<i>C. krempfii</i>	<i>C. puhoatensis</i>	<i>C. annamensis</i>
Leaf length (cm)	13-20	12-22	35-36	7-11.5	28.5-31	17-23	15-20.5
Leaf length (cm)	4-6	4-8	8.5-9	2.7-4.5	6-7.5	5-6.5	5-9
Leaf apices	Acuminate	Obtuse	Acute	Bluntly acuminate to caudate	Shortly, broadly, and bluntly acute or acuminate	Acuminate or narrowly acuminate	Attenuate or narrowly acuminate
Leaf bases	Obtuse or nearly round	Auriculate and amplexicaul	Auriculate	Rounded to obtuse	Cordate	Rounded or broadly obtuse	Acute to partially obtuse and slightly assymmetric
Pairs of lateral veins	14-19	15-18 (-20)	15-18	6-7	14-20	10-13	10-13
Petiole length (cm) and features	0.7-1.2, pubescent	0.3-0.5, glabrous	1, glabrous	0.5-1, glabrous or pubescent	1.5, glabrous	0.8-1.6, puberulous	1-1.3, sparsely appressed puberulent
Pedicel length (cm)	0.9-1.3	1.1-1.2	1-1.2	Sessile	1.5	0.7-1	0.7-1
Perule number	N/a	N/a	6	12 or more, persistent	About 13	Number not given	N/a
Bracteole Number	3(-4)	6-7	N/a	N/a	2	3-4	3-4
Flower diameter (cm)	5.5-6.5	4-7	5-7	10-14	6-7	4.5-6	4.5-6
Flower number	Solitary, nodding	Solitary	Mostly solitary, upright, or horizontal	Solitary, sessile	Solitary	1-2, borne on a short bracteate shoot	1-2(-3), borne on a short bracteate shoot, nodding

Sepal number	5-6(-7), persistent	5	N/a	N/a	N/a	5, persistent	5, persistent
Petal number	14-15	8-13	8	8-10	10	12-13	20-22
Petal colour	Red	Pinkish purple	Orange with narrow, white margins	White	White(?)*, red(?)^	Bright yellow, sometimes with large red patch on outer petals	Bright red with a distinct and intense white margin
Petal features	Both sides tomentose, innermost petals basally united with outermost filaments for 1.5-1.6 cm	Brownish velutinous abaxially, basally united with outermost filaments for 1.1 cm	In 2 whorls of 5 and 3, sometimes emarginated	Petals basally connate and adnate with filaments for 0.5-1 cm from base	Puberulous on inner face, densely so towards base, grey-velutinous on back, basally united with outermost filaments for 1-2 cm	Petals abaxially pubescent, basally united with outermost filaments for 0.5-0.7 cm	Shiny, arranged in 3 whorls, outermost whorl abaxially velutinous at tips, innermost petal whorl basally united with filaments for 0.5-1 cm
Filament length (cm) and features	2.5-3.5, pubescent at base, in 5-6 whorls, outer filaments basally united for 2-2.2 cm	3.2, free parts of filaments glabrous, outer filaments united for 2.2 cm forming a fleshy cup, minutely velutinous inside and out	4-5, glabrous, basal third fused, basally adnate to inner petal whorl	2.5-3.5, glabrous, outer filaments basally united for 0.5-0.6 cm	2-2.5, lower half puberulous, glabrous above, outer filaments basally united for 0.7-0.8 cm into a tube	2.5-2.8, glabrous, in 4-5 whorls, outer filaments basally united for 1.5-1.8 cm forming a cup, inner filaments united for 0.3-0.5 cm, free above union	2.4-3, glabrous, 4-5 series, outer filaments basally connate for 1.5-1.8 cm forming a cup, inner filaments basally connate for 0.4-0.7 cm
Locule number	3-4	3	5	5	5	3(-4)	4-5
Styles	3-4, free to base, tomentose 2.2-2.4 cm long	3, free to base, glabrous, 2-2.1 (-2.5) cm long	5-parted, basally fused, 3.5-4.5 cm long	5-parted, connivent at base, apically dividing into 5 recurved arms, densely white tomentose up to stigmatic arms, 2.5 cm long	5, free to base, thinly puberulous, 1.5 cm long	3(-4), free to base, pubescent, 1.8-2.3 cm long	4-5, free to base, tomentose, 1.8-2.3 cm long, persistent
Length of filaments to styles	Filaments longer than styles	Filaments longer than styles	Filaments equal to or longer than styles	Filaments equal in length to styles	Filaments longer than styles	Filaments longer than styles	Filaments shorter than or equal to styles
Ovaries	Ovate, ribbed, tomentose	Ovoid, glabrous	Tomentose	Globose-ovoid, tomentose	Ovoid-globose	Ovoid with slight longitudinal striations, pubescent	Flattened-globose, terminating with 4-5 persistent style remnants, strongly 4-5-lobed, yellow, tomentose

