



RESEARCH ARTICLE

# Additions to the angiosperm flora of Manipur, India

Kazhuhrii Eshuo\*, Sochanngam Kashung & Kholi Kaini

Department of Botany, Dhanamanjuri University, Imphal, Manipur - 795 001, India

\*Email: kazhuhrii@gmail.com

 OPEN ACCESS

## ARTICLE HISTORY

Received: 22 March 2024  
Accepted: 18 July 2024

Available online  
Version 1.0 : 30 September 2024



## Additional information

**Peer review:** Publisher thanks Sectional Editor and the other anonymous reviewers for their contribution to the peer review of this work.

**Reprints & permissions information** is available at [https://horizonepublishing.com/journals/index.php/PST/open\\_access\\_policy](https://horizonepublishing.com/journals/index.php/PST/open_access_policy)

**Publisher's Note:** Horizon e-Publishing Group remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Indexing:** Plant Science Today, published by Horizon e-Publishing Group, is covered by Scopus, Web of Science, BIOSIS Previews, Clarivate Analytics, NAAS, UGC Care, etc See [https://horizonepublishing.com/journals/index.php/PST/indexing\\_abstracting](https://horizonepublishing.com/journals/index.php/PST/indexing_abstracting)

**Copyright:** © The Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited (<https://creativecommons.org/licenses/by/4.0/>)

## CITE THIS ARTICLE

Eshuo K, Kashung S, Kaini K. Additions to the angiosperm flora of Manipur, India. Plant Science Today (Early Access). <https://doi.org/10.14719/pst.3586>

## Abstract

The investigation into angiosperm flora has identified 5 flowering plants as a new record to Manipur state, northeast India: *Amorphophallus napalensis* (Wall.) Bogner & Mayo and *Arisaema naphanthoides* (Wall.) Mart. (Araceae), *Impatiens pulchra* Hook. f. & Thomson (Balsaminaceae), *Lonicera acuminata* Wall. (Caprifoliaceae) and *Silene baccifera* (L.) Durande (Caryophyllaceae). Notably, the genus *Silene* is a new addition to the state's flora. Detailed morphological descriptions and colour photo plates are provided for easy identification.

## Keywords

Angiosperms; biodiversity; Manipur; new addition

## Introduction

Manipur, located in northeastern India, is an ecologically rich region with unique topography. Its biodiversity is highlighted by the state animal, the Sangai (*Rucervus eldii* McClelland), an endemic brown antlered deer and the state flower, the Shirui Lily (*Lilium mackliniae* Sealy), also endemic. Geographically, Manipur spans between 23°50' to 25°42' N latitude and 92°59' to 94°46' E longitude, covering approximately 22327 sq. km. It borders Myanmar to the east, Nagaland to the north, Assam to the west and Mizoram to the south. The state is divided into 2 main regions: the valley, covering about 1787 sq. km. at an elevation of 700 m above sea level and the surrounding hills, which cover approximately 20540 sq. km with elevations ranging from 1500 m to 2900 m.

## Study area

Mao area is situated 45 km from the main district headquarters and 109 km from Imphal, the capital city of Manipur. The geographical coordinates of the area are between 25°28' to 25°31'N latitude and 94°6' to 94°8'E longitude, with an elevation ranging from 1550 to 2994 m above sea level. The region is known for its high altitudinal gradient and montane forest and falls under micro- endemic hotspots (1). The vegetation is predominantly subtropical deciduous mixed forest. Species diversity is high, but it decreases with increasing elevations. At the mountain peak, only a few species of shrubs, grasses and herbs are found. The area's rich biodiversity has attracted many taxonomists to explore it (2-13). The present investigation aims to document the diverse plant species in the Mao area of Senapati district, Manipur.

Field surveys were conducted from 2020 to 2023 across different seasons and locations. During these explorations, several angiosperm plants were collected. Upon detailed observation and consultation with existing literature (14-19), 5 plant specimens: *Amorphophallus napalensis* (Wall.) Bogner & Mayo and *Arisaema nepenthoides* (Wall.) Mart. (Araceae), *Impatiens pulchra* Hook. f. & Thomson (Balsaminaceae), *Lonicera acuminata* Wall. (Caprifoliaceae) and *Silene baccifera* (L.) Durande (Caryophyllaceae) were identified as new records for the state flora of Manipur.

