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Two new species of *Mallotus* (Euphorbiaceae) from Vietnam

Van-Son DANG[1,2,*], Takenori YAMAMOTO[3], Quoc Bao NGUYEN[1], Quoc Trong PHAM[1], Ba Vuong TRUONG[1], Tran Vy NGUYEN[1,2], Phetlasy SOULADETH[4], Deuanta KONGXAISAVAT[4], Kaito YAMAZAKI[5,6], Shuichiro TAGANE[3]

1. *Institute of Life Sciences, Vietnam Academy of Science and Technology, 85 Tran Quoc Toan Street, District 3, Ho Chi Minh City, Vietnam.* ***2.*** *Graduate University of Science and Technology, Vietnam Academy of Science and Technology, 18 Hoang Quoc Viet Street, Cau Giay District, Ha Noi City, Vietnam.* ***3.*** *Kagoshima University Museum, Kagoshima University, 1-21-30, Korimoto, Kagoshima, 890-0065, Japan.* ***5.*** *Japan Wildlife Research Center, Tokyo, Japan.* ***4.*** *Faculty of Forest Science, National University of Laos, Dongdok Campus, Xaythany District, Vientiane Capital, Laos.* ***6.*** *Graduate School of Science and Engineering, Kagoshima University, 1-21-35 Korimoto, Kagoshima, 890-0065, Japan.* [*]*Corresponding author's email: dvsonitb@gmail.com*

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ABSTRACT: Two new species of *Mallotus* (Euphorbiaceae), *M. ninhthuanensis* V.S.Dang, Bao & Tagane sp. nov. and *M. vinhhyensis* V.S.Dang, Tagane & Tk.Yamam. sp. nov. from Nui Chua National Park in Ninh Thuan Province, south-central Vietnam, are described and illustrated. Information on their distribution, habitat and ecology, phenology, and vernacular names is provided. Based on the available data, two new species are assigned to Endangered (EN) according to Guidelines for Using IUCN Red List Categories and Criteria.

KEY WORDS: Acalyphoideae, endemic species, *Mallotus ninhthuanensis*, *Mallotus vinhhyensis* Nui Chua, taxonomy, Vinh Hy.

INTRODUCTION

The genus *Mallotus* Lour. is a large genus belonging to the subfamily Acalyphoideae of the Euphorbiaceae comprising around 118 currently recognized species (POWO, 2024). The genus is mainly distributed in tropical and subtropical regions in the Old World, extending to Australia and the Pacific (Webster, 1994; Sierra *et al.*, 2010). Species of *Mallotus* are typically shrubs, but some are small trees and climbers, usually dioecious; flowering branches usually flattened (van Welzen and Chayamarit, 2020). The genus is characterized by indumentum of simple and stellate hairs, upper leaf surface with black to brown extrafloral nectaries and lower often glandular-scaly, base usually with 2 or more glands, flowers without petals, stamens 15–250, stamens 15–250, thecae often separated by broad connective, latter often with apical clumps of cells, undivided stigmas and lobed capsules to indehiscent drupes, often armed with spines (Sierra *et al.*, 2005; Qiu and Michael, 2008; Racarcha and Thammarong, 2020; van Welzen and Chayamarit, 2020). In Vietnam, 35 species of the genus *Mallotus* have been recorded according to recent national checklists and floras (Pham, 2000; Nguyen, 2007; Nguyen and Nguyen, 2014).

During our botanical survey in Nui Chua National Park, Ninh Thuan Provine, South Central Vietnam in December 2023, two unknown *Mallotus* species were collected with additional attention. After the careful examination with relevant taxonomical literature from Vietnam and surrounding countries, they were convinced to be undescribed species. We here described them as two new species, namely *Mallotus ninhthuanensis* V.S.Dang, Bao & Tagane and *Mallotus vinhhyensis* V.S.Dang, Tagane & Tk.Yamam.

