# *MUSSAENDA REFLEXISEPALA*, A NEW SPECIES OF RUBIACEAE FROM VIETNAM

VAN DUY NONG[1] AND TAO CHEN[2,3]

**Abstract.** A new species of Rubiaceae from South Central Vietnam is described and illustrated. The new species, *Mussaenda reflexisepala,* is similar to *M. caudatiloba* in young plant parts densely white villose, but different in calyx lobes recurved, obviously reflexed, corolla lobes yelllow to orange or reddish orange, ovate to broadly obovate, which are clearly distinguished from other known species of *Mussaenda*. The pollen morphology of *Mussaenda reflexisepala* is also reported.

**Keywords:** *Mussaenda reflexisepala*, Rubiaceae, Pollen morphology, new species, Vietnam

The genus *Mussaenda* Burm. ex L. *s. str*. (Rubiaceae; Alejandro *et al*., 2005) is a paleotropical group of ca. 135 species widespread in tropical Africa, Asia and Pacific islands, with ca. 27 species occurring in Vietnam (Ho, 1999; Ban, 2005). Species in *Mussaenda* are usually characterized by the enlarged petaloid calycophylls, the reduplicate-valvate corolla aestivation, the indehiscent, berry-like fruits, the numerous, minute, reticulate seeds, and such habit as small trees, erect or scandent shrubs, rarely suffrutices or epiphytes (Cheek, 2009).

During our field work in 2010 and 2011, having as ultimate goal a taxonomic revision of the genus, we collected some peculiar specimens of *Mussaenda* in the Hon Ba Nature Reserve, Cam Lam District, Khanh Hoa Province, South Central Vietnam. After having examined specimens in several mayor herbaria (BM, E, IBSC, K, KUN, PE, HN, VNM) and consulting the relevant literature (Chen *et al*., 2011; Ho, 1999; Ban, 2005), we found them to be similar to yet different from *Mussaenda caudatiloba* D. Fang (2002). Therefore, we concluded that the plants from Hon Ba Nature Reserve represent a hitherto undescribed species, which we describe and illustrate herein.

## MATERIAL AND METHODS

**Field work.** Field expeditions were undertaken by the authors respectively in 2010 in Khanh Hoa Province, Vietnam and also in 2011 in Ninh Thuan Province, Vietnam. The measurements and other details given in the description are based on field observations as well as herbarium specimen measurements under a stereo microscope (Olympus SZX7). The RHS colour chart was used for the colour references (RHS, 2015).

**Pollen material.** Samples were taken from specimens collected in areas in Khanh Hoa. Vouchers were deposited in the herbarium of Tay Nguyen Institute for Scientific Research (VTN), Vietnam Academy of Sciences and Technology, Da Lat, Vietnam as well as the herbarium of Shenzhen Fairy Lake Botanical Garden (SZG), the Chinese Academy of Sciences, China. Dried pollen was acetolysed following Erdtman (1969), then suspended in 70% ethyl alcohol after washed, air dried on brass stubs and coated with gold palladium, and observed under a JSM-6360LV scanning electron microscope (SEM). Twenty pollen grains per sample were measured. Palynological terminology follows Erdtman (1952) and Faegri and Iversen (1989).

## RESULTS AND DISCUSSION

**Morphological observation.** At first glance *M. reflexisepala* somewhat resembles *M. caudatiloba* in that young plant parts are densely whitish villose. Nonetheless, upon careful examination of the specimens, it is clear that they are different species. The calyx lobes of *Mussaenda reflexisepala* are narrowly lanceolate, obviously recurved and reflexed, (vs. linear, spreading in *M. caudatiloba*) and the corolla lobes are yellow to orange or reddish orange, ovate to braodly obovate, cuspidate (vs. orangish yellow, trangular-lanceolate, caudate in *M. caudatiloba*) (Table 1).

**Microscope observations of pollen.** The pollen grains are single, isopolar, radially symmetrical, suboblate or subspheroidal in shape, the exine ornamentation is finely rugulose, 4-colporate and sized 12.5 × 13.5 $\mu$m to 14.25 × 16.25 $\mu$m. The colporate aperture ovate to circular sized 1.75 × 2.5 $\mu$m to 3.75 × 2 $\mu$m.

