

Nymphanthus adenophorus, a new species of Phyllanthaceae from Vietnam

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Abstract

A new species of *Nymphanthus* (Phyllanthaceae), *N. adenophorus* from Ninh Thuan Province, central Vietnam, is described and illustrated, along with its vernacular name and preliminary conservation status. The new species is similar to *N. pireyi* and *N. nanellus*, but distinguished by its terete and shorter floriferous branchlets with fewer leaves, larger leaf blades, faintly visible lateral veins, longer pedicels of male flowers, and accordion-folded discs of pistillate flowers.

Key words: flora, Indochina, Malpighiales, Phyllanthaceae, taxonomy

Introduction

Nymphanthus Loureiro (1790: 543) is a genus of subshrubs to shrubs of Phyllanthaceae comprising ca. 90 species, distributed in tropical Asia to Malesia, with a few species extending to Australia (Bouman *et al.* 2022). Traditionally, it had been placed in the large, pantropical genus *Phyllanthus* Linnaeus (1753: 981) *s.l.*, comprising ca. 900 species (reviewed by Bouman *et al.* 2018, 2022). Recent molecular analyses, however, showed *Phyllanthus s.l.* to be paraphyletic (e.g. Hoffmann *et al.* 2006, van Welzen *et al.* 2014, Bouman *et al.* 2021), and thereby Bouman *et al.* (2022) separated the genus into multiple monophyletic genera; *Nymphanthus* is one of the segregates, characterized by the combination of features including its habit of subshrubs to shrubs; staminate flowers of 4 sepals, 4 alternisepalous free discs, and 2 or 4 stamens with connate filaments and horizontally dehiscing anthers; fruit of dehiscent capsules; and distribution in Asia to Australia (Bouman *et al.* 2022). Of the ca. 45 species of *Phyllanthus s.l.* known to occur in Vietnam (Thin 2007, POWO 2024), 20 are now placed in *Nymphanthus* (Bouman *et al.* 2022).

During our botanical survey in the Nui Chua National Park, central Vietnam in 2023, we collected a noteworthy specimen which should belong to *Nymphanthus*. Further comparisons with related taxa, based on the literature and herbarium specimens, revealed it differs from any other previously known taxa of the genus. Here, we describe and illustrate it as a new species, *Nymphanthus adenophorus* Tk.Yamam., Tagane & V.S.Dang, along with its vernacular name and preliminary conservation status.

Materials and methods

To assess the novelty of the new species, we consulted the taxonomic literature for *Nymphanthus* in Vietnam and its adjoining areas (Gagnepain & Beille 1931, Li 1987, Hô 2003, Chantaranothai 2007, Thin 2007, Li & Gilbert 2008,

Kantachot & Chantaranothai 2013, Pornpongrueng *et al.* 2017, 2019, Bouman *et al.* 2018, 2022, Yamamoto *et al.* 2024) and herbarium specimens housed in FOF, KAG, SAR, and VNM [the herbarium acronyms follow Thiers (2024 continuously updated)], and those digitized images available at JSTOR Global Plants (<https://plants.jstor.org>), Chinese Virtual Herbarium (<http://www.cvh.ac.cn>), Indian Virtual Herbarium (<https://ivh.bsi.gov.in>), Muséum National d'Histoire Naturelle (<https://www.mnhn.fr>), and Naturalis Bioportal (<https://bioportal.naturalis.nl>).

The measurements of characters for the description of the new species are based on the herbarium specimen collected in our field survey, except for those of colours, which are derived from the field observations and photos (*i.e.*, *in vivo*). To compare the significant characters of the new species with those of similar taxa: *Nymphanthus pireyi* (Beille 1927: 605) R.W.Bouman (in Bouman *et al.* 2022: 23) and *N. nanellus* (Li 1987: 376) R.W.Bouman (in Bouman *et al.* 2022: 23), seven characters were selected for comparison in Table 1. These include the shape and length of floriferous branchlets, the number of leaves per floriferous branchlet, the size of leaf blades, the visibility of lateral veins on the leaf blades, the length of pedicels of staminate flowers, and the shape of discs of pistillate flowers, based on the previously published literature (Beille 1927, Li 1987, Hô 2003, Li & Gilbert 2008) and digitized herbarium specimens listed in Appendix 1.

