



Taxonomic studies on *Begonia* (Begoniaceae) in Myanmar III: *Begonia kayinensis* (sect. *Monophyllon*), a remarkable new species from Kayin State, Southern Myanmar

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(Manuscript received 5 August 2023; Accepted 29 September 2023; Online published 5 October 2023)

ABSTRACT: *Begonia kayinensis*, a new species from Kayin State, Myanmar is described and illustrated. This new species is identified as a member of *Begonia* section *Monophyllon* A.DC. in its morphological characteristics including the upright stem with tuber, inflorescences arising from the top of the stem, and 2-loculed ovary. A description, photographs, illustration, and comparison with allied species in sect. *Monophyllon* and provisional assessment of the conservation status are provided.

KEY WORDS: *Begonia* sect. *Monophyllon*, *Begonia prolifera*, citizen science, Myanmar, new taxon, tuberous.

INTRODUCTION

Begonia L. (Begoniaceae) is one of the largest genera of angiosperms in the world, comprising 2116 accepted species, and is distributed throughout the tropical and subtropical regions of the world (Hughes *et al.*, 2015). In Myanmar, 92 species and eight sections (*Alicida*, *Apterobegonia*, *Dysmorphia*, *Monophyllon*, *Parvibegonia*, *Platycentrum*, *Petermannia*, *Putzeysia*) are currently recognized (Hughes *et al.*, 2019, Aung, 2020; Maw *et al.*, 2020, 2021; Maw, 2021). Along with high contributions by international institutions, field expeditions in Myanmar have significantly increased in recent years. Consequently, many new and newly recorded taxa have been published (Ding *et al.*, 2019), and the genus *Begonia* is ranked as the second of its significant number of new and newly recorded discoveries in Myanmar (Yang *et al.*, 2020). The northern and southern parts of Myanmar are likely to be the home for begonias with favorable conditions in climate, topography and vegetation. To date, 38 *Begonia* species are recorded in tropical and subtropical forests of northern Myanmar (Maw, 2021). However, the karst limestone areas of southern Myanmar are poorly known floristically.

In July 2020, K.Z. Hein, one of the co-authors found an unknown *Begonia* species from a local plant hunter. This unique species is characterized by having sessile leaf and bullate leaf surface. In order to obtain further information on this species, we requested invaluable assistance from M.K. Naing, a local nature explorer who is an active admin of the Native Species Conservation and Identification, Myanmar (NSCI). NSCI is a citizenship science initiative dedicated to documenting and conserving Myanmar's

biodiversity through collaboration among the enthusiastic community around the country including local and foreign researchers. Through this collaboration, all the required materials were collected, including *in situ* photographs, detailed locality information, potential threats to this species for an IUCN conservation assessment, and local knowledge about this species. Subsequently, careful examination of the morphology of the species was carried out by using the collected materials, color photographs, comparing with affiliated species and, reviewing the relevant literature and digitized herbarium specimens. The species was then confirmed as new to science and became the fifth representative of the *Begonia* sect. *Monophyllon* A.DC. The discovery of this new species highlights the critical role of citizen science and collaborative efforts in documenting the biodiversity of unexplored areas in Myanmar.

MATERIAL AND METHODS

Morphological examinations for the new species were based on the collected specimens and photographs, and the measurements and detailed descriptions are presented here. Inflorescences were preserved in 70 % ethanol for microscopy. The collected materials of the species were compared with descriptions of allied species (Phutthai *et al.*, 2019; Taram *et al.*, 2020, Souvannakhoummane *et al.*, 2021). Images of herbarium specimens were examined in the database of JSTOR Global Plants (<http://plants.jstor.org>). The conservation status of this species was provisionally assessed following the IUCN (2022) and applied their criteria while considering our current knowledge of the species.



TAXONOMIC TREATMENT

Begonia kayinensis M.B.Maw & Y.H.Tan, *sp. nov.*

Figs. 1 & 2

(section *Monophyllon*)

Type: MYANMAR. Kayin State: Hpa-an District, on limestone cave entrance at Yathae Pyan Cave, ca. 80 m a.s.l., 16 July 2023, *Min Khant Naing 1* (holotype: HITBC; isotypes: RAF).