MATERIALS AND METHODS

The specimens of the new species were collected from Nui Chua National Park, Ninh Thuan Province, South Central Vietnam, and deposited in the herbaria VNM, KAG and FOF. The relevant taxonomic literature (e.g. Pax and Hoffmann, 1914; Airy Shaw, 1972, 1975; Pham, 2000; Slik and van Welzen, 2001; Nguyen, 2007; van Welzen and Chayamarit, 2020) has been extensively consulted, as well as comparing morphological characters available materials of *Mallotus* at FOF, HN, KAG, TNS and VNM, available specimens highly digital scanned on the online Herbaria including P, K, JSTOR Global Plants. Photographs in the field were taken using an Olympus E-5 camera. All description of morphological characteristics follows Beentje and Williamson (2016). Assessment of the conservation status according to the IUCN Red List Categories and Criteria (IUCN, 2024).

TAXONOMIC TREATMENT

Mallotus ninhthuanensis V.S.Dang, Bao & Tagane, ***sp. nov.*** **Figs. 1 & 2**

Type: VIETNAM, Ninh Thuan Province, Nui Chua National Park, in evergreen forest, 11.77264°N, 109.16927°E, elevation 259 m, 22 December 2023, *S.Tagane, V.S.Dang, P.Souladeth, B.V.Truong, T.V.Nguyen, Q.T.Pham, Q.B.Nguyen, D.Kongxaisavath, T.Yamamoto, K.Yamazaki, N374* (holotype VNM! [VNM00070331], isotypes FOF! [FOF0009045], KAG! [KAG186373], TAI!).

Table 1. Comparison of morphological characteristics of ***Mallotus ninhthuanensis*** and closely related species.

	Mallotus ninhthuanensis	***Mallotus sathayensis***
Habit	shrubs to small trees	shrubs
Indumentum on twigs	sparsely hairy	densely hairy
Stipules	5 mm long	inconspicuous
Non-reduced leaves	18.5–28.5 × 6.3–11.3 cm	12–15 × 3.5–4 cm
Leaf base	obtuse, acute, cuneate	acute angle, narrow or slightly sloping
Petioles	2–7 mm long	2–3 mm long
Capsule size	*ca*. 11 × 7 mm	*ca*. 13 × 10 mm

Diagnosis: *Mallotus ninhthuanensis* is similar to *M. sathayensis* Thin endemic to Vietnam in their shrub habit and axillary inflorescence, but distinguished by its indumentum on twigs (sparsely hairy in *M. ninhthuanensis* vs. densely hairy in *M. sathayensis*), stipules 5 mm long (vs. inconspicuous), larger non-reduced leaves (18.5–28.5 × 6.3–11.3 cm vs. 12–15 × 3.5–4 cm), and smaller fruits (*ca*. 11 × 7 mm vs. *ca*. 13 × 10 mm) (Table 1).

Shrubs to small trees, 1–2 m tall, dioecious. **Indumentum** simple to tufted to stellate, white, *ca*. 0.2 mm long. **Young twigs** terete, 1.5–2.5 mm in diam., reddish brown, puberulent, old twigs glabrous. **Stipules** narrowly triangular, 5 mm long, densely hairy on both surfaces, apex attenuate, caducous. **Leaves** opposite, each pair unequal in size. **Non-reduced leaves**: petioles 1.2–2.5 cm long, hairy, swollen at both ends; blades elliptic to obovate-oblong, 18.5–28.5 × 6.3–11.3 cm, apex acuminate, acumen up to 1.8 cm long, base obtuse, acute, cuneate, margin crenate, adaxial surface reddish brown, glabrous, abaxial surface very pale creamy brown, glabrous except sparse hairs on midrib and secondary veins, basal glands 2, suborbicular to elliptic, *ca*. 1–2 mm long, 1–2 mm from petiole attachment; venation pinnate, midrib prominent on both surfaces, secondary veins 10–14 on each side, prominent abaxially, tertiary veins scalariform-reticulate, prominent abaxially. **Reduced leaves**: petiole 2–7 mm long, hairy; blades ovate to ovate-elliptic, 6.2–9.2 × 3.0–5.7 cm, secondary veins 6–7 on each side. **Staminate inflorescences** racemose, axillary, 1–2 cm long, hairy, with 2–3 nodes, 3 flowers per node; bracts triangular, *ca.* 1.5 mm long, densely hairy both sides. **Staminate flowers** on pedicels 3–6 mm long, densely hairy; sepals 3, ovate-triangular, 3–4 × 1.5–2 mm, papillose adaxially, densely hairy abaxially; petals and disc absent; stamens 15–20, filaments 2–4 mm long, glabrous, anthers ovoid, *ca.* 0.5 mm long. **Pistillate inflorescences** 2–4 cm long, with 2–3 nodes, one flower per node; bracts triangular, *ca.* 2 mm long, densely hairy on both surfaces. **Pistillate flowers** on pedicels 4–12 mm long; sepals 3, ovate-triangular, 2–3 × 1.5–2 mm, densely hairy abaxially; petals and disc absent; ovary 3-locular, densely covered with hairs, style *ca.* 1 cm long, puberulous, stigma 3-lobed, 2–3 mm long, plumose. **Capsules** dehiscent, *ca.* 11 × 7 mm, puberulous, column 4–5 mm long, pericarp *ca.* 0.4 mm thick. **Seeds** subglobose, 5–6 mm in diam., smooth, dark brown.