## Materials and Methods

Field surveys and plant collection were done at different locations and times. The collected specimens were dried, pressed and prepared as herbarium specimens using conventional herbarium techniques (20). Live plant photos were taken with a Sony SLT-58 and a Cyber Shot DSC-WX200. The herbarium specimens were deposited at the Herbarium, Department of Botany, D.M. College of Science, Imphal-Manipur (DMH) for future reference. Detailed morphological descriptions and colour photo plates are provided for easy identification.

### New Records

#### 1. *Amorphophallus napalensis*

(Wall.) Bogner & Mayo in *Aroideana* 8(1): 19. 1985. *Thomsonia napalensis* Wall., *Pl. Asiat. Rar.* 1: 83. 1830. (Arecaceae) (Fig. 1. A).

Plants are herbs with tuberous, depressed globose, brown tubers. Leaves are usually solitary, appearing after flowering; petioles are 25–60 (–110) × 2–4 cm, pale green with black spots; leaflets are ovate, oblong or lanceolate with undulate margins. The peduncle is up to 90 cm long and convolute, with an elongate-ovate spathe that is obtuse or 2-lobed at the apex. The spadix is sessile, shorter than the spathe, 18–20 cm long, with a female zone of 3–4 cm and a male zone of 5–7 cm. the appendix is 10–12 cm long. Female flowers are dense, as are male flowers. Seeds are ellipsoid and 1–1.3 cm long.

#### Flowering and fruiting

June – July.

#### Distribution

India, Bhutan, Bangladesh, Myanmar and Nepal.

#### Specimen examined

India, Manipur, Senapati dist., Pudunamei-Mao, 1000–1800 m, *Kazuhrii Eshuo*, KE 100028.

#### Habitat

These plants are commonly found in mixed sub-tropical deciduous forests, growing alongside herbs like *Fagopyrum* sp., *Persicaria* sp., *Ageratina* sp., grasses, at Pudunamei Village at elevations of 1000–1800 m.

#### Notes

*Amorphophallus napalensis* flowers without leaves, which appear afterward. The plant is easily identified by its

robust spathe and black-spotted stem. This species has been reported in Arunachal Pradesh, Assam, Meghalaya, Mizoram, Nagaland, Sikkim and West Bengal (21). The local Mao people collect these plants for pig fodder.

#### 2. *Arisaema nepenthoides*

(Wall.) Mart. In H.W. Schott & S.L. Endlicher, *Melet. Bot.* 17. 1831. *Arum nepenthoides* Wall., *Tent. Fl. Nepal.* 26. 1824 (Araceae) (Fig. 1. B–C).

Dioecious herbs, tuberous with depressed-globose tubers measuring 5–7 cm in diameter. Cataphylls are 2 or 3 in number, up to 25 cm long, linear-oblong and densely covered with dark brown irregular spots. The petiole, up to 90 cm long and yellowish green, forms a pseudostem. Leaflets, 3–5 in number are sessile, lanceolate or elliptic, with acuminate apices. The middle leaflet measuring 8–30 × 2–3 cm, while the lateral leaflets are smaller, cuneate at the base and oblique. The peduncle, emerging from the pseudostem, is longer than the petiole. The spathe is yellowish brown with brown spots, cylindrical and has a broadly auriculate throat. The spadix is unisexual, with a female zone that is cylindrical, 2–3 cm long, obovoid, with a discoid or penicillate stigma. The male zone is 1–2 cm long, violet, with 1–3 globose anthers that dehisce by apical pores. The appendix is erect, cylindrical, yellowish green, with a truncate base and obtuse apex.

#### Flowering and fruiting

June to July.

#### Distribution

India, Bhutan, China, Myanmar and Nepal.

#### Specimen examined

India, Manipur, Senapati dist., Koziirri, 2600–2800 m, *Kazuhrii Eshuo*, KE 100032.

#### Habitat

The plants are found in tropical semi-evergreen forests, growing alongside herbs such as *Fagopyrum* sp., *Persicaria* sp., *Polygonum* sp. and grasses at Koziirri at an elevation 2600–2800 m.