TABLE 1. Morphological comparisons of *Nymphanthus adenophorus* with *N. pireyi* and *N. nanellus*. The characteristics of *N. pireyi* are based on Beille (1927) and Hô (2003), while those of *N. nanellus* are from Li (1987) and Li & Gilbert (2008). The length of floriferous branchlets, the number of leaves per floriferous branchlet, and the visibility of lateral veins on the leaf blades are also derived from digitized herbarium specimens listed in Appendix 1.

Characters	<i>N. adenophorus</i>	<i>N. pireyi</i>	<i>N. nanellus</i>
Shape of floriferous branchlets	terete	angular	2-winged
Length of floriferous branchlets (cm)	1.1–2.3	4–6	3.8–8
Number of leaves per floriferous branchlet	5–9	8–34	22–38
Size of leaf blades (mm)	6–10 × 6–9	5–7 × 3–4	4–5 × ca. 2
Visibility of lateral veins on leaf blades	faintly visible on both surfaces	slightly conspicuous adaxially, inconspicuous abaxially	slightly conspicuous adaxially, inconspicuous abaxially
Length of pedicels of staminate flowers (mm)	7–13	1–2	2
Shape of discs of pistillate flowers	connate, accordion-folded	connate, cup-shaped	connate, discoid

Taxonomy

Nymphanthus adenophorus Tk.Yamam., Tagane & V.S.Dang, *sp. nov.* Type:—VIETNAM. Ninh Thuan Province: Ninh Hai District, Nui Chua National Park, 11.74647°N, 109.21991°E, 25 m elev., 20 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 N226* [fl. & young fr.] (holotype VNM00072234!, isotypes FOF0008897!, KAG186121!, KAG186225!). Figures 1 & 2.

Among *Nymphanthus* species distributed in Vietnam and adjoining countries, *N. adenophorus* is similar to *N. pireyi* (endemic to Central Vietnam) and *N. nanellus* (endemic to South China) in having small leaf blades ($\leq 1 \times 1$ cm) of ovate, suborbicular to obovate shapes, sepals of both staminate and pistillate flowers with non-fimbriate margins, and pistillate flowers bearing connate (not free) discs surrounding the lower portion of the ovary. However, the new species can be clearly distinguished by its terete, shorter (1.1–2.3 cm), and fewer-leaved (5–9 leaves) floriferous branchlets (vs. angular, 4–6 cm, and 8–34-leaved in *N. pireyi*; 2-winged, 3.8–8 cm, and 22–38-leaved in *N. nanellus*), relatively larger leaf blades (6–10 × 6–9 mm vs. 5–7 × 3–4 mm in *N. pireyi*; 4–5 × ca. 2 mm in *N. nanellus*), faintly visible lateral veins on both surfaces of the leaf blades (vs. slightly conspicuous on the adaxial surface, and inconspicuous on the abaxial surface in both species), longer pedicels of the staminate flowers (7–13 mm vs. 1–2 mm in *N. pireyi*; ca. 2 mm in *N. nanellus*), and pistillate flowers with accordion-folded discs (vs. cup-shaped in *N. pireyi*; discoid in *N. nanellus*) (Table 1).



FIGURE 1. Holotype of *Nymphanthus adenophorus* Tk.Yamam., Tagane & V.S.Dang (*Tagane et al.* N226, VNM00072234).



