NEW DISTRIBUTION RECORD OF LYSIMACHIA OTOPHORA C.Y.WU (PRIMULACEAE) FROM VIETNAM

Tran Duc Binh[1*], Bui Hong Quang[1], Do Van Hai[1], Nguyen Quang Hung[1], Le Ngoc Han[1], Vu Anh Thuong[1], Nguyen Thu Thuy[1,2]

[1]Institute of Ecology and Biological Resources - Vietnam Academy of Science and Technology
[2]International Biological Material Research Center - Korea Research Institute of Bioscience and Biotechnology

ARTICLE INFO

Received: 29/6/2021
Revised: 14/9/2021
Published: 16/9/2021

KEYWORDS

Lysimachia
New distribution
Bat Xat Nature Reserve
Lao Cai
Viet Nam

ABSTRACT

The occurrence of *Lysimachia otophora* C.Y.Wu was doubtful in Vietnam due to the unavailability of related specimens and literature. In the course of fieldwork in Bat Xat Nature reserve of Lao Cai province, a distinct species of *Lysimachia* with a petiole leaf auriculate at base, racemes axillary, bracts narrowly lanceolate, corolla yellow and stamens 5 (with 2 stamens short and 3 stamens long) was found. After careful comparison of our specimens and the research samples of *L. otophora* C.Y.Wu, we concluded that they are similar. This species has been reported native to China (Yunnan and Guangxi) until now and reported for the first time in Vietnam. In this paper, we confirm the new distribution of *L. otophora* C.Y.Wu in Vietnam providing suitable references. However, we provided data on taxonomy, morphology, ecology and distribution of the mentioned species accompanied by the photographs. Therefore, the total number of species in this genus is 23 species and 1 variety in Vietnam.

BỔ SUNG VÙNG PHÂN BỐ MỚI CHO LOÀI LYSIMACHIA OTOPHORA C.Y.WU (PRIMULACEAE) Ở VIỆT NAM

Trần Đức Bình[1*], Bùi Hồng Quang[1], Đỗ Văn Hài[1], Nguyễn Quang Hưng[1], Lê Ngọc Hân[1], Vũ Anh Thương[1], Nguyễn Thu Thủy[1,2]

[1]Viện Sinh thái và Tài nguyên sinh vật - Viện Hàn lâm Khoa học và Công nghệ Việt Nam,
[2]Trung tâm Nghiên cứu Vật liệu sinh học Việt Nam - Hàn Quốc - Viện Khoa học Sinh học và Công nghệ Sinh học Hàn Quốc

THÔNG TIN BÀI BÁO

Ngày nhận bài: 29/6/2021
Ngày hoàn thiện: 14/9/2021
Ngày đăng: 16/9/2021

TỪ KHÓA

Lysimachia
Phân bố mới
Khu bảo tồn thiên nhiên Bát Xát
Lào Cai
Việt Nam

TÓM TẮT

Sự xuất hiện của loài *Lysimachia otophora* C.Y.Wu được nghi ngờ ở Việt Nam do không có mẫu vật và các tài liệu liên quan. Trong quá trình điều tra thực địa ở Khu bảo tồn thiên nhiên Bát Xát của tỉnh Lào Cai, nhóm nghiên cứu đã phát hiện một loài thuộc chi *Lysimachia* với đặc điểm gốc cuống lá dạng tai, cụm hoa nách lá, lá bắc hình mác hẹp, tràng vàng và nhị 5 (trong đó 2 nhị ngắn và 3 nhị dài) được tìm thấy. Sau khi so sánh các mẫu vật đã thu thập được và mẫu nghiên cứu của loài *L. otophora* C.Y. Wu, chúng tôi kết luận rằng chúng rất giống nhau. Loài này được ghi nhận là đặc hữu của Trung Quốc (Vân Nam, Quảng Châu) và lần đầu tiên được báo cáo ở Việt Nam. Trong bài báo này, chúng tôi xác nhận vùng phân bố của loài *Lysimachia otophora* C.Y. Wu ở Việt nam, cung cấp các tài liệu tham khảo có liên quan. Ngoài ra, chúng tôi còn cung cấp dữ liệu về mô tả, đặc điểm hình thái, sinh thái và sự phân bố của loài được đề cập kèm theo ảnh màu. Vì vậy, tổng số loài thuộc chi này ở Việt Nam là 23 loài và 1 thứ.