#### Notes

*Arisaema nepenthoides* has been reported in Arunachal Pradesh, Meghalaya, Sikkim and West Bengal in India (21). Local people, such as Maos, collect these plants to use as pig fodder.

#### 3. *Impatiens pulchra*

Hook. f. & Thomson in *J. Proc. Linn. Soc., Bot.* 4(15): 139. 1859. (Balsaminaceae) (Fig. 2. A–F).

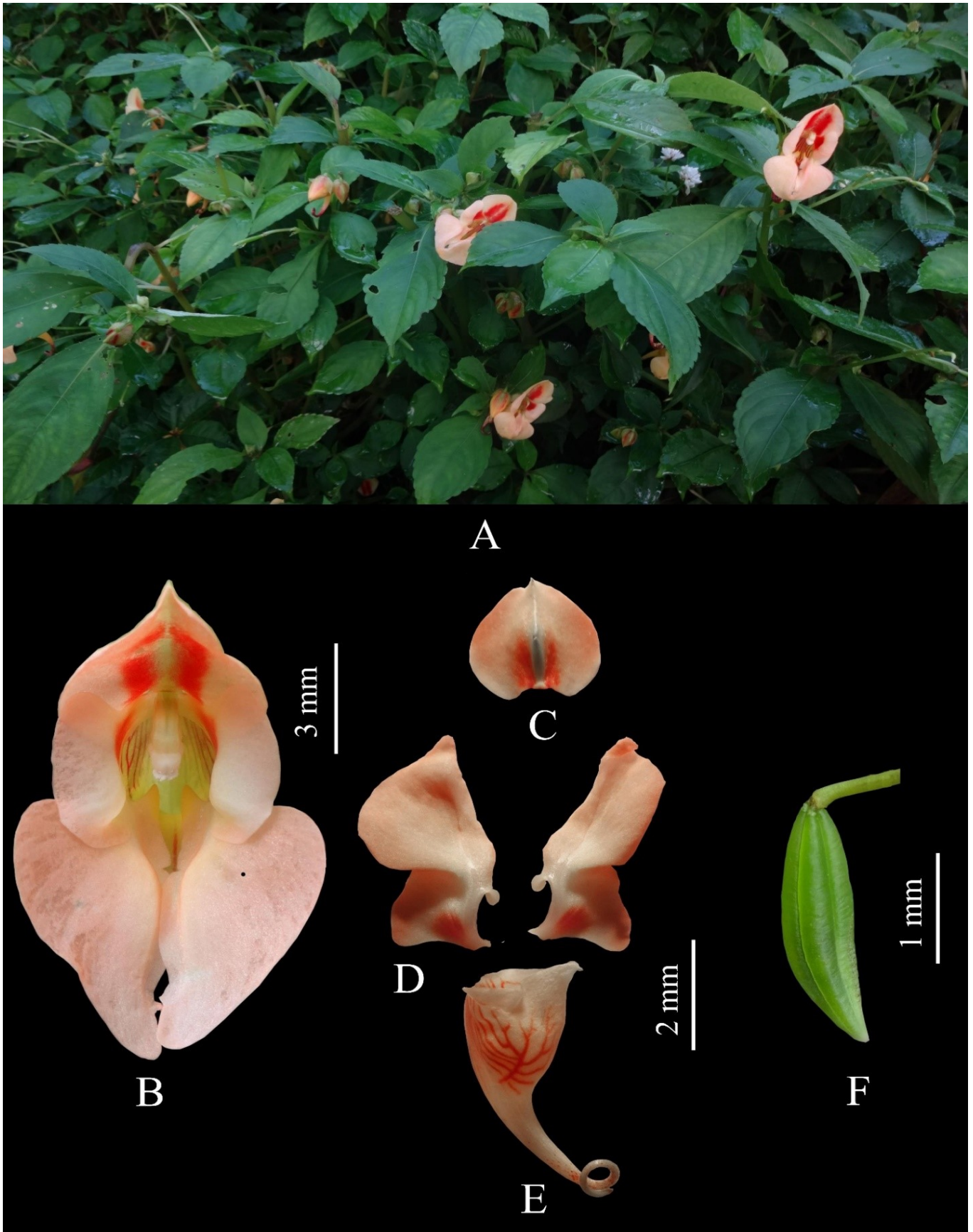
Perennial herbs, succulent and either branched or sparsely branched, reaching up to 80 cm in height; stems are terete. Leaves alternate, clustered at the tips or predominantly in the apex region, with fewer in the basal region; petioles 1–2.5 (up to 4) cm long and green; blades measure 8–11 × 3–5 cm, ovate to obovate, with a cuneate base, crenate margins and an acute to acuminate apex; stipules are absent. Inflorescences are axillary, with a peduncle 4–6 cm long, bearing 1–3 flowers; buds are orange to reddish. Flowers are orange-red or yellowish-red, with



