



Taxonomic notes of the genus *Eumachia* DC. in the flora of Vietnam and description of a new species

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ABSTRACT: The genus *Eumachia* DC. has been poorly documented and studied in Vietnam. In this research, we provide a taxonomic revision of this genus based on available specimens. Five species, *E. chasaliifolia*, *E. montana*, *E. ovoidea*, *E. sondangii*, and *E. straminea*, are recognized in Vietnam: *E. sondangii* is described as new to science; *E. straminea* is recorded in the country for the first time; a new combination is provided for *E. chasaliifolia*, and two lectotypifications are made for *Chassalia ovoidea* and *Psychotria chasaliifolia*. For each species, description, color photographs, phenology, distribution, and habitat are provided. A key to the Vietnamese *Eumachia* species is also provided.

KEY WORDS: *Chassalia*, Gentianales, Indochina, Palicoureeae, plant diversity, *Psychotria*, Rubiaceae, taxonomy.

INTRODUCTION

The genus *Eumachia* was described in 1830 by A.P. de Candolle, with one species, *E. carnea* (G.Forst.) DC., in the tropical Pacific, which was later transferred to *Psychotria* as *P. carnea* (G.Forst.) A.C.Sm. (de Candolle, 1830; Smith, 1936). The genus *Eumachia* was previously classified under the genus *Psychotria* due to the extensive characterization of *Psychotria* in the Pacific region. However, molecular data from *Psychotria* species distributed in Asia, New Guinea, and the Pacific have confirmed that *E. carnea* belongs to the Palicoureeae clade rather than the Psychotrieae clade (Barrabé *et al.*, 2012; Razafimandibison *et al.*, 2014). The clade that includes *Eumachia* has been treated under the name *Margaritopsis* Wight, which was described in 1869 (Taylor, 2005; Barrabé *et al.*, 2012). These studies have expanded the concept of *Margaritopsis* and clarified its distinction from *Psychotria*. Barrabé and Davis (2013) mentioned that *Eumachia* has priority over *Margaritopsis*, but this genus has rarely been mentioned and is mostly known from the 19th century (Barrabé and Davis, 2013). As a result, these authors proposed conserving *Margaritopsis* over *Eumachia*, but this proposal was rejected by Appleyard (2014). Therefore, Razafimandibison *et al.* (2014) demonstrated that the appropriate name for this clade is *Eumachia*. Taylor *et al.* (2017) expanded and surveyed comprehensively *Eumachia* with 83 species accepted in tropical regions such as tropical continental Africa,

American, northeastern Australia, New Guinea, Pacific Islands, and Southeast Asia.

In Vietnam, *Psychotria chasaliifolia* Pit. was first described in “*Flore générale de l’Indo-chine*” (Pitard, 1924). The type specimens were collected in Thua Thien – Hue Province with the note “*haut cours du Bo-giang, prov. de Thua-thien*” (Pitard, 1924). Two specimens of this species were found in the P herbarium with the barcode numbers P00604056, P00604057 containing information that matched the cited species. Those are considered to be syntypes. After thoroughly studying the morphological characteristics of those specimens, we conclude that this species should belong to the genus *Eumachia* rather than the genus *Psychotria*. Hence we propose a new combination name, *Eumachia chasaliifolia* (Pit.) Bao & T.A.Le in this study.

Moreover, during our botanical surveys in Northern (Ha Noi), Central (Thua Thien – Hue, Quang Binh, Quang Tri Provinces), South-Central (Kon Tum, Khanh Hoa, Ninh Thuan Provinces) and Southern Vietnam (Tay Ninh Province), several specimens of *Eumachia* were collected. To clarify their identity, we carried out a thorough review of relevant taxonomic literature (Pitard, 1924, Pham, 2000; Tran, 2005; Chen and Taylor, 2011; Taylor *et al.*, 2017; Wong *et al.*, 2019) and detailed comparisons with specimens from accessible herbaria (FOF, FU, HN, KAG, VNM) and digital herbarium collections, such as those of *Eumachia* and *Psychotria* specimens from E, K, L, LE, P, and JSTOR Global Plants, etc. As a result, the species



collected in Northern Vietnam matches *Eumachia montana* (Blume) I.M.Turner, the one from Central Vietnam corresponds to *E. chasaliifolia* (Pit.) Bao & T.A.Le, the one from Southern Vietnam aligns with *E. ovoidea* (Pierre ex Pit.) Barrabé, C.M.Taylor & Razafim., and one unknown species from South-Central Vietnam matches *E. straminea* Hutch. – a new record for the flora of Vietnam. In addition, we verified that another unknown species from the South-Central Vietnam did not match any previously known species, representing a species new to science described below as *E. sondangii*. To contribute to the better understanding of the flora of Vietnam, we provide a revision of the genus *Eumachia* in Vietnam, including its nomenclature, type information and geographical distribution, as well as a formal description of morphological characteristics for the genus and each species, and a key to the Vietnamese *Eumachia* species.

TAXONOMIC TREATMENTS

Eumachia DC. Prodr. [A. P. de Candolle] 4: 478. 1830; Delprete & Kirkbride, J. Bot. Res. Inst. Texas 9: 76. 2015; Taylor *et al.*, Candollea 72: 298. 2017; Turner, Edinburgh J. Bot. 76: 23. 2018; Wong *et al.*, Fl. Sing. 13(1): 70. 2019. = *Psychotria* L. sect. *Eumachia* (DC.) A.C.Sm., Bernice P. Bishop Mus. Bull. 141: 151. 1936. **Type species:** *Eumachia carnea* (G.Forst.) DC.

= *Chazaliella* E.M.A.Petit & Verdc., Kew Bull. 30: 268. 1975. **Type species:** *Chazaliella abrupta* (Hiern) E.M.A.Petit & Verdc. (= *Psychotria abrupta* Hiern = *Eumachia abrupta* (Hiern) Delprete & J.H.Kirkbr.).

= *Chytropsia* Bremek., Recueil Trav. Bot. Néerl. 31: 291. 1934. = *Psychotria* L. sect. *Chytropsia* (Bremek.) Steyerl., Mem. New York Bot. Gard. 23: 484. 1972. **Type species:** *Chytropsia astrellantha* (Wernham) Bremek. (= *Eumachia astrellantha* (Wernham) Delprete & J.H.Kirkbr.).

= *Margaris* Griseb., Cat. Pl. Cub. 134. 1866 [nom. illeg.] [not *Margaris* DC.]. = *Margaritopsis* C.Wright, Anales Acad. Ci. Med. Habana 6: 146. 1869; Barrabé *et al.*, Taxon 61: 1251. 2012. **Type species:** *Margaritopsis acuífolia* C.Wright (= *Eumachia acuífolia* (C.Wright) Delprete & J.H.Kirkbr.).

= *Mapouria* sect. *Chaenotrichae* Müll. Arg., Flora 59: 496. 1876. **Type species:** *Mapouria chaenotricha* (DC.) Müll. Arg. (= *Eumachia chaenotricha* (DC.) Razafim. & C.M. Taylor).

= *Readea* Gillespie, Bernice P. Bishop Mus. Bull. 74: 35. 1930. **Type species:** *Readea membranacea* Gillespie (= *Eumachia membranacea* (Gillespie) Delprete & J.H.Kirkbr.).

Shrubs or small trees. **Stipules** interpetiolar, triangular to bilobed, sometimes connate around the stem, green when young, becoming straw-colored when dry, persistent or absent. **Leaves** opposite, membranous to chartaceous, yellowish green color when dry, petiolate. **Inflorescences** terminal, basically cymose, axis often drying yellowish green. **Flowers** 4- or 5- merous, sometimes distylous; calyx tube cupuliform, lobes truncate to lobate; corolla tube salverform to funnelform, white to cream or yellowish green to greenish, lobes triangular to ovate, usually villous in the throats, ovary bilocular with singular ovule in each locule. **Fruits** fleshy, ellipsoid to subglobose, orange to red or sometimes

black colour when ripe, pyrenes 2, smooth to ribbed dorsally, plane to concave ventrally with marginal performed germination slits. **Seeds** with endosperm not ruminate, seed coat without ancol-soluble pigments (Taylor *et al.*, 2017; Wong *et al.*, 2019).

Distribution and habitat: About 86 accepted species distributed in lowland to highland areas of tropical forests regions worldwide except Madagascar and the subcontinent of India (Barrabé *et al.*, 2012; Razafimandibison *et al.*, 2014; Taylor *et al.*, 2017; POWO, 2024). The estimated number of *Eumachia* species in Southeast Asia, New Guinea, and the Pacific region is higher than formerly thought and brings the center of diversity to this area (Taylor *et al.*, 2017). In Vietnam, five species are known (**Fig 1 & 2**).