Phenology: Flowering and fruiting specimens were collected in December.

Distribution: Vietnam (so far known only from the type locality).

Habitat and Ecology: The new species grows in evergreen forest at an elevation of 259 m.

Etymology: The epithet "*ninhthuanensis*" is derived from the type locality Ninh Thuan Province, Vietnam.

Vernacular name: Ba bét ninh thuận.

Provisional conservation assessment: At present, only one population of *Mallotus ninhthuanensis* has been discovered with about 70 individuals at its type locality. The locality is inside the national park and the forest has been well-protected. However, as the locality is beside natural trails, where the species might be easily affected by human tourism activities. Thus, until more information becomes available, the conservation status of this new species is assessed as Endangered (EN) according to the IUCN Red List Categories and Criteria B2a,b(i, ii, iii) + D (IUCN 2024).

Fig 1. Holotype of ***Mallotus ninhthuanensis*** V.S.Dang, Bao & Tagane (VNM [VNM00070331], photo by Van-Son Dang).

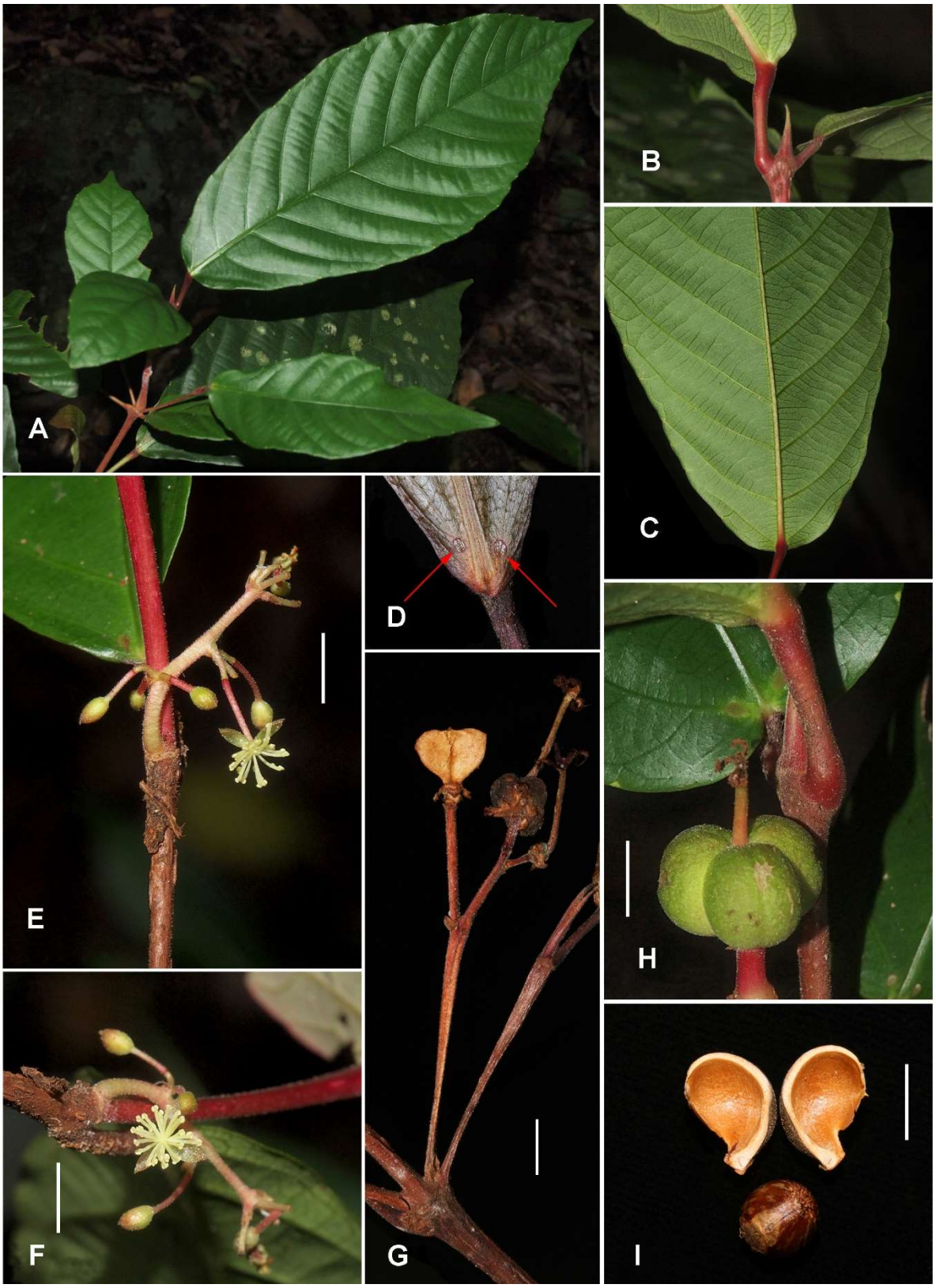