**Fig. 1.** A. *Amorphophallus napalnesis* (Wall.) Bogner & Mayo, B-C. *Arisaema nephanthoides* (Wall.) Mart., B. An upper portion of plant showing spathe and leaves, C. Tuber, D-F. *Silene baccifera*, (L.) Durande., D. Plant habit with flowers E. Closed up view of a flower, F. Fruit.

pedicels up to 2 cm long and green. Bracts at the base are green, persistent, with an acute apex, up to 3 mm long and may be glabrous to hairy. Lateral sepals are 2, ovate with an apex acute, approximately  $12 \times 9$  mm, with an entire, non-membranous margin. The lower sepal is orange, boat-

shaped or navicular, up to 2.6 cm long, non-beaked, with a spur coiled at the tip, up to 2.5 cm long, unifid and with greenish red tip. The dorsal petal is orange, orbicular, about  $1.9 \times 1.7$  cm, with a cuspidate apex and slightly raised on the dorsal side. Lateral petals are united,



**Fig. 2.** *Impatiens pulchra* Hook. f. & Thomson. **A.** Plant habit with flowers **B.** Front view of the flower; **C.** Dorsal petal, **D.** Lateral petals, **E.** Lower sepal showing spur, **F.** Fruit (capsule).

yellowish-orange-red, bilobed, subequal, with an obtuse apex, approximately 3.5 cm long, and 1.5 cm wide, not clawed, with a basal auricle. Stamens are 5, enclosing the ovary, up to 6 mm long, with obtuse lobes. Capsules are turgid, green and smooth, up to 4 cm long. Seeds are numerous, black and up to 1 mm across.

#### **Flowering and Fruiting**

June – October.

#### **Distribution**

India, Bhutan, China, Myanmar, Nepal and Thailand.

### Specimen examined

India, Manipur, Senapati dist. Pudunamai-Mao, 1600–1800 m, *Kazuhrii Eshuo*, KE100002 & KE 100019.

### Habitat

The plants commonly grow near perennial stream, in shady places with high moisture, alongside fern and other species such as *Oenanthe* sp., *Pilea* sp., *Elatostema* sp., *Fagopyrum* sp. at elevation of 1600–1800 m.

### Ethnobotanical uses

The boiled extract of the leaves is used by the Mao tribe to

treat gastritis. The plant is also consumed as a vegetable and used as fodder for pigs.