Etymology: The genus is named after Eumakhos of Kerkura (25 BCE – 75 CE) who wrote “Root Gathering” wherein he states that the Narcissus is called Akakallis and Krotalon.

Vernacular name: We propose the name “*Hoàng thác diệp*” as the local name for this genus, meaning the straw-colored stipules when dry. This is one of the key distinguishing features *Eumachia* from *Psychotria*, as well as from other genera in the family.

Taxonomic notes: The genus *Eumachia* has been poorly known (Taylor *et al.*, 2017). It is distinguished from the other genera of the family Rubiaceae by the following morphological characteristics: shrubs or small trees, twigs yellowish green when dry; stipules connate around stems, yellowish when dry; leaves membranous; inflorescence cymes, terminal; flower white to yellowish green colour, sometimes distylous; fruits ellipsoid to subglobose, red or black when ripe; pyrenes smooth to ribbed in both sides; seed with endosperm not ruminate. In Vietnam, this genus has received little attention and research due to its similarity to the genus *Psychotria*, which often leads to misidentification between. The characteristic of black fruits in *Eumachia* is reported for the first time, as previous study that species in this genus have orange to red fruits when ripe (Taylor *et al.*, 2017; Wong *et al.*, 2019). The finding may serve as useful information contributing to the classification of the genus *Eumachia*.

A key to the species of *Eumachia* in Vietnam

1. Inflorescence peduncle longer than 1.5 cm 2
- Inflorescence peduncle up to 1 cm long 4
2. Fruits black when ripe **2. *E. montana***
- Fruits red when ripe 3
3. Young branches, petiole, abaxial leaf surface and peduncle puberulent; flowers white to yellowish white; corolla lobes 3–4 mm long **3. *E. ovoidea***
- Young branches, petiole, abaxial leaf surface, and peduncle glabrous; flowers white to greenish white; corolla lobes 2.5–3 mm long **5. *E. straminea***
4. Leaf width 5–7 cm; stipules connate near the base; flowers white to greenish white; stigma bilobed, not flared **1. *E. chasaliifolia***
- Leaf width 2–4 cm; stipules shortly connate near the base; flowers white to yellowish white; stigma bilobed, clavate and widely flared **4. *E. sondangii***

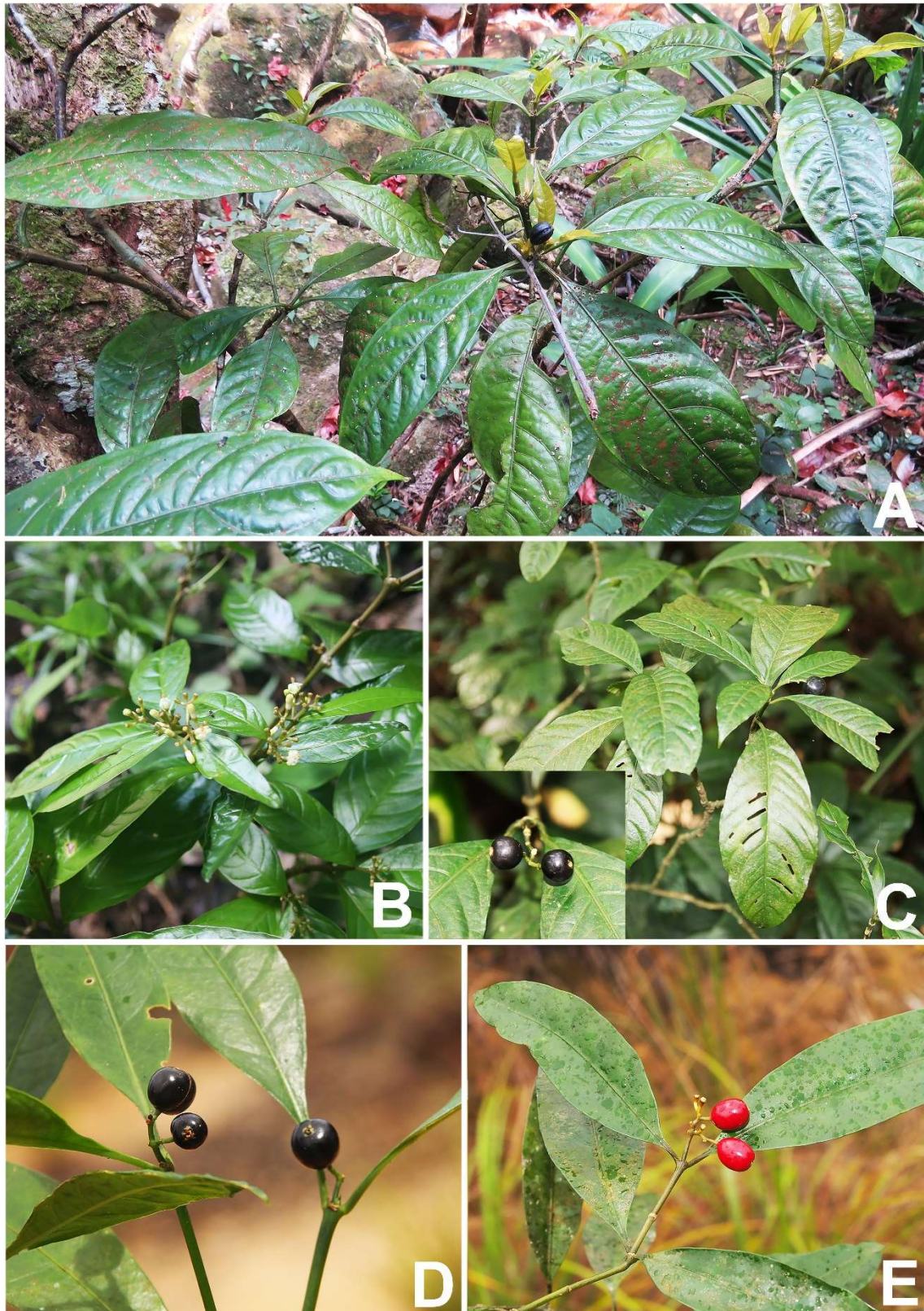


Fig. 1. Habit of Vietnamese *Eumachia* species. **A.** *Eumachia chasaliifolia* (Pit.) Bao & T.A.Le. **B.** *Eumachia montana* (Blume) I.M.Turner. **C.** *Eumachia ovoidea* (Pierre ex Pit.) Barrabé, C.M.Taylor & Razafim. **D.** *Eumachia sondangii* Bao & Tagane **E.** *Eumachia straminea* (Hutch.) Barrabé, C.M. Taylor & Razafim. **Photos:** **A:** Tuan Anh Le; **B, C:** Quoc Bao Nguyen; **D, E:** Shuichiro Tagane.

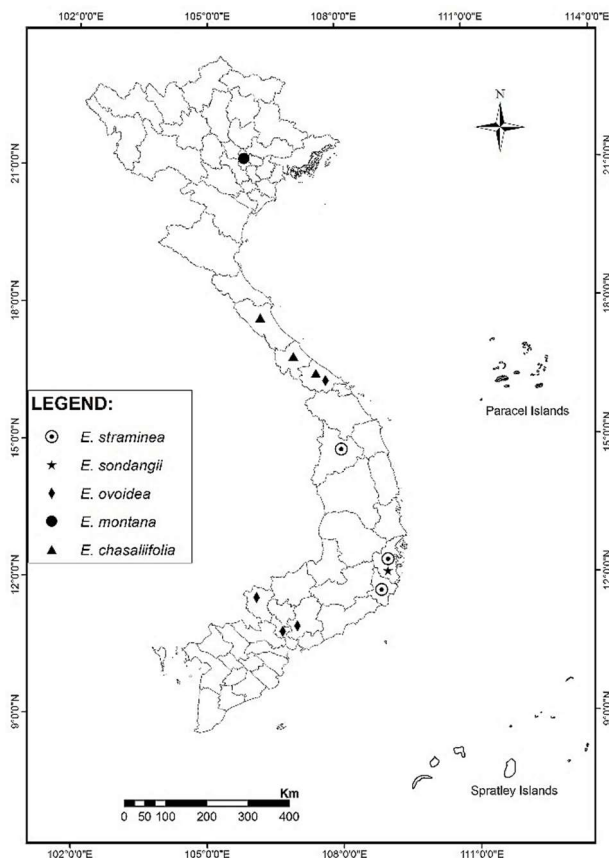


Fig. 2. Distribution of *Eumachia* species in Vietnam.