Fig 2. ***Mallotus ninhthuanensis*** V.S.Dang, Bao & Tagane. **A.** Leafy twig, **B.** Branch apex showing opposite leaves and an acuminate bud, **C.** Portion of abaxial leaf surface, **D.** Base of leaf upper surface showing 2 basal glands, **E–F.** Staminate inflorescences, **G.** Infructescence, **H.** Fruit, **I.** 2-valved part of capsule, showing inside and seed (A–C, E, F, H: photos by Shuichiro Tagane and D, G, I: photos by Nguyen Quoc Bao). Scale bars = 5 mm.

Table 2. Comparison of morphological characteristics of ***Mallotus vinhhyensis*** and closely related species.

	Mallotus vinhhyensis	***Mallotus havilandii***
Habit	shrubs or small trees, 2 m tall	small trees, up to 8 m tall
Stipules	6–7 mm long	6–11 mm
Non-reduced leaves	8.5–19 × 3–6 cm	11–24.5 × 3.5–8 cm
Reduced leaves	6–15 × 5–13 mm	15–30 × 14–22 mm
Basal macular glandes	2–4 per sides, only on basal secondary veins	11–16 per side, often on all veins
Capsule size	*ca*. 11 × 8 mm	*ca*. 10 × 7 mm

Mallotus vinhhyensis V.S.Dang, Tagane & Tk.Yamam.**, *sp. nov.*** **Figs. 3, 4**

Type: Vietnam, Ninh Thuan Province, Nui Chua National Park, in evergreen forest, 11.77264°N, 109.16927°E, elevation 259 m, 22 December 2023, *S.Tagane, V.S.Dang, P.Souladeth, B.V.Truong, T.V.Nguyen, Q.T.Pham, Q.B.Nguyen, D.Kongxaisavath, T.Yamamoto, K.Yamazaki, N372* (holotype VNM!, [VNM00070332], isotypes, FOF! [FOF0009043], KAG! [KAG186371], TAI!).