Diagnosis. *Begonia kayinensis* is most similar to *Begonia prolifera* A.DC. in having an erect stem, globose tuber with fibrous roots, a single sessile leaf and free styles, but it can be significantly distinguished from the latter by having bullate upper lamina (vs. relatively flat), deep red (vs. light green) lower lamina, and stamens numerous 25–30 (vs. 10–13).

Description. Perennial herb, monoecious, 10–30 cm tall, tuberous; tuber globose with numerous fibrous roots, 5–15 mm in diameter. Stem red, succulent, 5–13 cm long, glabrous (sometimes red pilose). **Stipules** persistent, lanceolate, 5–7 × ca. 1.5 mm, glabrous, margin entire or incised one side, apex acuminate or cuspidate. **Leaf** unifoliate; blade basifixed, symmetric or sub-symmetric, cordate or orbicular-cordate, 8–30 × 7–21.5 cm, adaxially bullate, purplish-red to brownish-red, and with maroon patches between the veins, sometimes mottled, subglabrous (sometimes scabridulous), velvety; abaxially dark red, glabrous or sparsely pilose on veins, base cordate, overlapped, margin repand or undulate-dentate, apex acuminate to caudate, venation palmate, prominent, more prominent in both surfaces of brownish-red blade form, 7–9 veins on each side of the midrib. **Inflorescence** up to 20 cm long, panicle, arising from the top of stem with the leaf, flowers small; peduncle red, glabrous; bracts ovate or ovate-reniform, 1.5–2 × 1.5–2 mm, reddish-green, membranous, margin entire, glandular-pubescent, apex rounded or retuse. **Staminate flower:** pedicel 8–10 mm long, pink, subglabrous; tepals 4, white to pink, unequal, glabrous; outer 2 suborbicular, apex rounded, margin entire, ca. 4 × 3 mm, glabrous; inner 2 ovate-elliptic, apex obtuse, margin entire, ca. 3 × 2 mm; androecium actinomorphic, stamen numerous, 25–30, yellow, filaments ca. 0.5 mm long, subequal, fused at base into a column, anthers ca. 1 mm long, obovate. **Pistillate flower:** pedicel 6–13 mm long, red or green, with white or pink translucent hairs; tepals 5, white to pink, unequal, glabrous; outer 2, suborbicular to obovate, apex obtuse, margin entire, ca. 4 × 2.5 mm, glabrous; inner 3 obovate, ca. 3 × 2 mm, apex obtuse or rounded; styles 2, yellow, free, ca. 1.5 mm long, stigma bifid with twisted bands; ovary green, glabrous, 2-locular, placentation axillary, placental branch 2-lobed per locule. **Fruit:** nodding, capsule ovoid, brownish-green or greenish-red; 3-winged, unequal, abaxial wing ovate-triangular, apex acute, 6–11 × 7–9 mm; lateral wings crescent-shaped, ca. 2 × 3.5 mm.

Phenology. *Begonia kayinensis* is flowering from

July to August and fruiting from August to November. It sheds the leaf and stores the tuber to adapt to unfavorable environmental conditions. So, it dies in the dry periods and grows back once rainfall returns.

Distribution. The new species is only known from Hpa-an District, Kayin State, southern Myanmar. It is distributed in the limestone hills and caves, namely Yathae Pyan Cave, Mt. Zwegabin and its continuous limestone areas. A more comprehensive range of distribution is expected in other limestone areas across Kayin state and between transboundary regions of southern Myanmar and Thailand. Further investigation is required to understand the actual distribution range of *B. kayinensis*.

Ecology. It grows on shaded, moist limestone surface, exposed limestone and cave entrance at an elevation of around 80 m a.s.l.

Etymology. The specific epithet of the new species refers to Kayin state where the type is collected.