1. *Eumachia chasaliifolia* (Pit.) Bao & T.A.Le, *com.nov.*

Fig.3

≡ *Psychotria chasaliifolia* Pit. in P.H. Lecomte *et al.*, Fl. Indo-Chine 3: 363. 1924. **Type:** Prov. de Thua Thien-Hue, haut cours du Bo Giang, Eberhardt 2826 (**lectotype:** P00604056 image!, designated here, isolectotype P00604057 image!).

Shrubs, 1–2 m tall. **Twigs** glabrous, dark green *in vivo*, yellowish gray *in sicco*, cylindrical. **Stipules** triangular to ovate, 2–3 mm long, fused at the base, green *in vivo*, straw-colored *in sicco*, persistent or caducous, not leaving a ring of reddish-brown hairs present at the nodes, glabrous on both surfaces, apex acute, margin entire. **Leaves** simple, opposite-decussate, petiolate; leaf blades ovate, elliptic, ovate-elliptic to lanceolate-elliptic, 10–22 × 5–7 cm, glabrous on both surfaces, adaxial surface dark green *in vivo*, abaxial surface light green *in vivo*, greenish *in sicco*, apex acute to acuminate, base cuneate to obtuse, margins flat, midrib prominent on both surfaces, secondary veins 9–11 pairs, without domatia; petioles 1–1.5 cm long, glabrous. **Inflorescence** terminal, cymose, glabrous, pedunculate; peduncle ca. 1 cm long, glabrous; branched portion corymbiform; bracts triangular, ca. 0.8 mm long, caducous. **Flowers** small, 5-merous, pedicellate; pedicel ca. 2 mm long, glabrous, bracteoles caducous, not seen. **Calyx** brownish-green, cupuliform, glabrous outside, tube ca. 2 mm long, lobes 5, triangular, 1–1.2 mm long, apex acute, margin entire. **Corolla** white

to greenish white, tube lighter colour than lobes, 2–3 mm long, glabrous on both surfaces except villous throat inside, lobes 5, oblong-triangular, 2–3 mm long, apex acute, incurved. **Stamens** 5, exserted, filaments 0.5–0.8 mm long, glabrous, erect, anthers oblong-ovate, 0.5–0.6 mm long, dorsifixed. **Ovary** 2-locular, style 1–2 mm long, glabrous, stigma 2-lobed, not flared. **Fruits** drupaceous, green when young, black when ripe, ellipsoid to subobovoid, 8–10 × 5–7 mm, glabrous, with persistent calyx lobes on the top. **Pyrenes** 2, smooth or shallowly 3- or 4- ridged. **Seeds** 2, hemi-ellipsoid, 5–7 × 4–5 mm, albumen entire.

Distribution: Endemic to Vietnam (Thua Thien – Hue, Quang Binh, Quang Tri Provinces).

Phenology: Flowering from February to April and fruiting from March to August.

Ecology: It grows in the evergreen forests, at an altitude of 600–1600 m.

Vernacular name: Hoàng thác diệp lá mỏng

Specimens examined: VIETNAM. Quang Binh Province: Phong Nha-Ke Bang National Park, U Bo Mountain, in broad-leaved evergreen forest, 17°25'51.67"N 106°23'10.57"E, alt. 603 m, 6 December 2024, S. Tagane *et al.* N949 (FOF!, KAG189052!, VNM!); *ibid.*, 17°28'14.41"N 106°22'38.6"E, alt. 855 m, 6 December 2024, S. Tagane *et al.* N1005 (FOF!, KAG189108!, VNM!). Quang Tri Province: Da Krong district, Huong Hiep commune, evergreen forests, alt. 700–1600 m, 16°45'48.8"N 106°44'22.8"E, 15 April 2023, Q.B. Nguyen *et al.*, QB109 (VNM!). Thua Thien – Hue Province: Bach Ma Mountain, “station d’altitude près de Huê le 20 April 39, sol granilo schisteune 1000 a 1200 m”, E. Poilane 29866 (P05377091 image!).

Taxonomic notes: *Psychotria chasaliifolia* Pierre ex Pit. was described in 1924, based on specimens collected in “haut cours du Bo-giang, prov. de Thua-thien” (currently in Thua Thien Hue Province). During our fieldworks in Central Vietnam, we collected some specimens of this species from Quang Binh and Quang Tri Provinces. However, upon observing the morphological characteristics of the species, they did not match any characteristics of the current taxonomic treatment of the genus *Psychotria*. Some of the features distinguishing them from *Psychotria* are the stipules (the stipules of this species has straw-coloured when ripe, caducous and lack of the red hair ring around the base or leaf axil), the leaf blades (thin, green or slightly yellowish when dry), the terminal cymose inflorescences, the pyrene morphology (lacking ridges or grooves on the dorsal surface), and seeds with endosperm not ruminant, features that suggest this species should belong to the genus *Eumachia* rather than *Psychotria*.

Two specimens with barcodes P00604056 and P00604057 at the P herbarium match the original collection site described by Pitard. Therefore, those are syntypes, and we designate the following specimen as lectotype for this species as “Eberhardt N°2826, haut cours du Bo Giang, Prov. de Thua Thiên-Huê, 2 m to 2.5 m, flowers brown” with barcode P00604056 according to Art. 9.3, 9.4, and 9.12 of the International Code of Nomenclature for Algae, Fungi, and Plants (Turland *et al.*, 2018).