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Table 1. A morphological comparison between *Mussaenda reflexisepala* and *Mussaenda caudatiloba*.

| Characters | *Mussaenda reflexisepala* | *Mussaenda caudatiloba* |
|---|---|---|
| **Leaf** | narrowly elliptic to lanceolate, 1.2–13.3 × 0.8–4.5 cm, base cuneate, apex acuminate | ovate to lanceolate, 4–11 × 2–5 cm, base rounded to rarely cordate, apex acuminate to subcaudate, |
| **Petiole** | 2–5 mm long | 5–10 mm long |
| **Inflorescence** | flowers lax; peduncle 1–4 cm long; bract triangular, 3–5 mm long | flowers congested; peduncle 0.5–1 cm long; bracts linear, ca. 8 mm long |
| **Calyx lobe** | narrowly lanceolate, recurved, obviously reflexed, 5–7 mm long | linear, straight, spreading, 1–1.3 cm long |
| **Calycophyll** | blade ovate or irregular ovate, 3–6 × 2.5–4.5 cm, base broadly cuneate, apex acuminate, stipe 1.5–2.0 cm long | blade ovate, 5–6.7 × 3–5.3 cm, base rounded, apex acute, stipe 1.8–2.5 cm long |
| **Corolla lobe** | ovate to broadly obovate, yellow to orange or reddish orange above, 5–6.5 mm long, apex cuspidate | triangular-lanceolate, orangish yellow, ca. 8 mm long, apex caudate, incurved |

## Description of new species

**Mussaenda reflexisepala** T. Chen & V. D. Nong *sp. nov.* TYPE: VIETNAM. Ninh Thuan Province: Ninh Son District, Song Pha pass mountain, 11˚50'22.1"N, 108˚40'45.7"E, 648 m, 09 July 2011, N.V. Duy *780* (Holotype, VTN; Isotype, SZG). Fig. 1, 2.

*Mussaenda reflexisepala* is similar to *Mussaenda caudatiloba* in having young plant parts densely villose. It differs from *Mussaenda caudatiloba* in having calyx lobes recurved, obviously reflexed, and corolla lobes yellow to orange or reddish orange above, ovate to broadly obovate, which are distinct from all known *Mussaenda* species.

Climbing *shrubs*, 2–3 m high, young branches terete or angulate, densely white villose, gradually brownish when mature and glabrescent when old. Stipules triangular-lanceolate, deeplybifid, acuminate, 0.7–1 cm long. *Leaves* opposite; *petiole* 0.2–0.5 cm long, densely white villose; *blade* drying thinly papery, dark green adaxially, pale abaxially, elliptic, 1.2–13.3 × 0.8–4.5 cm, densely white villose with denser pubescence along weins, margin entire, base cuneate, apex acuminate; secondary veins 8–10 pairs, arc ascending, prominent beneath. *Inflorescences* cymose**,** pauciflorous, terminal, peduncle 1–4 cm long; flowers lax, *pedicel* 1 mm long; bract triangular, 3–5 mm long, densely white villose; calyx lobe 5(–6), green, narrowly lanceolate, acute, recurved, obviously reflexed, 0.5–0.7 cm long, 1.5 mm wide at base, pilose adaxially, villose abaxially; *calycophylls* white, blade sparsely pilose adaxially, villose abaxially, ovate or irregularly ovate, 3–6 × 2.5–4.5 cm, apex acuminate, base broadly cuneate, longitudinal veins 6, densely villose abaxially, stipe 1.5–2.0 cm long. *Corolla* tube slender, densely white villose outside, 2.0–2.5 cm long, ampliate part 1.0–1.3 cm long, densely yellow clavate pubescent inside; *corolla lobes* yellow to orange or reddish orange adaxially, ovate to broadly obovate, cuspidate at apex, 5–6.5 mm long, sparsely villose abaxially. *Stamens* 5, inserted at 1/6 near the base of the corolla tube, *filament* glabrous, 5 mm long, *anther* linear, 4.5–5 mm long. *Style* glabrous, heterostylous, long style ca. 19 mm long, short style ca. 4 mm long, *stigma* bifid, glabrous, 4–8 mm long. *Berry* densely white villose, elliptic to oblong, 12–20 × 8–11 mm, *pedicel* 1–3 mm, *seeds* numerous, minute, ca. 0.8 mm long, brown, surface reticulate.

**Phenology:** Flowers June to August; fuits August to October.

**Distribution and ecology:** *Mussaenda reflexisepala* has been collected from two localities in Vietnam, Hon Ba, Suoi Dau, Cam Lam District in Khanh Hoa Province, and Song Pha, Ninh Son District in Ninh Thuan Province. It grows sporadically on scrub roadside of the evergreen secondary forest, accompanied with *Thysanolaena maxima* (Poaceae), *Rubus sp*. (Rosaceae), *lantana sp*. (Verbenaceae), etc. This species have both long-styled and short-styled flowers which bear fruits with fertile ovaries. The changing color of corolla lobes may significant contribute to the pollination and fruition of the new species confined to narrow areas in the Hon Ba Nature Reserve.