Vernacular. Kayin kyaway pann (ကရင် ကြွေပန်း)

Conservation status. Near Threatened (NT) (IUCN 2022). The species is abundant in three localities in Kayin State, southern Myanmar. While the species is relatively common in the localities, there is a potential for the species to become threatened in the near future. Its distribution range is restricted to tourist attractions such as Mt. Zwegabin, a famous tourist spot, and potential anthropogenic threats are observed. Moreover, this attractive species is popular among *Begonia* enthusiasts and is on sale for ornamental purposes. Some local people collect it as a vegetable due to its sour taste. Therefore, the potential risk of overharvesting and collecting needs to be considered. It is recommended that monitoring and conservation efforts are put in place to ensure the species' long-term survival and prevent it from becoming vulnerable or endangered.

Notes. Among the *Begonia* species which are currently assigned in sect. *Monophyllon*, *Begonia kayinensis* is morphologically similar to *B. prolifera* (Fig. S1) from Myanmar, Thailand and China by having a globose tuber, unifoliate leaf, and free styles. But the new species can be easily distinguished by purplish-red to brownish-red bullate upper lamina (vs. uniformly green), deep red lower lamina with prominent veins (vs. green), lamina base cordate with overlapping lobes (vs. cordate without overlapping), margin repand or undulate-dentate (vs. dentate to slightly incised, sometimes with densely small tubercle at margin), inflorescence paniculate (vs. thyrsoid cyme), and pistillate flower pedicel with translucent hairs (vs. subglabrous). A detailed comparison of *B. kayinensis* and *B. prolifera* is presented in Table 1.

At present, *Begonia* section *Monophyllon* comprises five species (*B. kayinensis* M.B.Maw & Y.H.Tan, *B. prolifera* A.DC., *B. paleacea* Kurz, *B. lanxangensis* Souvann. & Aver., and *B. oyuniae* M.Taram & N.Krishna), including the discovery of this new species.