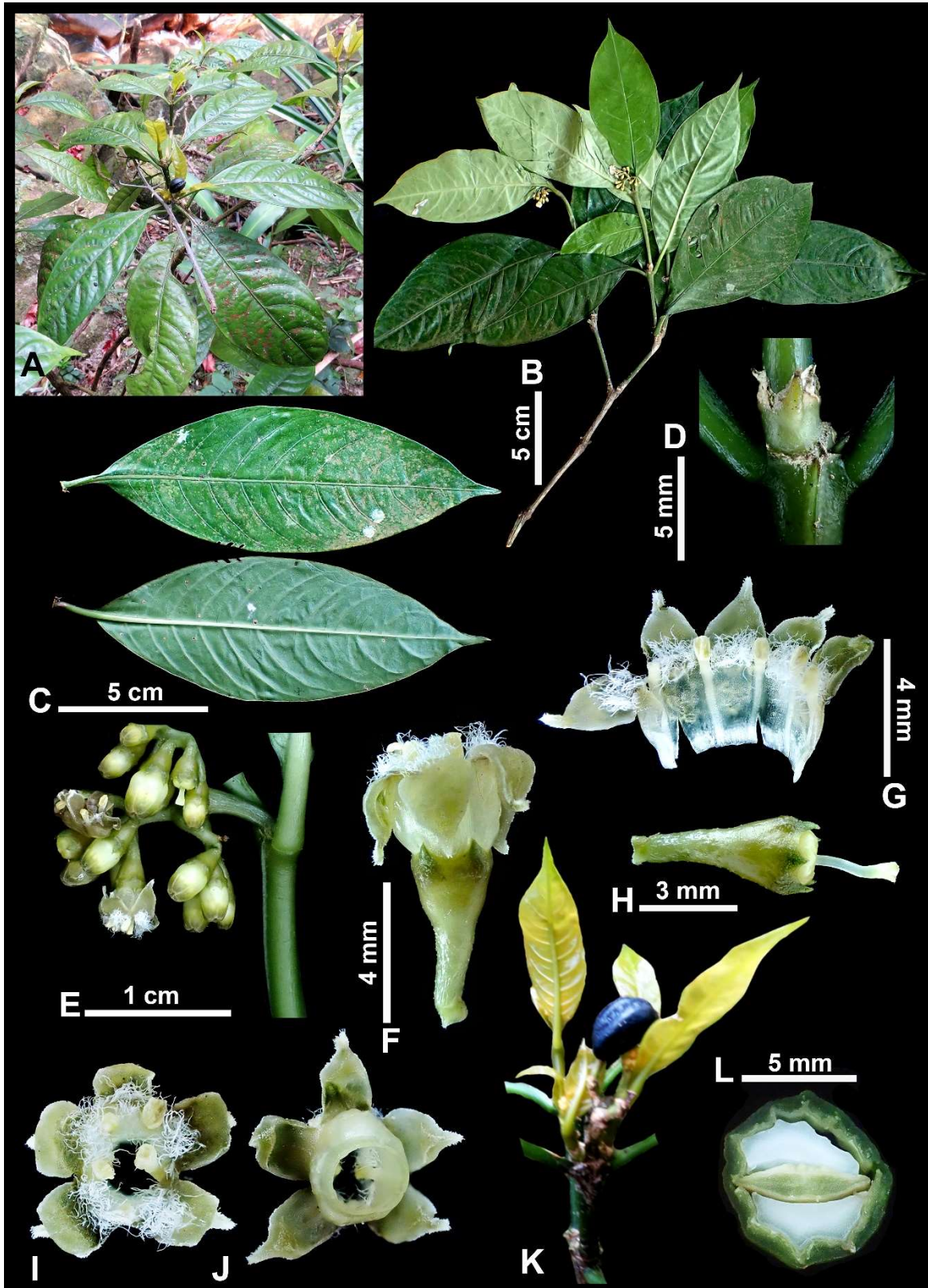


Fig. 3. *Eumachia chasaliifolia* (Pit.) Bao & T.A.Le. **A.** Habit. **B.** Flowering branch. **C.** Leaves blade, adaxial (above), abaxial (below). **D.** Stipules. **E.** Inflorescence. **F.** Flower. **G.** Corolla opened to show stamens. **H.** Pedicel, calyx, style and stigma. **I.** Corolla (Seen top view). **J.** Corolla (Seen bottom view). **K.** Inflorescence. **L.** Fruit cross-section shows pyrenes, seeds and albumen. **Photos:** all by Tuan Anh Le.



2. *Eumachia montana* (Blume) I.M.Turner, Edinburgh J. Bot. 76 (1): 24. 2018. **Fig.4**

≡ *Psychotria montana* Blume, Catalogus: 54. 1823; I.M. Turner, A. Cat. Vas. Pl. Malaya. Gar. Bull. Sing. 47(2): 442. 1995 publ 1997; Taylor et al., Candollea 72: 316. 2017; P.H.Hô, III. Fl. Vietnam 3: 196. 2000; N.N.Tran in N.T. Ban, Checkl. Plant Sp. Vietn. 3: 141. 2005. **Type:** INDONESIA. Java: ?Megamendung, C.L. Blume s.n. (**lectotype:** L0001196 image!, designated by Turner, 2018).
 = *Chassalia montana* (Blume) Miq., Fl. Ned. Ind. 2: 281. 1857.
 = *Uragoga montana* (Blume.) Kuntze, Revis. Gen. Pl. 2: 961. 1891.
 = *Psychotria expansa* Blume, Bijdr. Fl. Ned. Ind.: 963. 1826. = *Chassalia expansa* (Blume) Miq., Fl. Ned. Ind. 2: 280. 1857. **Type:** INDONESIA. Java, C.L. Blume s.n. (**lectotype:** L0001195 image!, designated by Sohmer, 1988).
 = *Psychotria umbellata* Korth., Ned. Kruidk. Arch. 2 (4): 245. 1851., nom. illeg., non Thonning (1827), nec Vellozo (1829).
 = *Uragoga acutifolia* Kuntze, Revis. Gen. Pl. 2: 954. 1891. **Type:** INDONESIA. Sumatra, Korthals s.n. (**lectotype:** L2952601 image!, designated by Turner, 2018).
 = *Psychotria bantamensis* Miq., Fl. Ned. Ind. 2, fasc. 2: 288. 1857. **Type:** INDONESIA. Java, zuidkust van Bantam, *Junghuhn s.n.* (**lectotype:** L0281706 image!, designated by Turner, 2018).
 = *Psychotria viridissima* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 41: 315. 1872. **Type:** MYANMAR. Pegu, Toukyeghat, Chymenah evergreen forest, S. Kurz s.n. (**lectotype:** K000031773 image!, designated by Turner, 2018).

Shrubs, 1–2 m tall. **Twigs** glabrous, dark green *in vivo*, dark brown *in sicco*, cylindrical. **Stipules** triangular, 2–3 mm long, shortly fused near the base, green *in vivo*, straw-coloured *in sicco*, persistent or caducous, not leaving a ring of reddish-brown hairs present at the nodes, glabrous on both surfaces, apex acute, margin entire. **Leaves** simple, opposite-decussate, petiolate; leaf blades elliptic, ovate-elliptic, obovate, obovate-elliptic, 5–17 × 4–8 cm, glabrous on both surfaces, adaxial surface dark green *in vivo*, abaxial surface light green *in vivo*, greenish *in sicco*, apex acuminate or acute, base cuneate to obtuse, margins flat, midrib prominent on both surfaces, secondary veins 7–12 pairs, without domatia; petioles 1–3 cm long, glabrous. **Inflorescence** terminal, cymose, glabrous, pedunculate; peduncle 2–3.5 cm long, glabrous; branched portion corymbiform; bracts triangular, ca. 1 mm long. **Flowers** small, 4- or 5-merous, pedicellate; pedicel ca. 3 mm long, glabrous, bracteoles caducous, not seen. **Calyx** cupuliform, glabrous outside, tube ca. 1 mm long, lobes 4 or 5, triangular, ca. 1 mm long, apex acute, margin entire. **Corolla** white, tube cupuliform, 1–2 mm long, glabrous on both surfaces, lobes 4 or 5, triangular, 2–3 mm long, villous at throat inside, apex cute, incurved. **Stamens** 4 or 5, exserted, filaments ca. 1 mm long, glabrous, erect, anthers oblong-ovate, 0.4–0.8 mm long, dorsifixed. **Ovary** 2-locular, style ca. 1 mm long, glabrous, stigma 2-lobed. **Fruits** drupaceous, green when young, black when ripe, ovoid, 8–11 × 7–9 mm, glabrous, with persistent calyx lobes on the top. **Pyrenes** 2, smooth. **Seeds** 2, hemi-ovoid, 6–9 × 6–7 mm, albumen entire.

Distribution: Vietnam (Ha Noi); Andaman Islands, Assam, Bangladesh, Borneo, Cambodia, Himalaya, India, Java, Malay Peninsula, Myanmar, New Guinea, Singapore, and Thailand (POWO, 2024).

Phenology: Flowering in April to September and fruiting in August to December.

Ecology: It grows in evergreen forests, an altitude of 600–1000 m.

Vernacular name: Hoàng thác diệp núi.

Specimens examined: VIETNAM: Ha Noi: “Province de Sontay”, Vers 700m, Ba Vi Mountain, 26 May 1940, *Petelot 2633* (HN0000054229!, HN0000054230!, VNM00013754!); “dans les forêt, Prov. de Hà Thái”, Ba Vi Mountain “vallée de Lankok”, 1–31 October 1887, B. Balansa 2716 (P00604060 image!); “Tonkin, Dans les forêts au-dessus du village de SoudÚ (Mont Bavi), Prov. de Hà Thái”, 18 October 1887, B. Balansa 2717 (P00604061 image!); “Forêt du Mont Bavi”, 18 December 1994, D.D. Tirvengadam et al. 3252 (P04610184 image!); Forêt du Mont Bavi, 18 December 1994, D.D. Tirvengadam et al. 3271 (P04610182 image!), 3272 (P04610185 image!); Ba Vi National Park, evergreen forest, alt. 800 m, 21°04'11.60"N, 105°21'40.28"E, 20 January 2024, Q.B. Nguyen QB098 (VNM!).

Taxonomic notes: Taylor et al. (2017) mentioned three species from Asia, Australasia and the Pacific region may belong in *Eumachia*, including *Psychotria expansa*, *P. montana*, and *P. pilita*, but the identities of these names have not been confirmed. Turner (2018) treated *P. expansa* as a synonym of *P. montana* based on some arguments including Valenton (1909), Backer and Bakhuizen van de Brink (1965), and Sohmer (1988) and transferred this species to the genus *Emachia* along with its lectotypification.

3. *Eumachia ovoidea* (Pierre ex Pit.) Barrabé, C.M.Taylor & Razafim., Candollea 72 (2): 313. 2017. **Fig.5**

≡ *Chassalia ovoidea* Pierre ex Pit. in P.H.Lecomte et al., Fl. Indo-Chine 3: 366. 1924 = *Psychotria ovoidea* (Pierre ex Pit.) P.H.Hô, III. Fl. Vietnam 3(1): 201. 2000, nom. illeg. = *Psychotria vietnamensis* Ruhsam, Bot. J. Linn. Soc. 157: 117. 2008. **Type:** VIETNAM. Province unlocated, “Cochinchine, Go-viap, Bien-hoa”, 1862–1866, C. Thorel 795 (**lectotype:** P04009119 image!, designated here, **isolectotypes:** P04009119 images!, P04009120 images!, P04009121 images!, P04009122 images!, P04009123 images!, P04009127 images!, VNM00013688!).