DOI: https://doi.org/10.34238/tnu-jst.4713

[*] Corresponding author. *Email: tranbinha4@gmail.com*

1. Introduction

The genus *Lysimachia* L. includes about 140-200 species and was originally placed in Primulaceae [1], mainly distributed in the temperate and subtropical parts of the northern hemisphere, but has a few species in Africa, Australia and South America [2-6].

While studying of the literature, we found that the species *Lysimachia otophora* has been recorded available in Vietnam [7]. However, the distribution location and study specimen are not specified. Currently, there occur 22 species and 1 variety of *Lysimachia* are reported in Vietnam [8], [9]-[15].

In 2019-2020, during a plant survey of Bat Xat Nature Reserve in Lao Cai province, we discovered *Lysimachia otophora*. After carefully studying the monographs, collected specimens and consulting relevant literature [6], [8], [9]-[15], we confirmed the species *Lysimachia otophora* new distribution in Vietnam; the current specimens have been kept in herbaria (HN) of the Institute of Ecology and Biological Resources. In this paper, we provided the photographs, ecology, distribution, data on taxonomy and notes to easily identify species in future studies.

2. Methods/Materials

Materials: Specimens of *Lysimachia* housed in the herbaria (HN, HNU, P, K, WUK, IBSC, LBG, NAS, HITBC, IMDY, KUN, PE, IBK) were examined, and relevant literatures were also consulted [8]-[10]. Morphological comparison of our specimen with allied species was carried out to confirm the identity of the plant.

Methods: The morphological comparison method was used to study the plants. It is one of the most suitable methods in plant taxonomic studies. Based on the morphological characteristics of the reproductive organs of plants for comparison because it is little change and less affected by the environment [16]. In addition, morphological descriptions were formed on literatures of [7]-[10]. Besides, the scientific name was updated according to the current latest classification system [17] – [19].

3. Results and Discussion

3.1. Results

Taxonomic treatment

Lysimachia otophora C.Y.Wu (Figure 1)

C. Y. Wu in C. Y. Wu & H. W. Li, 1965. Yunnan Redai Yaredai Zhiwu Quxi Yanjiu Baogao (Rep. Stud. Pl. Trop. Subtrop. Yunnan). 1: 46.

Herbs perennial, 20-60 cm tall, rust-colored strigillose throughout. Stems erect, nearly terete in the lower part, obtusely quadrangular in the upper part, simple or weakly branched. Leaves opposite; petiole 1-3 cm, auriculate and semi-clasping at base; leaf blade elliptic-ovate, 3-7.5 × 1.5-4 cm, base broadly cuneate to subrounded, apex acute; veins 4-6 pairs, slightly raised abaxially; veinlets invisible. Racemes axillary, 4-10-flowered; peduncle 1-4 cm; bracts narrowly lanceolate, 5-11 mm, outside glabrous, inside ciliate, ± adnate to base of pedicel. Pedicel 2-5 mm. Calyx 5, Calyx lobes lanceolate, 5-10 × 1.5 mm, both surfaces puberulent, costate. Corolla yellow, slightly longer than calyx; tube ca. 1 mm; lobes 6-8 × 3-4 mm, sparsely transparent glandular, apex acute. Stamens 5; with 2 stamens short and 3 stamens long; filaments connate basally into a 2-2.3 mm high tube, glandular, free parts 2-4.5 mm; anthers yellow, oblong, dorsifixed, opening by lateral slits, ca. 1 mm. Pistil 8 mm; ovary ca. 2 mm, sparsely strigillose of 2/3 upper part, glabrous of 1/3 lower part; style 4-6 mm, sparsely puberulent at the base, stigma glabrous. Capsule greenish when young, subglobose, ca. 3 mm in diam.

Loc. class.: China Type: Not found yet

Flowering and fruiting: May-July.

Ecology and habitat: *Lysimachia otophora* found in Bat Xat Nature Reserve, near the border of China. We are observed at Red waterfall, 7 km SSE of Y Ty village. This species was found growing on slopes, secondary forest, along streams, wet places, at elev. about 1400 m. About in association with *Gnetum montanum*, *Uncaria* sp., *Symplocos* sp., *Hartia* sp., *Asarum petelotii*, *Vaccinium* sp., *Anemone sumatrana*, *Burmannia disticha*.