Diagnosis: *Mallotus vinhhyensis* is most similar to *M. havilandii* Airy Shaw distributed in Borneo, in leaf shape and indumentum of simple to tufted to stellate, but distinguished by its basal macular glandes (2–4 per sides, only on basal secondary veins vs. 11–16 per side, often on all veins), smaller reduced leaves (6–15 × 5–13 mm vs. 15–30 × 14–22 mm), and larger fruits (*ca*. 11 × 8 mm vs. *ca*. 10 × 7 mm) (Table 2).

Shrubs or small trees, 2 m tall, dioecious. **Indumentum** simple to tufted to stellate, dense, white, *ca*. 1 mm long. **Young twigs** terete, densely covered with indumentum, old twigs grayish brown, glabrescent, lenticellate. **Stipules** linear, 6–7 mm long, densely hairy, often caducous. ***Leaves*** simple, opposite, unequal, one of each pair much smaller, smaller leaf sometimes caducous. **Non-reduced leaves**: petioles 2.5–8 mm long, densely hairy; blades oblong, oblong-elliptic, oblong-lanceolate, 8.5–19 × 3–6 cm, adaxial surface dark green *in vivo*, dark grayish brown *in sicco*, glabrous except on midrib and secondary veins, abaxial surface with numerous yellowish gland-dots, light green *in vivo*, yellowish brown *in sicco*, evenly hairy, apex acuminate, base cordate, each lobe never overlapping, margin shallowly dentate, ciliate, basal macular glands 2–4 pairs on secondary veins, 0.6–1 cm from margin, domatia absent; venation basally palmate to apically pinnate, veins (7 or) 9 at petiole attachment, midrib sunken adaxially, prominent abaxially, secondary veins 7–12 (except basal palmate veins) per side along midrib, prominent abaxially, ending parallel to the margin, tertiary veins scalariform, prominent abaxially. **Reduced leaves** suborbicular, 6–15 × 5–13 mm, apex acute, base cordate, margin dentate with 3–5-toothed, ciliate, indumentum and glands similar to non-reduced leaves. **Inflorescences** and **flowers** not seen. **Infructescence** racemose, 7 cm long, hairy; bracts linear, 3.1 mm long. **Capsules**, depressed globose, *ca*. 11 × 8 mm, 3-lobed, green, gland-doted, hairy, with slender, *ca.* 2 mm long plumose spines; column 5–8 mm long, pericarp *ca.* 0.8 mm thick; sepals persistent, narrowly triangular, *ca.* 2 mm long, reflexed, dense hairy adaxially, glabrous abaxially, apex acute; fruiting pedicel 1.5 cm long. **Seeds** globose, ca. 5 mm in diam., reddish brown, smooth.

Phenology: Fruiting specimens were collected in December.

Distribution: Vietnam (so far known only from the type locality).

Habitat and Ecology: *Mallotus vinhhyensis* is collected in the evergreen forest, at 259 m elevation in Nui Chua National Park.

Etymology: The specific epithet "*vinhhyensis*" refers to Vinh Hy, a famous tourist destination of the National Park.

Vernacular name: Ba bét vĩnh hy.

Provisional conservation assessment: *Mallotus vinhhyensis* occurs sympatrically with M. *ninhthuanensis,* and we found 60 mature individuals. As the same reason with the above species, it is assessed as Endangered (EN).

Fig 3. Holotype of ***Mallotus vinhhyensis*** V.S.Dang, Tagane & Tk.Yamam. (VNM [VNM00070332], photo by Van-Son Dang).