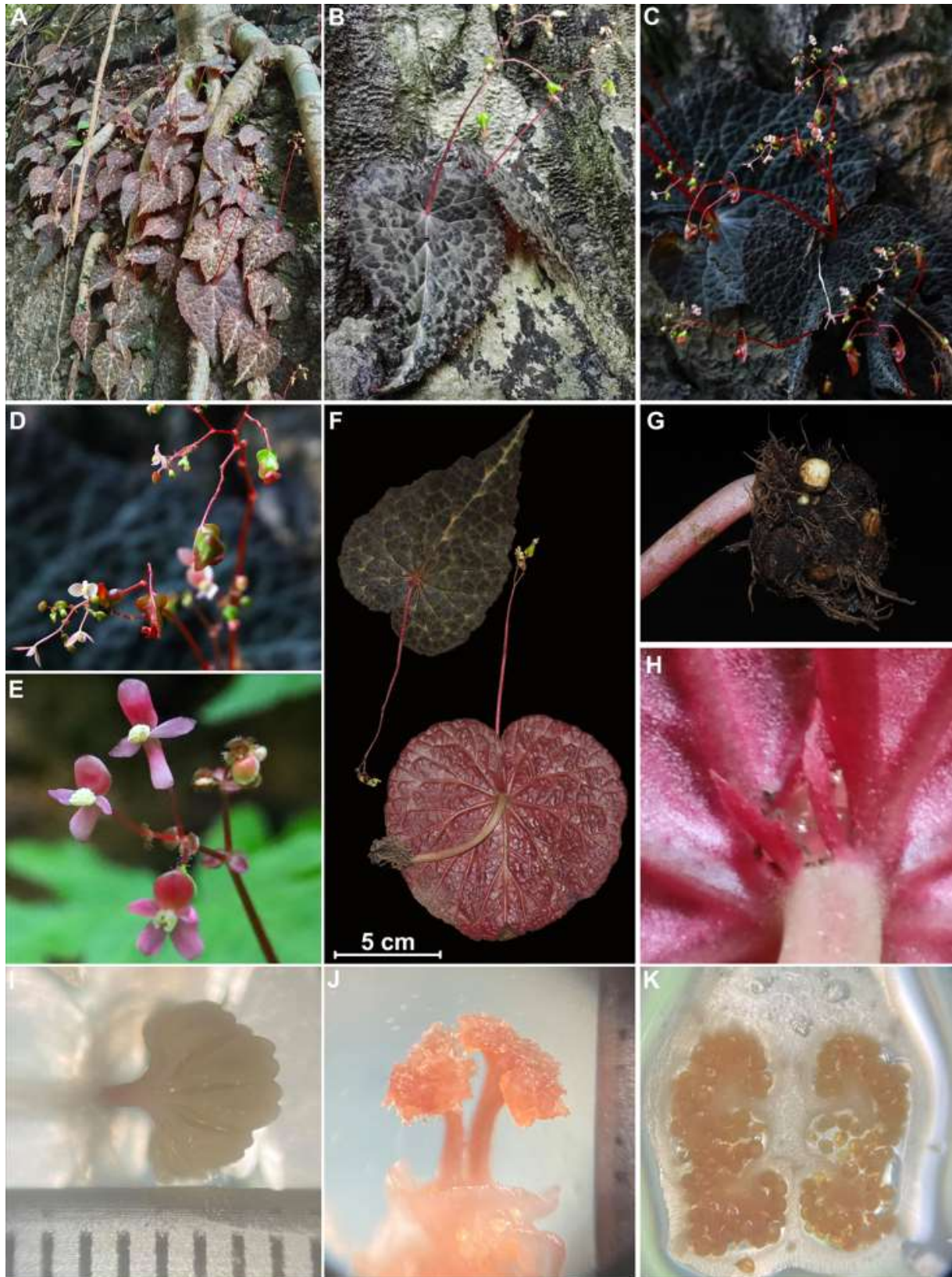


Fig 1. *Begonia kayinensis* M.B.Maw & Y.H.Tan, sp. nov. **A–C.** Habit; **D–E.** Inflorescence; **F.** Plants with scale; **G.** Tuber; **H.** A stipule pairs; **I.** Androecium; **J.** Styles and stigmas; **K.** Ovary transverse section. Photos by: A, B, H. M.K.Naing; C–E. T.N. Tun; F, G. M.B. Maw; I–K. K.Z. Hein; Hpa-an District, Kayin State, Myanmar.