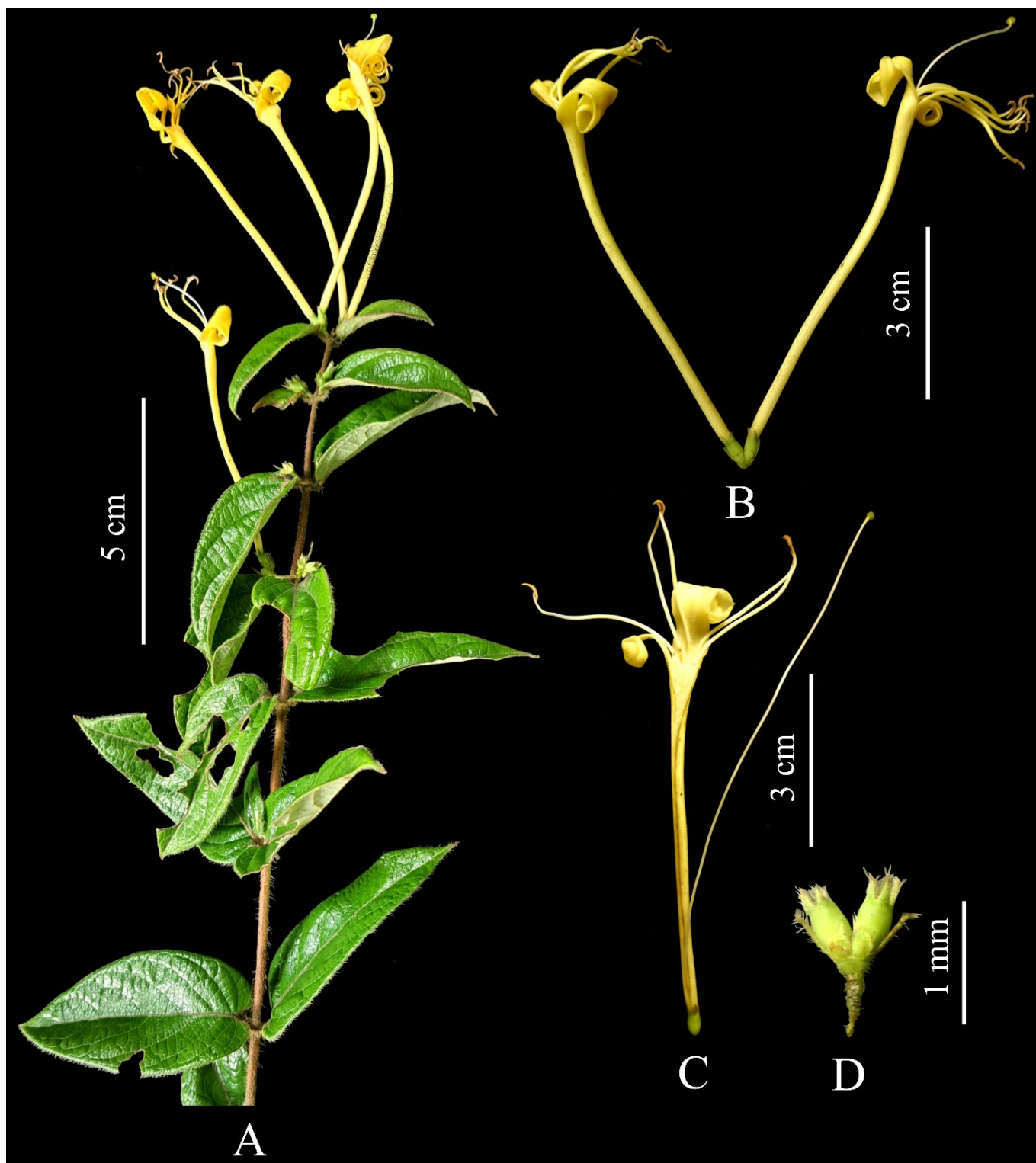
### Notes

*Impatiens pulchra* has been previously reported in Arunachal Pradesh, Sikkim, Nagaland and West Bengal in India (22).

### 4. *Lonicera acuminata*

Wall. in Roxb., Fl. Ind., ed. 1824, 2: 176. 1824 (Caprifoliaceae) (Fig. 3. A–D).

Perennial shrubs, either erect or vines-like, with a



**Fig. 3.** *Lonicera acuminata* Wall. **A.** A Flowering Twig; **B.** Showing complete flowers; **C.** L.S. of Flower showing anthers and carpel; **D.** Showing calyxes of flower.

hard, solid and strongly pubescent stem that is dark brownish-red. Leaves are opposite and decussate, stipulate, approximately 7 mm long, with the node completely encircled by the leaf base, which is pubescent. The leaf base is rounded to cordate, while the blade is ovate-lanceolate, measuring 5.5–9.2 × 2.5–4 cm, with an acute to acuminate apex. The blade is monocostate, light green on the dorsal side and whitish green on the ventral side, with an entire margin and ciliate edges. Inflorescences are lateral cyme, with 2–6 flowers per cyme. Flowers are white when young, turning yellow to orange-yellow as they mature. They have bracteates, measuring 1–2.5 mm long, 0.5–1 mm wide, orbicular to linear and pubescent. Pedicels are 1–2 mm long. The calyx is green, with 5 triangular sepals approximately 1 mm long, acute at the apex and pubescent. The corolla is white to yellow or orange-yellow, with a hairy, long tube approximately 6 cm long. It is ex-trose and splits into 2 lobes, with 4 united petals and 1 free petal. The anthers are 5, epipetalous, with filaments about 2.5 cm long, dorsifixed, versatile and lobed curved. The style is long, up to 8.5 cm, with a capitate stigma and an inferior ovary.