FIGURE 2. *Nymphanthus adenophorus* Tk.Yamam., Tagane & V.S.Dang (from Tagane *et al.* N226). A. Habit; B, C. Floriferous branchlets showing adaxial and abaxial leaf surfaces respectively; D. Enlarged view of a part of a floriferous branchlet showing stipules; E. Lateral view of a staminate flower. One of four sepals was detached to show the internal morphology; F, G. Overhead view of a staminate flower. Sepals were detached in G to show four foveolate discs; H. Diagonally overhead view of a pistillate flower; I. Lateral view of a pistillate flower; J. Enlarged view of a young ovary with one of three bifid stigmas (the rest of two were destroyed during dissection); K. Young fruit. Abbreviations: an, theca of anther; dc, floral disc; ov, ovary; sp, stipule. All scale bars = 0.5 mm. All photos taken by T. Yamamoto.

Description:—**Prostrate subshrubs** up to 50 cm tall, monoecious, all parts glabrous. **Branches** reddish light green when young, later becoming reddish brown, terete to slightly furrowed (not angular), bearing fascicles of 1–3(–4) floriferous branchlets on each node; floriferous branchlets short and slender, 1.1–2.3 cm long, 0.2–0.5 mm thick, reddish light green, terete (not angular nor winged). **Stipules** in pairs, narrowly deltate to trullate, 0.3–1.2 × 0.2–0.5 mm, reddish light green to reddish purple, acute to attenuate at apex, margin entire. **Leaves** alternate, 5–9 per branchlet; petioles 0.4–1.1 mm long; leaf blades broadly obovate to broadly elliptic, sometimes suborbicular, 6–10 × 6–9 mm, chartaceous, grayish red when young, later becoming green, abaxial surface slightly glaucous, rounded to retuse at apex, obtuse to rounded, slightly oblique at base, margin entire, slightly recurved, midveins not prominent on both surfaces, lateral veins 2–3 pairs, faintly visible on both surfaces. **Inflorescences** axillary, unisexual; staminate inflorescences 1-flowered or fascicle with 2(–3) flowers on proximal to middle axils of branchlets; pistillate inflorescences 1-flowered on distal axils. **Bracts** ovate, 0.3–0.5 × 0.2–0.3 mm, acute to acuminate at apex, cuneate at base, margin entire. **Staminate flowers:** pedicels 7–13 mm long, slender, slightly dilated near distal end, pink to purplish red; sepals 4, erect, ovate, 1.3–1.9 × 0.6–1.1 mm, purplish red, obtuse to rounded at apex, margin entire; discs 4, alternisepalous, free, elliptic to cordate, surface foveolate with many glands; stamens 2, glabrous, filaments united throughout their length, forming staminal column 0.8–0.9 × 0.2–0.3 mm, anthers ca. 0.2 × 0.5 mm, thecae 2 per anther, transversely dehiscent; pistillode absent. **Pistillate flowers:** pedicels 1.3–2 mm long, dilated acropetally, purplish red; sepals 6 in 2 whorls, slightly spreading, elliptic to ovate, 1.5–2.1 × 0.8–1 mm, white to purplish red, obtuse to rounded at apex, margin entire; discs connate (not free), surrounding base of ovary, accordion-folded with 6 antesealous ridges and 6 alternisepalous valleys, surface foveolate with many glands; ovary superior, 3-locular, depressed globose, ca. 0.6 × 0.9 mm, with 6 longitudinal furrows, surface smooth; styles up to 0.1 mm long; stigmas almost completely bifid to base, 0.4–0.6 mm long; staminodes absent. **Capsules** (immature) subglobose, 2–3 mm in diam., purplish red, glabrous, smooth. **Seeds** (immature) trigonous, 2 per locule, light brown, surface smooth.

Distribution:—VIETNAM. Ninh Thuan Province (so far known only from the type locality).

Habitat and ecology:—*Nymphanthus adenophorus* is prostrate subshrubs in open scrublands on rocky slopes at 25 m elev., which is ca. 150 m away from the coast. The specimen with flowers and young fruits was collected in December.