**Etymology:** The specific epithet refers to the unique morphology of calyx lobes obviously reflexed in flowers and fruits.

**Additional specimens examined:** VIETNAM. Khanh Hoa Province: Cam Lam District, Suoi Dau, Hon Ba, 12˚06'30"N, 108˚59'14"E, 627, 20 August 2010, *N.V. Duy 610* (VTN!); Same locality, 30 August, 2011, *N.V. Duy 850* (VTN!). Khanh Hoa Province: Cam Lam District, in disturbed vegetation along the road at the base of Hon Ba Nature Reserve, 12˚07'52"N, 109˚00'47"E, 221 m, 7 July 2011, *Leong-Skornickova J., Rybkova R., Tran H.D., Truong D.V., Ponert J. HB128* (E!).

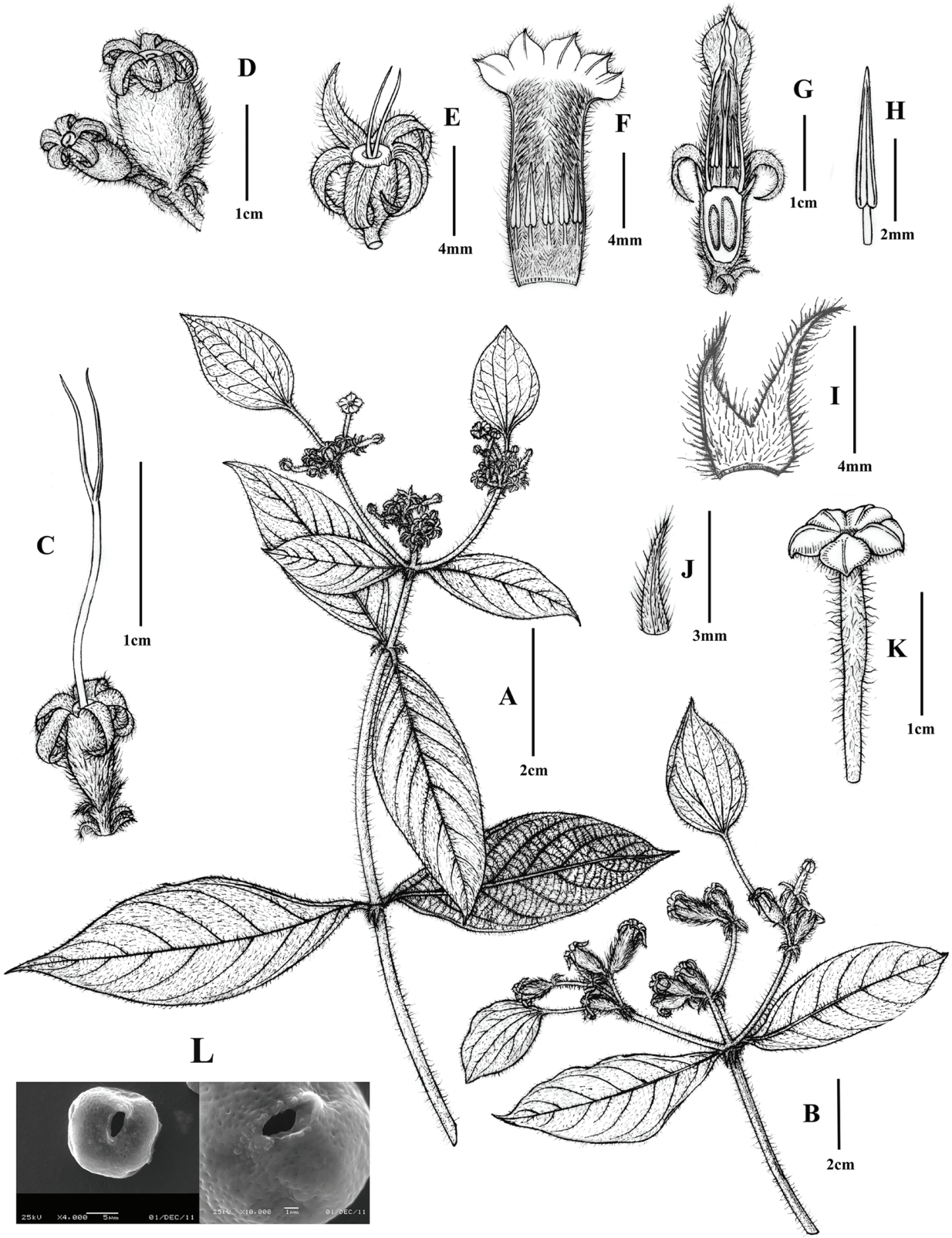


FIGURE 1. *Mussaenda reflexisepala* T. Chen & V. D. Nong. **A**, flowering branch; **B**, fruiting branch; **C**, calyx and long style; **D**, fruits; **E**, calyx and short style; **F**, corolla opened showing stamens; **G**, calyx and corolla opened showing stamens and pistil; **H**, anther; **I**, stipule; **J**, bract; **K**, corolla; **L**, pollen and view showing colporate aperture. Drawn by Y. X. Liu based on the holotype.