Shrubs, 1–2 m tall. **Twigs** puberulent, dark green *in vivo*, brown *in sicco*, cylindrical. **Stipules** triangular, to ovate or elliptic, 2–3 mm long, shortly fused near the base, green *in vivo*, straw-colored *in sicco*, persistent or caducous not leaving a ring of reddish-brown hairs present at the nodes, puberulent to glabrous on both surfaces, apex triangular or 2-lobed, lobes linear, margin fimbriate. **Leaves** simple, opposite-decussate, petiolate; leaf blades elliptic, ovate-elliptic, lanceolate-elliptic to elliptic oblong, 7–18 × 3–8 cm, adaxial surface glabrous, dark green *in vivo*, abaxial surface puberulent, light green *in vivo*, greenish *in sicco*, apex acuminate or acute, base cuneate to obtuse, margins flat, midrib prominent on both surfaces, secondary veins 6–11 pairs, without domatia; petioles 0.8–1.2 cm long, puberulent. **Inflorescence** terminal, cymose, puberulent, pedunculate; peduncle 2–4 cm long, puberulent; branched portion corymbiform; bracts triangular, ca. 1 mm long, caducous. **Flowers** small, distylous, 4- or 5-merous, pedicellate; pedicel ca. 3 mm long, glabrous, bracteoles caducous, not seen. **Calyx** brownish-green, cupuliform, puberulent outside, tube ca.

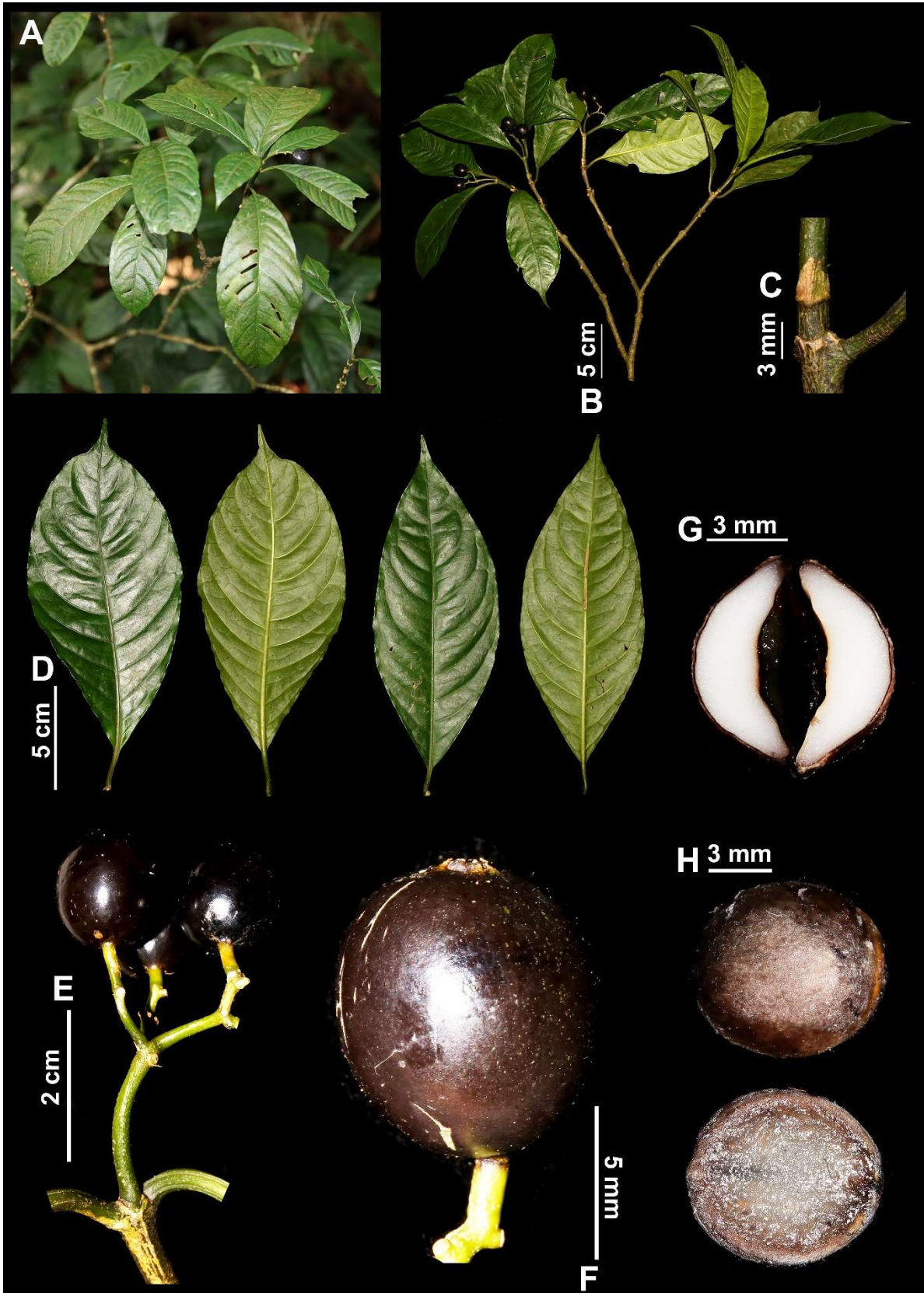


Fig. 4. *Eumachia montana* (Blume) I.M.Turner. A. Habit. B. Fruiting branch. C. Stipules. D. Leaves. E. Inflorescence. F. Fruit. G. Cross-section of pyrenes, showing albumen. H. Pyrenes. Photos: all by Quoc Bao Nguyen.