Etymology:—The specific epithet *adenophorus* is derived from the presence of many distinct glands on floral discs.

Vernacular name:—Diệp hạ châu núi chúa.

Preliminary conservation assessment:—Data deficient (DD). During six days of our field survey conducted in/around the Nui Chua National Park in 2023, *Nymphanthus adenophorus* was found only in one locality, at an open coastal scrubland ca. 150 m away from the coast, where we confirmed ca. 50 mature individuals. Although the number of known populations and individuals are very limited, the similar environment is widely seen around the type locality mostly as parts of the Nui Chua National Park, which encloses ca. 33 km of coastline. Additional populations can be found in the coastal area of the national park and its vicinity, and thus further floristic investigations are needed to elucidate the distribution range of this species. Given the inadequacy of the information of its distribution and number of individuals, we here propose Data deficient (DD) according to the IUCN Red List Categories (IUCN 2024).

Notes:—*Nymphanthus adenophorus* is distinguished from other *Nymphanthus* species distributed in Vietnam by the combination of the following features: prostrate subshrubs up to 50 cm tall, floriferous branchlets 1.1–2.3 cm long with 5–9 leaves, leaf blades broadly obovate to broadly elliptic, sometimes suborbicular, 6–10 × 6–9 mm, sepals of staminate and pistillate flowers with non-fimbriate margins, staminate flowers on pedicels 7–13 mm long, and glabrous and smooth capsules.