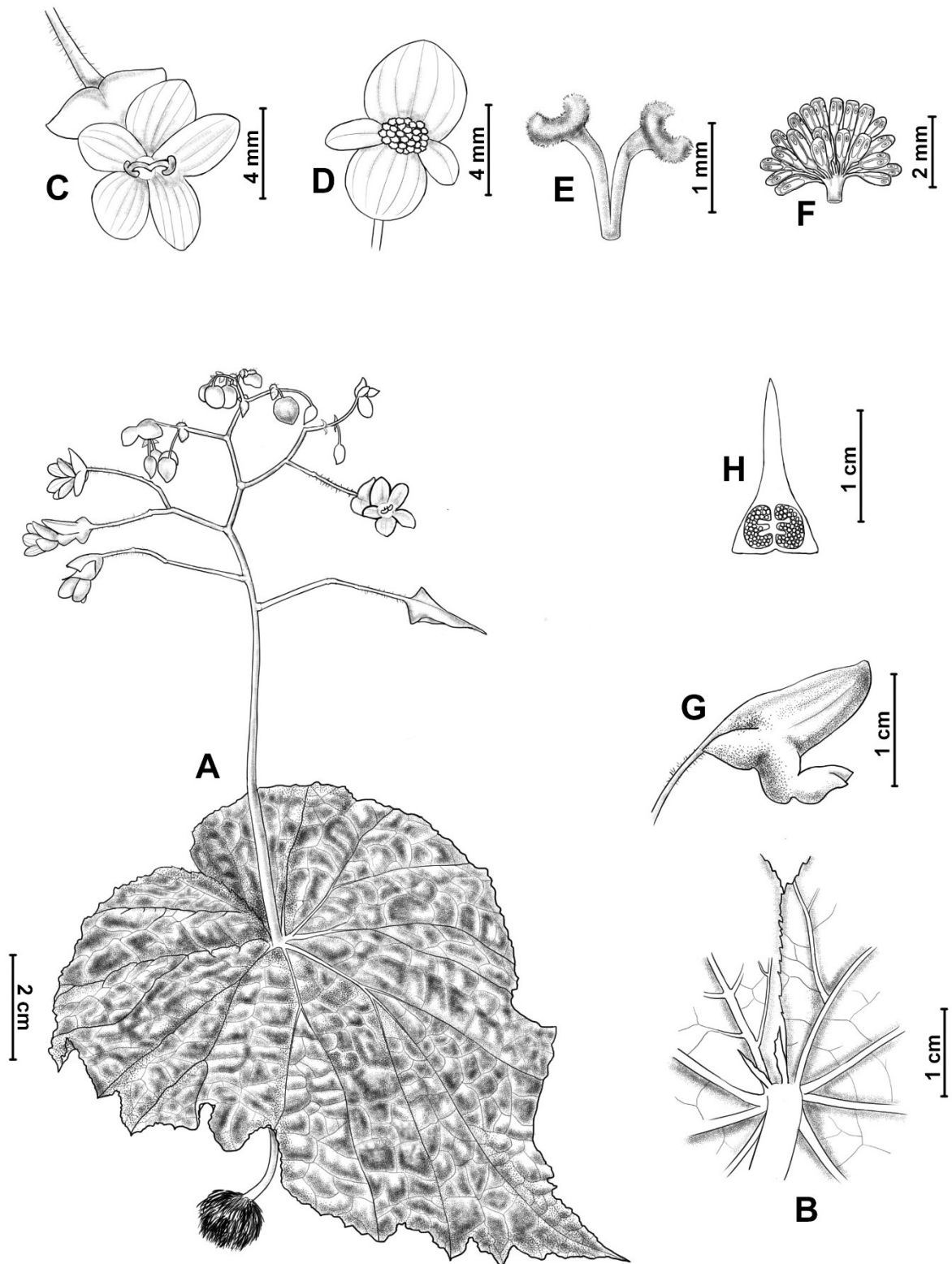


Fig 2. *Begonia kayinensis* M.B.Maw & Y.H.Tan, sp. nov. **A.** Habit; **B.** Pistillate flower; **C.** Staminate flower; **D.** Styles and stigmas; **E.** Androecium; **F.** Ovary transverse section; **G.** Pistillate flower bud; **H.** A stipule pairs. Drawn by Hai-Yao Chen.

**Table 1.** Morphological comparison between *Begonia kayinensis* and *B. prolifera*.

Affinities	<i>B. kayinensis</i> (Myanmar)	<i>B. prolifera</i> (Myanmar, Thailand, China)
Leaf		
shape	cordate or orbicular-cordate	orbicular-cordate
base	cordate, overlapping	cordate, non-overlapping
dimension	8–30 × 7–21.5 cm	8–16 × 9–18 cm
colour	upper surface bullate, purplish-red to brownish-red, and with maroon patches between the veins, sometimes mottled; lower surface deep red	upper surface uniformly green; lower surface pale green
vestiture	upper surface- subglabrous (sometimes scabridulous); lower surface glabrous or sparsely pilose on veins	upper surface- subglabrous or sometimes sparsely white hispid; lower surface subglabrous
Inflorescence		
type	paniculate cyme	thyrsoid cyme
length	up to 20 cm	10–18 cm
peduncle	red, glabrous	light green or reddish-brown, subglabrous
Pistillate flower		
pedicle	translucent hairs	subglabrous

Here, we assigned the new species to sect. *Monophyllon* since it morphologically matches the well-defined characteristics of this section by having an upright stem and inflorescence arising from the top of the stem with the leaf.

ACKNOWLEDGMENTS

We are grateful to Saw Chit Soe Paing for providing living plant specimens and Toe Naing Tun for providing the photographs. We also extend our thanks to Hai-Yao Chen for the illustration. We thank Hong-Bo Ding and Ma-Mai Yue for providing the photographs of *Begonia prolifera*. The first author would like to thank “The Chinese Government Scholarship” Doctoral Program and the project of the Southeast Asia Biodiversity Research Institute, Chinese Academy of Sciences (Y4ZK111B01) for the funding support in her study on the genus *Begonia* in Southeast Asia, and also to the National Natural Science Foundation of China (Grants no. 31970223).

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Supplementary materials are available from Journal Website