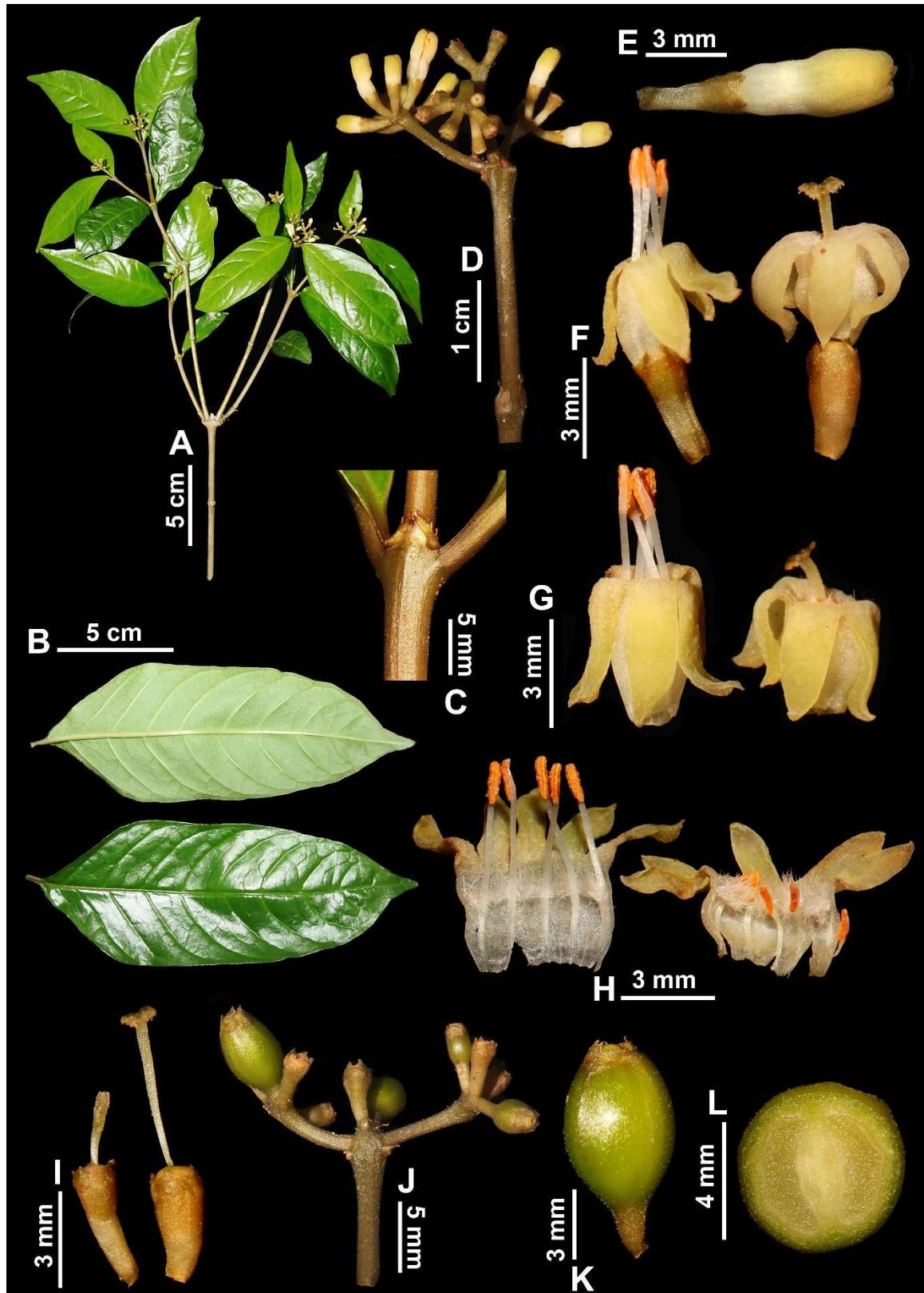


Fig. 5. *Eumachia ovoidea* (Pierre ex Pit.) Barrabé, C.M.Taylor & Razafim. **A.** Flowering branch. **B.** Leaves blades, abaxial (above) and adaxial (below). **C.** Stipules. **D.** Inflorescence. **E.** Flower bud. **F.** Flowers, short-styled (left) and long-styled (right). **G.** Corollas. **H.** Corollas, opened showing stamens and villous hairs at throat. **I.** Flowers corollas removed, showing styles and stigmas. **J.** Young infructescence. **K.** Young fruit. **L.** Young fruit cross-section showing pyrenes, seeds, and albumen. **Photos:** all by Quoc Bao Nguyen.



1 mm long, lobes 4 or 5, triangular, ca. 0.8 mm long, apex acute, margin ciliate. **Corolla** white to yellowish white, tube lighter colour than lobes, tube 2–3 mm long, glabrous on both surfaces except villous throat inside, lobes 4 or 5, oblong-triangular, 3–4 mm long, apex acute, incurved. **Stamens** 4 or 5, inserted or exerted, filaments 0.8–2 mm long, glabrous, erect, anthers oblong-ovate, 1–1.5 mm long, dorsifixed. **Ovary** 2-locular, style 1–3.5 mm long, glabrous to puberulent, stigma 2-lobed, not flared to widely flared, papillate. **Fruits** drupaceous, green when young, red when ripe, ellipsoid, 6–8 × 4–6 mm, puberulent, with persistent calyx lobes. **Pyrenes** 2, smooth or shallowly 3- or 4-ridged. **Seeds** 2, hemi-ellipsoid, 4–6 × 4–5 mm, albumen entire.

Distribution: Vietnam (Dong Nai, Ho Chi Minh, Thua Thien – Hue, Tay Ninh Provinces), Cambodia.

Phenology: Flowering in May to September and fruiting in July to November.

Ecology: This species was found growing in evergreen forest, at elevations about 800 m.

Vernacular name: Hoàng thác diệp lá bầu dục.

Specimens examined: VIETNAM. Thua Thien – Hue Province: Bach Ma Mountain, 20 April 1939, *E. Poilane s.n.* (VNM00013689!); Haie à Phu mi, 1875, *Godefroy s.n.* (P04009126 image!). Tay Ninh Province, 6 November 1919, *E. Poilane 731* (P04009112 image!); Arbuste de 0.80m. de haut. 6 November 1919, *E. Poilane 740* (P04009114 image!, VNM00013687!); Ma Thien Lanh - Mt Ba Den, evergreen forest, alt. 50m, 11°23'21.05"N 106°09'15.41"E, 5 June 2023, *Q.B. Nguyen, T.V. Nguyen, H.P.V. Le QB088* (VNM!). Dong Nai Province: ad Tong hen in Prov. Bien Hoa, September 1865, *Pierre 6249* (P04009124 image!, P04009125 image!); *ibid.*, *L. Pierre 1975* (P04009115 image!). Ho Chi Minh: Prov. de Saigon, 1875, *Harmand-Godefroy s.n.* (P04009128 image!). Conchinchine (Southern Vietnam, Province unlocated): Plaine des Tombeaux, January 1868, *Talmy s.n.* (P04009108 image!); “Cochinchine, Go-viap, Bien-hoa”, 1862–1866, *C. Thorel 791* (K000777232 image!). CAMBODIA. Pursat Province: Bords de la rivièrre de Pursat, 6 December 1875, *Harmand-Godefroy 310* (P04605385 image!, P04009109 image!, P00400111 image!).

Taxonomic notes: The species *Chassalia ovoidea* was described in 1924, shortly after *Chassalia curviflora* (Wall.) Thwaites in “*Flore générale de l’Indochine*”. Later on, the species was transferred to the genus *Psychotria* under the name *P. ovoidea* (Pierre ex Pit.) P.H.Hô (Pitard, 1924; Ho, 2000). However, this scientific name is illegitimate because there was already *P. ovoidea* Wall. ex Hook.f described earlier in 1880. Rusham *et al.* (2008) proposed a new name for the species, *P. vietnamensis* Rusham, but the authors did not designate a lectotype from the syntype specimens of the species. Taylor *et al.* (2017) noted that the species had more common characteristics with the *Eumachia* than *Psychotria*, and the morphology of the species differed from previously described *Eumachia* species. As a result, the species was fully transferred to the *Eumachia* with the name *Eumachia ovoidea* (Pierre ex Pit.) Barrabé, C.M. Taylor & Razafim. (Taylor *et al.*, 2017). From our field surveys in Tay Ninh Province, Southwest Vietnam, we collected flowering and fruiting specimens of this species, whose characteristics showed that placing this species in

the genus *Eumachia* was appropriate. Since previous studies had been designated the lectotype of this species, we here formally select the lectotype of this species in this study. Among its syntypes *Thorel 971*, *Thorel 795*, *Harmand-Godefroy 310*, *Harmand-Godefroy s.n.*, *Pierre 1975*, *Pierre 6249*, *Poilane 740*, and *Talmy s.n.* all are preserved at P, the specimen P04009119 (“*Go-viap, Bien-hoa, 1862–1866*” *Thorel 975*) is the only specimen containing all vegetative and reproductive parts and we selected this specimen as lectotype of this species.

4. *Eumachia sondangii* Bao & Tagane, *sp. nov.*

Fig.6

Type: VIETNAM. Khanh Hoa Province, Cam Lam district, Suoi Cat commune, Hon Ba Nature Reserve, in the evergreen forest, alt. 1400 m, 12°07'10.12"N, 108°57'16.62"E, 30 June 2023, *Q.B. Nguyen, B.V. Truong, V.L. Mang QB083* (**holotype:** VNM00071171!).

Diagnosis: *Eumachia sondangii* resembles *E. chasaliifolia* in having elliptic to lanceolate-elliptic leaf blades, cymose inflorescence, and pedicles 0.5–1 cm long, but differs by its smaller leaf blades (6–16 × 2–4 cm in *E. sondangii* vs. 10–22 × 5–7 cm in *E. chasaliifolia*), fewer secondary veins (5–8 pairs vs. 9–11 pairs), stipules acute or shortly 2-lobed at apex (vs. never lobed), and stigma not flared (vs. widely flared).