#### Flowering and fruiting

June – July.

#### Distribution

Bhutan, China, India, Myanmar, Nepal and Philippines.

#### Specimen examined

India, Manipur, Senapati dist., Pudunamei-Mao, 1600–1800 m, *Kazuhrii Eshuo*, KE 100053.

#### Habitat

The plants are commonly found in mixed sub-tropical deciduous forests, growing alongside herbs and shrubs at Pudunamei village situated at an elevation of 1600–1800 m.

#### Notes

*Lonicera acuminata* has not been reported in Manipur until now. Previously, this species has been documented in Arunachal Pradesh, Sikkim, West Bengal and Nagaland (23, 24).

#### 5. *Silene baccifera* (L.)

Durande, Fl. Bourgogne 1: 260. 1782. *Cucubalus baccifera* L., Sp. Pl. 414. 1753 (Caryophyllaceae) (Fig. 1. D–F).

Perennial herbs with branched, spreading stems that are pubescent and brownish green. The leaves are olive green, ovate-lanceolate, measuring 5–15 × 2–4 cm and are pubescent, ciliate and falcate. The leaf margins are entire, with the base either cuneate or rounded and the apex acute to acuminate. Flowers are solitary and nodding, with a pedicel 4–6 mm long. The calyx is yellowish green, broadly campanulate, 8–12 mm long and ciliate. The 5 petals are white, exceeding the calyx and 1.5–1.8 cm long with a bifid limb. The stamens and style are included within the calyx. Fruits are black when mature, globose, 6–8 mm in diameter and irregularly dehiscent. The seeds are black, 1.5 mm across and reniform.

#### Flowering and fruiting

June – August.

#### Distribution

India, China, Europe, Nepal, Afghanistan, Pakistan, Taiwan, Tibet.

#### Specimen examined

India: Manipur: Senapati district, Pudunamei-Mao, 1600–1800 m, *Kazuhrii Eshuo*, KE 100018.

#### Habitat

The plants are commonly found in open forests, growing alongside other herbs, shrubs or grass at an elevation of 1600–1800 m.

#### Notes

The genus *Silene* has not been previously reported in the state of Manipur, northeast India. *S. baccifera* has been reported in Nagaland, Sikkim, Uttarakhand and Jammu and Kashmir in India (25).

#### Acknowledgements

The authors greatly acknowledged the help rendered by Kholi Adahrii, Lolia Hepuni and Dr. Santanu Dey in helping during fieldwork and providing literature. The authors are thankful to the university authority for the facility provided to carry out the research work.

#### Authors' contributions

KE carried out fieldwork, identification of plant specimens and drafted the manuscript. SK carried out manuscript revision and photo plate preparation. KK carried out fieldwork, herbarium preparation and manuscript revision. All authors read and approved the final manuscript.

#### Compliance with ethical standards

**Conflict of interest:** Authors do not have any conflict of interests to declare.

**Ethical issues:** None.

#### References

1. Nayar MP. Hotspots of endemic plants of India, Nepal and Bhutan. Tropical Botanic Garden and Research Institute, Thiruvananthapuram; 1996.
2. Clarke CB. On the plants of Kohima and Muneypore. The Journal of Linnean Society. 1889;25:1-74. <https://doi.org/10.1111/j.1095-8339.1889.tb00793.x>
3. Deb DB. Dicotyledonous plants of Manipur territory. Bulletin of Botanical Survey India. 1961;3:253-350. <https://doi.org/10.20324/nelumbo/v3/1961/76503>
4. Mao AA. Notes on the orchids of Senapati and surrounding hills in the state of Manipur, India. The Journal of the Orchid Society of India. 1999;13(1-2):55-58.
5. Mao AA, Gogoi R. Floristic study of Dziiko valley and surrounding hills, Manipur and Nagaland, India. Indian Forest. 2010;136(1):57-68.