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References

- Beille, L. (1927) *Phyllanthus*. In: Lecomte, M.H. (Ed.) *Flore générale de l'Indo-Chine* 5. Masson, Paris, pp. 571–608.
- Bouman, R.W., Keßler, P.J.A., Telford, I.R.H., Bruhl, J.J. & van Welzen, P.C. (2018) Subgeneric delimitation of the plant genus *Phyllanthus* (Phyllanthaceae). *Blumea* 63 (2): 167–198.
<https://doi.org/10.3767/blumea.2018.63.02.14>
- Bouman, R.W., Keßler, P.J.A., Telford, I.R.H., Bruhl, J.J., Strijk, J.S., Saunders, R.M.K. & van Welzen, P.C. (2021) Molecular phylogenetics of *Phyllanthus* sensu lato (Phyllanthaceae): Towards coherent monophyletic taxa. *Taxon* 70 (1): 72–98.
<https://doi.org/10.1002/tax.12424>
- Bouman, R.W., Keßler, P.J.A., Telford, I.R.H., Bruhl, J.J., Strijk, J.S., Saunders, R.M.K., Esser, H.-J., Falcón-Hidalgo, B. & van Welzen, P.C. (2022) A revised phylogenetic classification of tribe Phyllanthae (Phyllanthaceae). *Phytotaxa* 540 (1): 1–100.
<https://doi.org/10.11646/phytotaxa.540.1.1>
- Chantaranothai, P. (2007) *Phyllanthus*. In: van Welzen, P.C. & Chayamarit, K. (Eds.) *Flora of Thailand*. Vol. 8, part 2. The Forest Herbarium, National Park, Wildlife and Plant Conservation Department, Bangkok, pp. 473–507.
- Gagnepain, F. & Beille, L. (1931) Euphorbiacées. In: Lecomte, M.H. & Gagnepain, F. (Eds.) *Flore générale de l'Indo-Chine* 5. Masson, Paris, pp. 229–673.
- Hô, H.H. (2003) *Cây cỏ Việt Nam: An illustrated flora of Vietnam*, vol. 2. Youth Publication, Ho Chi Minh City, 951 pp.
- Hoffmann, P., Kathirachchi, H. & Wurdack, K.J. (2006) A phylogenetic classification of Phyllanthaceae (Malpighiales; Euphorbiaceae sensu lato). *Kew Bulletin* 61 (1): 37–53.
- IUCN (2024) *Guidelines for Using the IUCN Red List Categories and Criteria, version 16*. Prepared by the Standards and Petitions Committee. Available from: <https://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 8 August 2024)
- Kantachot, C. & Chantaranothai, P. (2013) A new species of *Phyllanthus chayamaritiae* (Phyllanthaceae) from Thailand. *Blumea* 57 (3): 217–220.
<https://doi.org/10.3897/phytokeys.136.47625>
- Li, P.T. (1987) A revision of Chinese *Phyllanthus* (Euphorbiaceae). *Acta Phytotaxonomica Sinica* 25 (5): 371–383.
- Li, P.T. & Gilbert, M.G. (2008) *Phyllanthus*. In: Wu, Z.Y., Raven, P.H. & Hong, D.Y. (Eds.) *Flora of China*. Vol. 11. Science Press, Beijing and Missouri Botanical Garden, St. Louis, pp. 180–190.
- Linnaeus, C. (1753) *Species Plantarum*. Impensis Laurentii Salvii, Holmiae, 1200 pp.
- Loureiro, J. (1790) *Flora Cochinchinensis*, vol. 2. Ulyssipone, Lisbon, 744 pp.
- Pornpongrungrueng, P., Chantaranothai, P., Parnell, J.A. & Hodkinson, T.R. (2019) Two new species of *Phyllanthus* (Phyllanthaceae) from Thailand. *PhytoKeys* 136: 35–44.
<https://doi.org/10.3897/phytokeys.136.47625>
- Pornpongrungrueng, P., Parnell, J.A.N., Hodkinson, T.R. & Chantaranothai, P. (2017) *Phyllanthus kaweesakii* (Phyllanthaceae), a new species from Thailand. *Botany* 95 (6): 567–577.
<https://doi.org/10.1139/cjb-2016-0298>
- POWO (2024) *Plants of the World Online*. Royal Botanic Gardens, Kew. Available from: <http://www.plantsoftheworldonline.org/> (accessed 25 July 2024)
- Thiers, B.M. (2024 continuously updated) *Index Herbariorum. A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. Available from: <https://sweetgum.nybg.org/science/ih/> (accessed 17 April 2024)
- Thin, N.N. (2007) *Taxonomy of Euphorbiaceae in Vietnam*. Vietnam National University Publishers, Hanoi, 407 pp.
- van Welzen, P.C., Pruesapan, K., Telford, I.R.H., Esser, H.-J. & Bruhl, J.J. (2014) Phylogenetic reconstruction prompts taxonomic changes in *Sauropus*, *Synostemon* and *Breynia* (Phyllanthaceae tribe Phyllanthae). *Blumea* 59 (2): 77–94.
<https://doi.org/10.3767/000651914X684484>
- Yamamoto, T., Souladeth, P., Phonepaseuth, P., Kongxaisavath, D., Vongthavone, T., Truong, B.V., Pham, Q.T., Souvannakhommene, K. & Tagane, S. (2024) *Nymphanthus namkadingensis*, a new species of Phyllanthaceae from Laos. *Phytotaxa* 650 (3): 199–205.
<https://doi.org/10.11646/phytotaxa.650.3.1>

Appendix 1. Specimens of *Nymphanthus pireyi* and *N. nanellus* examined for the morphological characters in this study.

N. pireyi. VIETNAM. Thua Thien-Hue: *Eberhardt* 2416 (P04854984); Quang Tri: *M. de Pirey II* (P04854983), *M. Poilane* 13415 (P04854982), *M. Poilane* 13416 (P04854981).

N. nanellus. CHINA. Hainan: *C.H. Tsoong* 572 (IBK00168599), *C. Wang* 33346 (A00048613, MO-934100, US00385509, IBK00200091, IBK00200092), *Exped. Diaoluoshan* 2561 (IBK00168602), *F.C. How* 72329 (IBK00168601), *F.C. How* 72607 (IBK00168600).