Shrubs, 1–2 m tall. **Twigs** puberulent when young, glabrescent, green *in vivo*, brownish gray *in sicco*, cylindrical. **Stipules** triangular, 2–3 mm long, shortly fused near the base, green *in vivo*, straw-colored *in sicco*, persistent or caducous not leaving a ring of reddish-brown hairs present at the nodes, glabrous on both surfaces, apex acute or shortly 2-lobed, lobes triangular, margin entire. **Leaves** simple, opposite-decussate, petiolate; leaf blades elliptic, ovate-elliptic, ovate, lanceolate-elliptic to elliptic-oblong, 6–16 × 2–4 cm, glabrous on both surfaces, adaxial surface dark green *in vivo*, abaxial surface light green *in vivo*, greenish *in sicco*, apex acuminate or acute, base cuneate to obtuse, margins flat, midrib prominent on both surfaces, secondary veins 5–8 pairs, without domatia; petioles 1–2.5 cm long, glabrous. **Inflorescence** terminal, cymose, puberulent, pedunculate; peduncle 0.5–1 cm long, puberulent; branches short, puberulent; bracts triangular, ca. 1 mm long, barely visible. **Flowers** small, 4- or 5-merous, pedicellate; pedicel ca. 1 mm long, glabrous, bracteoles caducous, not seen. **Calyx** brownish-green, cupuliform, glabrous outside, tube 1–1.5 mm long, lobes 4 or 5, triangular, ca. 0.5 mm long, apex acute, margin entire. **Corolla** white to yellowish white, tube lighter colour than lobes, tube cupuliform, 1.5–2 mm long, glabrous on both surfaces except villous throat inside, lobes 4 or 5, triangular, 2–2.5 mm long, puberulent outer surfaces, apex acute, incurved. **Stamens** 4 or 5, exerted, filaments ca. 1 mm long, glabrous, erect, anthers oblong-ovate, 0.5–0.7 mm long, dorsifixed. **Ovary** 2-locular, style ca. 2 mm

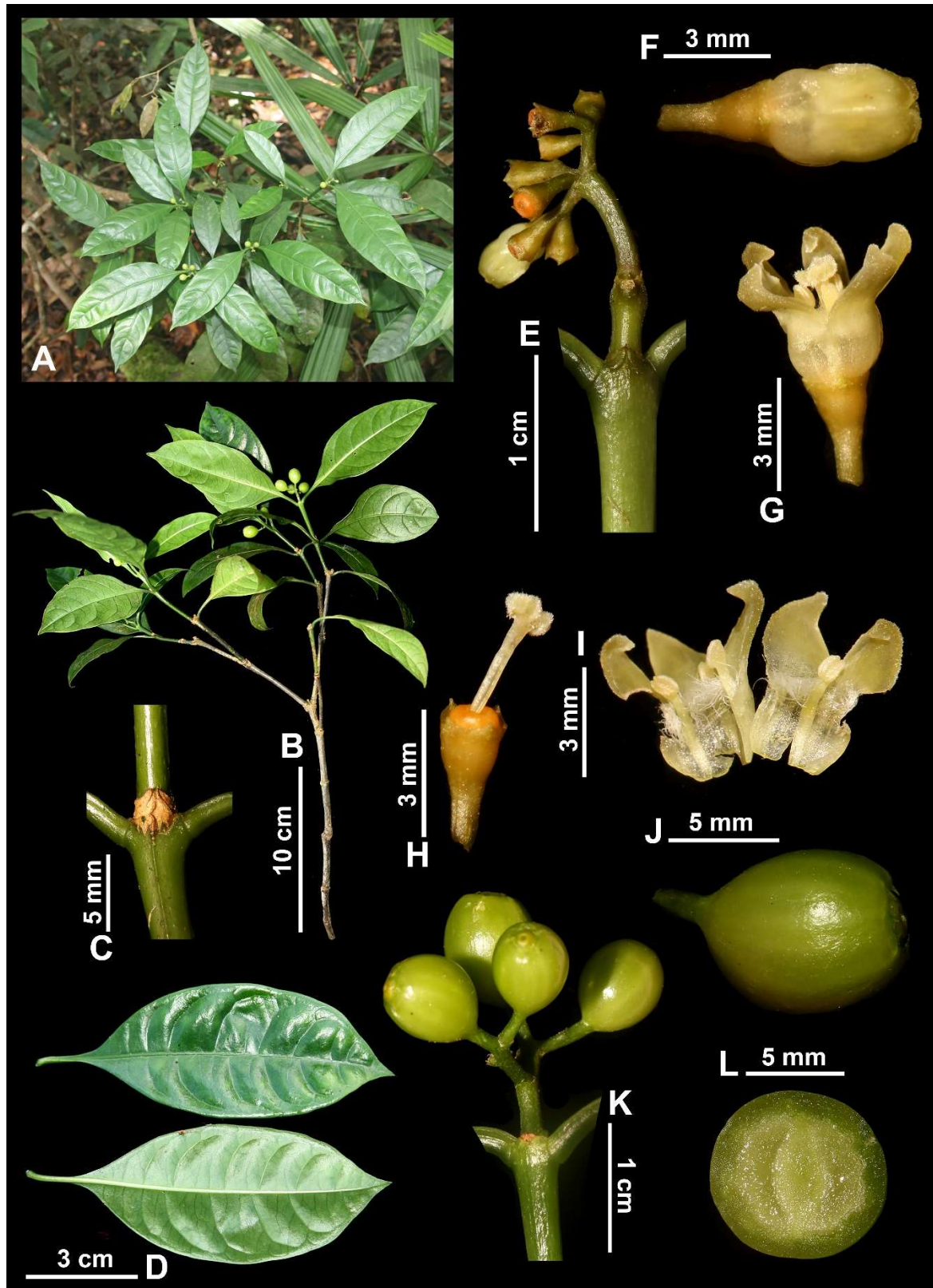


Fig. 6. *Eumachia sondangii* Bao & Tagane. **A.** Habit. **B.** Fruiting branch. **C.** Stipules. **D.** Leaves blades, adaxial (above) and abaxial (below). **F.** Flower bud. **G.** Flower. **H.** Flower, corolla removed showing ovary, style and stigma. **I.** Corolla open showing stamens and villos hairs at throat. **J.** Young fruit. **K.** Young Infructescence. **L.** Young fruit, cross-section showing pyrenes, seeds, and albumen
Photos: all by Quoc Bao Nguyen.



long, glabrous, stigma 2-lobed, widely flared, papillate. **Fruits** drupaceous, green when young, black when ripe, ellipsoid to subovoid, 7–11 × 4–8 mm, glabrous, with persistent calyx lobes. **Pyrenes** 2, smooth or shallowly 3- or 4-ridged. **Seeds** 2, hemi-ellipsoid or hemi-subovoid, 4–7 × 3–5 mm, albumen entire.

Phenology: Flowering from May to September, fruiting from July to December.

Distribution and habitat: The new species is so far known only from the type locality, Hon Ba Nature Reserve, Khanh Hoa Province. It grows in lower montane evergreen forests at an elevation of 1000–1400 m.

Etymology: The species epithet is name after Dang Van Son, who is a curator of the VNM Herbarium, Vietnam and the 1st author's PhD advisor. We honor his great contributions to the study of plant diversity in Vietnam. Thanks to his kind support, we were able to collect and found this new species.

Vernacular name: Hoàng thác diệp Đặng Văn Sơn.

Examined specimens (paratypes): VIETNAM. Khanh Hoa Province: Hon Ba Nature Reserve, Mt. Hon Ba, in transect line placed on slope of lower montane evergreen forest, alt. 1336 m, 12°07'11.42"N, 108°57'25.76"E, 26 November 2014, *H. Toyoma et al.* V2263 (FU!, VNM!).

Preliminary conservation assessment: Data Deficient (DD). We observed two small populations each consisting of ca. 30 mature individuals in Hon Ba mountain. The mountain is located within Hon Ba Nature Reserve and covered by thick evergreen forests with a total land area of approximately 209.8 km². It is conceivable that additional groups of mature individuals may inhabit the region and its environs. Therefore, a comprehensive survey is needed to investigate the distribution of this species in the area and to reassess its status according to IUCN criteria (IUCN, 2024).

Taxonomic notes: *Eumachia sondangii* also resembles *E. montana*. Both species share characters such as triangular stipules and black fruits when ripe. However, *E. sondangii* is distinguished from *E. montana* by its narrower leaf blades (2–4 cm wide in *E. sondangii* vs. 4–8 cm wide in *E. montana*) and shorter peduncle on inflorescence (0.5–1 cm long vs. 2–3.5 cm long).

5. *Eumachia straminea* (Hutch.) Barrabé, C.M. Taylor & Razafim., *Candollea* 72(2): 314. 2017. **Fig. 7**

≡ *Psychotria straminea* Hutch., *Pl. Wilson.* 3: 416. 1916. **Type:** CHINA. Yunnan: Mengtze, mountains to southeast, 1613 m, *s.d.*, *Henry 11138* (**holotype:** K000777057 image!, **isotype:** NY00132880 image!, LE01016128 image!).