6. Mao AA, Yumnam JY, Gogoi R, Pinokiyo A. Status and distribution pattern of *Rhododendron* species in temperate and sub-alpine hill ranges of mount Esii and surrounding in Manipur and Nagaland, India. *Indian Forest*. 2009;135(7):880-90.
7. Eshuo K, Chaturvedi SK. *Ceropegia longifolia* Wallich (Apocyanaceae: Asclepiadoideae) – a new record for Manipur, India. *Pleione*. 2011;5(1):201-04.
8. Lokho A. The folk medicinal plants of the Mao Naga in Manipur, North East India. *International Journal of Scientific and Research Publications*. 2012;2(6):1-8.
9. Dhatchanamoorthy N, Begum SN, Lokho K. *Maesa membranacea* (Primulaceae): an addition to the flora of India from Manipur state. *Richardiana*. 2021;5:224-29.
10. Dhatchanamoorthy N, Ravikumar K, Lokho K. Additions to the flora of Manipur state, North-Eastern India. *Pleione*. 2018;12(1):132-42. <https://doi.org/10.26679/Pleione.12.1.2018.132-142>
11. Eshuo K, Lokho A. *Sauromatum horsfieldii* (Araceae): a new addition to the flora of Manipur, northeastern India. *Journal of Threatened Taxa*. 2023;15(1):22538-542. <https://doi.org/10.11609/jott.8024.15.1.22538-22542>
12. Eshuo K. *Lycianthes lysimachioides* (Wall.) Bitter (Solanaceae): A new Addition to the Flora of Manipur, Northeast India. *Biological Forum – An International Journal*. 2023; 15(2):342-45.
13. Eshuo K. *Cheirostylis* Blume (Orchidaceae): a new generic addition to the orchid flora of Manipur state, Northeast India. *Plant Science Today*. 2024;11(1):564-67. <https://doi.org/10.14719/pst.2609>
14. Hooker JD. *The British flora of India*. Vols. 1–7. L. Reeve and Co., Kent, London; 1872-97.
15. Singh NP, Chauhan AS, Mondal MS. *Flora of Manipur*. Vol. I. Botanical Survey of India, Kolkata. India; 2000.
16. Mao AA, Krishna G, Hepuni L, Jalal JS. Additions to the flora of Manipur. 2023; 149(7):781-83. <https://doi.org/10.36808/if/2023/vk19i7/169458>
17. Balachandran N, Ravikumar K. Additions to the flora of Manipur in North East of India. *Pleione*. 2014;8(1):199-206.
18. Naithani HB, Negi RK. Addition of fourteen species of trees to the flora of Manipur, India. *Pleione*. 2022;16(3):278-88. <https://doi.org/10.26679/Pleione.16.3.2022.278-288>
19. Mao AA, Gogoi R. *Flora of Dziiko/Dzukou valley*. Botanical Survey of India, Kolkata, India; 2016.
20. Jain SK, Rao RR. *A handbook of field and herbarium methods*. Today and Tomorrow's Printers and Publishers, New Delhi; 1976.
21. Sasikala K, Vajravelu E, Daniel P. Araceae, pp. 289–299. In Nair VJ, Singh P, editors. *Fascicles of Flora of India, Fascicle 29*. Botanical Survey of India, Kolkata; 2019.
22. Gogoi R, Borah S, Dash SS, Singh P. *Balsams of the Eastern Himalaya- A Regional Revision*. Botanical Survey of India, Kolkata; 2018.
23. Mao AA, Odyuo N, Verma D, Singh P. *Checklist of flora of Nagaland*. Botanical Survey of India, Kolkata; 2017.
24. BSI 2023. "*Lonicera*" on <https://efloraIndia.gov.in>. Botanical Survey of India, Kolkata. (Accessed on 6<sup>th</sup> February, 2024).
25. Singh M, Yadav K, Agnihotri P. An overview of the genus *Silene* L. (Caryophyllaceae) in India. *Pleione*. 2022;16(2):146-53. <https://doi.org/10.26679/Pleione.16.2.2022.146-153>