Capsules	Subglobose, furfuraceous, sparsely pubescent	Globose, 3 well-marked longitudinal grooves, shiny	Not seen	Subglobose surrounded by persistent sepals, furfuraceous	Not seen	Not seen	Flattened-globose, with persistent sepals and style remnants, 4-5 irregularly lobed
Columellae	Stout, 2.8-3.2 cm long	Not given	Not given	Stout, 1.2-1.5 cm long	Not given	Not given	Not given
Seeds/locule	1-3	Not given	Not given	Not given	Not seen	2	1-2

The red petal color of *Camellia maianhii* is dissimilar to most species in sect. *Archecamellia*, except for *C.krempfii* (Gagnep.) Sealy, which may be white (Sealy, 1958), or red [12] Despite the uncertainty of the petal colour *C. maianhii* is distinguished from *C. krempfii* by its smaller leaves; obtuse to nearly rounded leaf bases; fewer pairs of lateral veins; shorter petioles; shorter pedicels; petals with both sides tomentose; greater number of petals; fewer locules; fewer, longer, and tomentose styles; and ovate, ribbed, and tomentose ovaries (Table 1).

Two other spp. with pinkish-reddish coloured petals are *Camellia amplexicaulis* (Pit.) Cohen-Stuart sens. lat. and *Camellia cattienensis* Orel (Sealy, 1958; Orel & Wilson, 2011) [5,16]. The morphological features that differentiate *C. Maianhii* from these two spp., include leaf size 13-20 × 4-6 cm (Vs. 15.3-16.2 × 6-7.5 cm for *C. amplexicaulis* and 35-36 × 8.5-9 cm for *C. cattienensis*); acuminate leaf apices (Vs. obtuse for *C. amplexicaulis* and acute for *C. cattienensis*); leaf bases obtuse to nearly round (Vs. auriculate and amplexicaul for *C. amplexicaulis* and auriculate for *C. cattienensis*); petioles 0.7-1.2 cm long and pubescent (Vs. 0.3-0.5 cm and glabrous for *C. amplexicaulis* and 1 cm long and glabrous for *C. cattienensis*); pedicel length 0.9-1.3 cm (Vs. 1.1-1.2 cm for *C. amplexicaulis* and 1.1-1.2 cm for *C. cattienensis*); flower diameter 5.5-6.5 cm (Vs. 4-7 cm for *C. amplexicaulis* and 5-7 cm for *C. cattienensis*); both sides of petals tomentose (Vs. brownish velutinous for *C. amplexicaulis* and not given for *C. cattienensis*); greater number of petals 14-15 (Vs. 8 for *C. amplexicaulis* and 8 for *C. cattienensis*); petal colour red (Vs. pinkish purple for *C. amplexicaulis* and orange for *C. cattienensis*); stamens 2.5-3.5 cm long and basally pubescent (Vs. 3.2 cm long, free parts of filaments glabrous and outer filaments united for 2.2 cm form a fleshy cup which is velutinous inside and out for *C. amplexicaulis* and 4-5 cm long and glabrous for *C. cattienensis*); locule number 3-4 (Vs. 3 for *C. amplexicaulis* and 5 for *C. cattienensis*); styles 3-4, free to base, 2.2-2.4 cm long and tomentose (Vs. 3, free to base, 2-2.1(-2.5) cm long, and glabrous for *C. amplexicaulis* and 5-parted, basally fused, 3.5-4.5 cm long for *C. cattienensis*); filaments longer than styles (filaments longer than styles for *C. amplexicaulis* and filaments equal to or longer than styles for *C. cattienensis*); and ovate, ribbed and tomentose ovaries (Vs. ovoid, glabrous for *C. amplexicaulis* and tomentose for *C. cattienensis*) (Table 1).

*Camellia annamensis* NS Lý, VD Lương, NĐ Đỗ, TH Lê & TL Nguyễn in sect. *Piquetia* appears like *C. maianhii* (Ly, et al., 2022). However, the two species are well differentiated

by a number morphological differences, namely leaf size 13-20 × 4-6 cm (Vs. 15-20.5 × 5-9 cm for *C. annamensis*); leaf apices acuminate (Vs. attenuate or narrowly acuminate for *C. annamensis*); leaf bases obtuse to nearly round (Vs. acute to partially obtuse for *C. annamensis*); pairs of lateral leaf veins 14-19 (Vs. 10-13 for *C. annamensis*); flowers not borne on short, bracteate, axillary shoots (flowers borne on short, bracteate, axillary shoots for *C. annamensis*); petals 14-15, red, with both sides tomentose (Vs. 20-22, bright red with distinct, intense, white margins, velutinous at the tips of abaxial sides for *C. annamensis*); filaments pubescent at base, longer than styles (Vs. glabrous, styles longer than or equal to filaments for *C. annamensis*); styles 3-4 (Vs. 4-5 for *C. annamensis*); ovaries 3-4-locular (Vs. 4-5-locular for *C. annamensis*); and 1-3 seeds per locule (Vs. 1-2 seeds per locule for *C. annamensis*).

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**DOI: 10.36959/771/576**