Shrubs, 1–2 m tall. **Twigs** glabrous, green *in vivo*, yellowish brown *in sicco*, cylindrical. **Stipules** triangular, ovate or elliptic, 3–4 mm long, shortly fused near the base, green *in vivo*, straw-coloured *in sicco*, persistent or caducous not leaving a ring of reddish-brown hairs present at the nodes, glabrous on both surfaces, apex triangular or 2-lobed, lobes linear, margin entire. **Leaves** simple, opposite-decussate, petiolate; leaf blades elliptic, ovate-elliptic, lanceolate-elliptic to elliptic oblong, 6–28

× 2–7 cm, glabrous on both surfaces, adaxial surface dark green *in vivo*, abaxial surface light green *in vivo*, greenish *in sicco*, apex acuminate or acute, base cuneate to obtuse, margin flat, midrib prominent adaxially, secondary veins 5–10 pairs, without domatia; petioles 1–4 cm long, glabrous. **Inflorescence** terminal, cymose, glabrous, pedunculate; peduncle 1.5–3 cm long, glabrous; branched portion corymbiform; bracts triangular, ca. 1 mm long. **Flowers** small, 4- or 5-merous, pedicellate; pedicel ca. 3 mm long, glabrous; bracteoles caducous, not seen. **Calyx** brownish-green, cupuliform, glabrous outside, tube ca. 1 mm long, lobes 4 or 5, triangular, ca. 1 mm long, apex acute, margin entire. **Corolla** white to greenish white, tube lighter colour than lobes, tube 1.5–2.5 mm long, glabrous on the both surfaces except villous throat inside, lobes 4 or 5, oblong-triangular, 2.5–3 mm long, apex cuneate, incurved. **Stamens** 4 or 5, exerted, filaments ca. 2 mm long, glabrous, erect, anthers oblong-ovate, 1–1.4 mm long, dorsifixed. **Ovary** 2-locular, style ca. 1.8 mm long, glabrous, stigma 2-lobed. **Fruits** drupaceous, green when young, red when ripe, ellipsoid to subovoid, 7–10 × 5–9 mm, glabrous, with persistent calyx lobes. **Pyrenes** 2, smooth or shallowly 3- or 4-ridged. **Seeds** 2, hemi-ellipsoid or hemi-subovoid, the ventral face of seeds deeply concave, 5–7 × 4–7 mm, albumen entire.

Distribution: Vietnam (Kon Tum, Khanh Hoa, Ninh Thuan Provinces), China (Hainan).

Phenology: Flowering from January to July and fruiting from June to January in following year.

Ecology: It was found in evergreen forest, an altitude of 700–1600 m.

Vernacular name: Hoàng thác diệp gân vàng.

Specimens examined: VIETNAM. Kon Tum Province: Dak Glei, “Mt Dai Ding près de Dak Gley, Sol granitique couvert de vieille forêt”, 18 January 1947, *E. Poilane 32781* (P00604071 image!, P00604072 image!). Khanh Hoa Province: Nha Trang city, 25 October 1922, *E. Poilane 3252* (P04593053 image!); Hon Ba Nature Reserve, Mt. Hon Ba, in transect line placed on slope of lower montane evergreen forest, alt. 1336 m, 12°07'11.42"N, 108°57'25.76"E, 26 November 2014, *H. Toyoma et al.* V2262 (FU!, VNM!); *ibid.*, alt. 1500 m, 12°06'55.66"N, 108°56'36.82"E, 30 June 2023, *Q.B. Nguyen et al. QB081* (VNM!). Ninh Thuan Province: “Annam. Ca-na, Pro: Phanrang”, 29 November 1923, 750 m alt., *E. Poilane 8886* (P05377093 image!). CHINA. Yunnan: Mengtze, S.E. forests, 5000m, *Henry 11428* (E00873451 image!, K005668684 image!, LE01016129 image!); Yunnan: Mengtze, S.E. forests, 5000m, *Henry 13461* (E00873449 image!, K005668685 image!).

Taxonomic notes: Previously, *Psychotria straminea* was mentioned to resemble *P. montana* (now a synonym of *E. montana*) (Hutchinson, 1917), but differs in its having smaller and denser inflorescences, slightly swollen ridged fruits, and the ventral face of seeds deeply concave (Hutchinson, 1917). Additionally, the species may be compared with *E. ovoidea*, but differs in its glabrous stem, abaxial leaf surface (vs. puberulent in *E. ovoidea*), and white to greenish white flowers (vs. white to yellowish white).

The distribution of *E. straminea* has been reported to include Vietnam (Chen and Taylor, 2011; Taylor *et al.*,

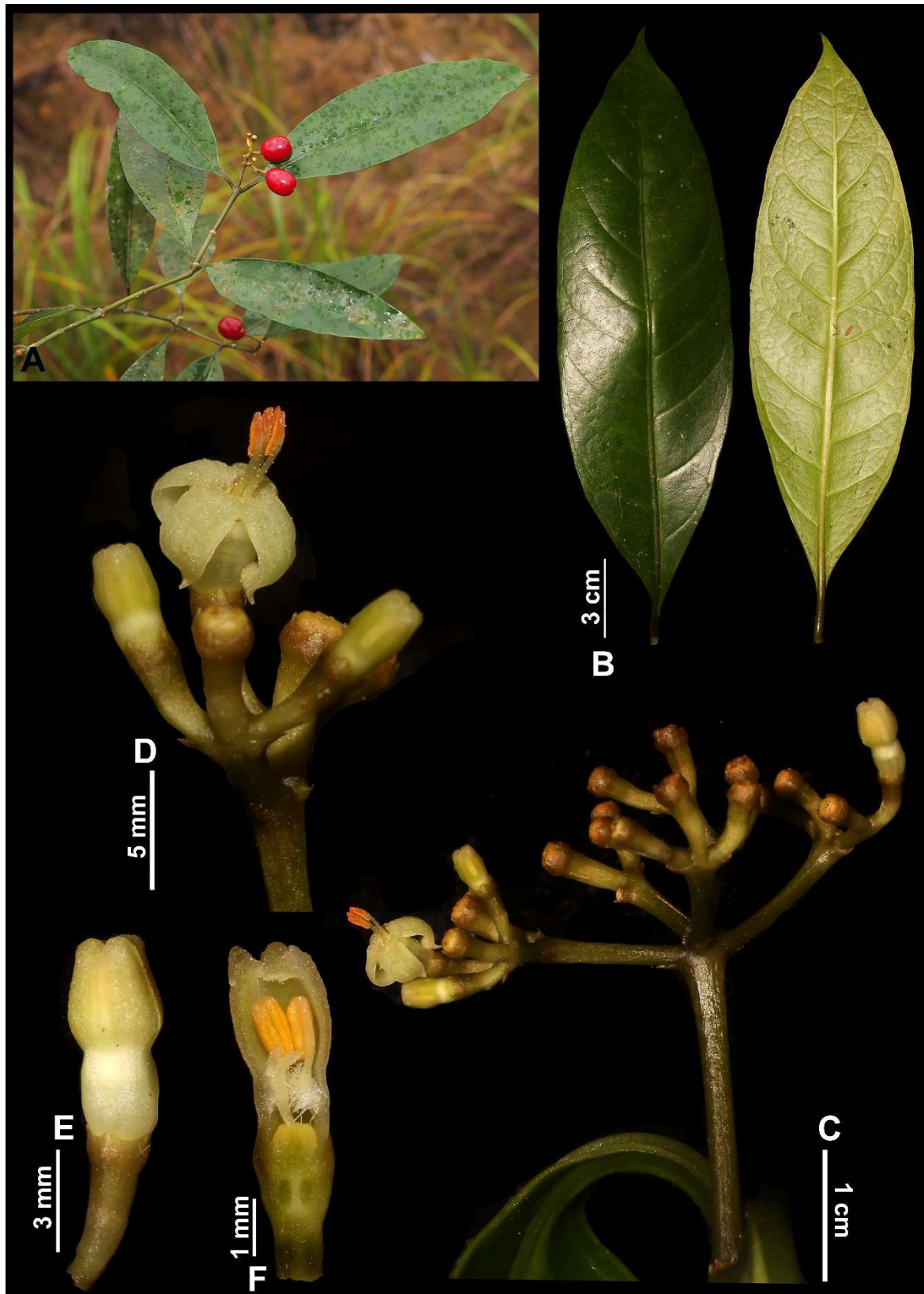


Fig. 7. *Eumachia straminea* (Hutch.) Barrabé, C.M. Taylor & Razafim. **A.** Fruiting branch. **B.** Leaves, adaxial surface (left) and abaxial surface (right). **C.** Inflorescence. **D.** Part of inflorescence showing flower buds and flower. **E.** Flower bud. **F.** Longitudinally dissected flower bud showing stamens, style, stigma and ovary. **Photos:** **A:** Shuichiro Tagane; **B–F:** Quoc Bao Nguyen.



2017). However, no concrete evidence has been provided. During our field surveys in Khanh Hoa Province, specimens of this species were collected. Also, we found out several collections of this species during our examination of collections at the P herbarium. We here report this species based on firm evidences (i.e. specimens), making it the first confirmed occurrence of *E. straminea* in Vietnam.

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