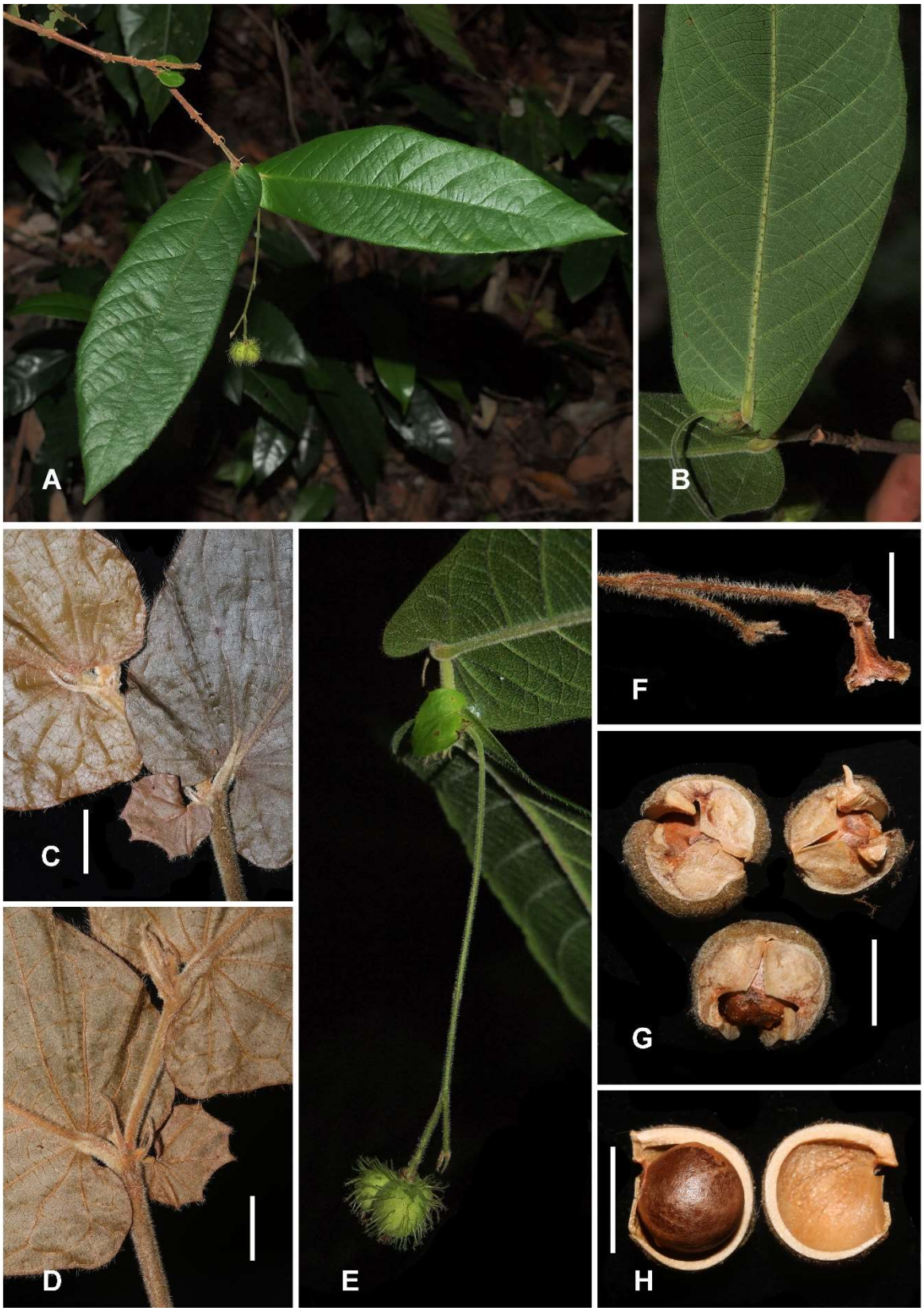

Fig 4. ***Mallotus vinhhyensis*** V.S.Dang, Tagane & Tk.Yamam. **A.** Fruiting branch, **B.** Portion of abaxial leaf surface, **C–D.** Adaxial and abaxial side of leaf base, **E.** Infructescence, **F.** Column, **G.** Capsule opened out showing three locules, **H.** 2-valved part of capsule opened out showing inside and seed (A, B, E: photos by Shuichiro Tagane and C, D, F–G: photos by Nguyen Quoc Bao). Scale bar = 5 mm.

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