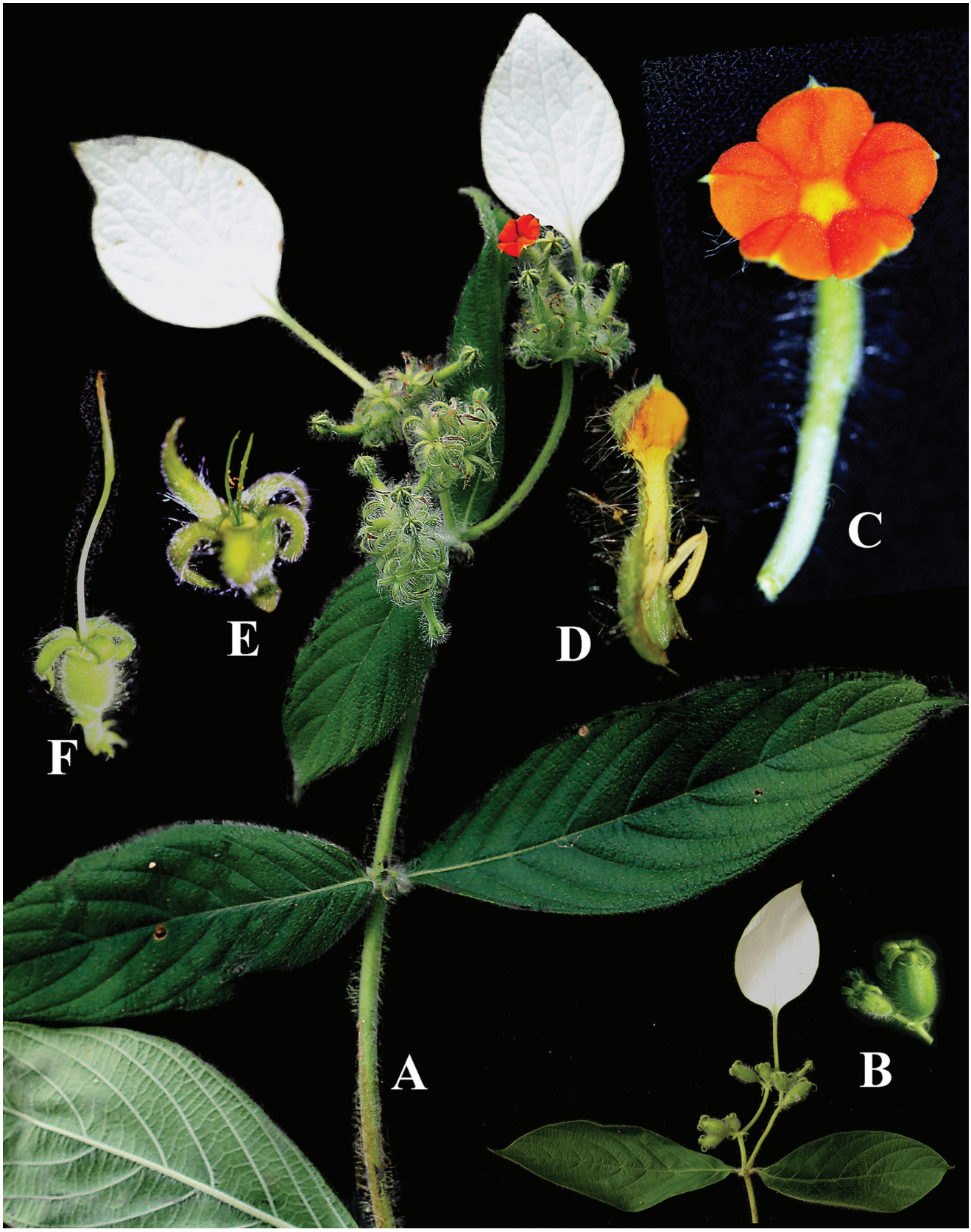


FIGURE 2. *Mussaenda reflexisepala* T. Chen & V. D. Nong. **A**, flowering branch; **B**, fruits branch; **C**, corolla lobes; **D**, corolla opened and stamens; **E**, calyx and short style; **F**, calyx and long style. Photographs by V. D. Nong based on the holotype.

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