Distribution: China (Yunnan, Guangxi), Vietnam (Lao Cai province, Bat Xat district, Y Ty commune). (Figure 2)

Specimens examined: CHINA. **Yunnan:** June 1934, *H. T. Tsai 62371* (WUK: WUK 0045635 Photo!, 0045605 Photo!; IBSC: IBSC 0004649 Photo!; LBG: LBG 00098149 Photo!; NAS: NAS 00047606 Photo!); 17 may 1936, alt. 1530 m, *C.W. Wang 73657* (WUK: WUK 0045954 Photo!, 0045954 Photo!; IBSC: IBSC 0004648 Photo!; LBG: LBG 00098148 Photo!; NAS: NAS 00047604 Photo!); 29 March 1940, alt. 700 m, *C.W. Wang 89683* (WUK: WUK 0268496 Photo!, 0268496 Photo!; HITBC: HITBC 042694 Photo!); 20 June 1934, alt. 1100 m, *H. T. Tsai 60365* (LBG: LBG 00098144 Photo!); 31 may 1934, *H. T. Tsai 62016* (LBG: LBG 00098145 Photo!); 23 may 1934, alt. 1300 m, *H. T. Tsai 55394* (LBG: LBG 00098146 Photo!); 13 July 1934, alt. 1300 m, *H. T. Tsai 60853* (LBG: LBG 00098147 Photo!; NAS: NAS 00047605 Photo!); 28 April 2012, alt. 1122 m, *5325230340* (IMDY: IMDY 001936 Photo!); Pingbian, Daweishan Mt, N.N.R, Shuiweicheng, N 22° 54’ 45.72”; E 103° 42' 03.51"; alt. 2047 m, 25 may 2014, *Cai J, Ta J.D, Yu X.Q, Su Y, Li C.H. 14CS9205* (KUN: KUN 1395836 Photo!, 1395837 Photo!); Jinping County, Fenshuiling Natural Reserve, Adebo, alt. 1400 m, 27 June 2009, *Yunnan Expedition Team, YN-ET 209* (PE: PE 01895522); Pingbian County, Baihe, Mabuchong, Dachengziqing, alt. 1400 m, 02 July 2009, *Yunnan Expedition Team, YN-ET 635* (PE: PE 01895523 Photo!), 07 June 1974, alt. 1200 m, *1581* (PE: PE 00204792 Photo!); **Guangxi:** 07 may 1957, 32259, (IBK: IBK 00028413 Photo!); 21 September 1977, *3-43342*, (GXMI: GXMI 038359 Photo!, 038358 Photo!), 03 June 2009, alt. 800 m, *09528* (IBK: IBK 00280878 Photo!).

VIETNAM, Lao Cai province, Bat Xat district, Y Ty commune, Bat Xat Nature Reservce, N 22° 36’ 17,1”; E 103° 38′ 44,8″; alt. 1445 m, 30 July 2019, Bui Hong Quang, Tran Duc Binh, VN-RU 179 (HN); Bat Xat Nature Reservce, N 22° 36’ 09,1”; E 103° 38′ 51,4″ alt. 1416 m, 15 August 2020, Bui Hong Quang, Le Ngoc Han, Vu Anh Thuong, Tran Duc Binh, BHQ 163 (HN); Bat Xat Nature Reservce, N 22° 36’ 09,1”; E 103° 38′ 51,4″ alt. 1416 m, 15 August 2020, Vu Anh Thuong, VAT 15052020-2 (HN).

Notes: According to our observations, *Lysimachia otophora* is common in the Red waterfall of Y Ty municipality in Bat Xat Nature Reserve. This is different from the rest of *Lysimachia* in Vietnam by having leaves opposite (vs. alternate or connate at base), inflorescence racemes axillary less than 10 flowered (vs. flowers solitary or racemes terminal more than 10 flowered). Besides, *Lysimachia otophora* is similar to *Lysimachia congestiflora* by leaves opposite, inflorescence racemes, leaf blade elliptic-ovate. However, *Lysimachia otophora* is distinguished from *L. congestiflora* by followed characteristics (Table 1).

Table 1. *Comparison of diagnostic characters of L. otophora and L. congestiflor*

Morphological Character	***L. otophora***	***L. congestiflora***
Stem	rust-colored strigillose throughout	fulvous pilose
Petiole leaves	auriculate and semi-clasping at base	narrowly winged
Side leaf	3-7.5 × 1.5-4 cm	1.4–3(–4.5) × 1.3–2.2(–3) cm
Veins	4-6 pairs	2–4 pairs
Inflorescence	Racemes axillary, 4-10 flowered	Racemes terminal, 2-4 flowered
Pedicel	2-5 mm	to 2 mm

3.2. Discussion

Lysimachia otophora has been reported native to China at an altitude from 1100 to 2047 m in Yunnan and 800 m in Guangxi, which are near Lao Cai province (Bat Xat district). When we investigated in the field, we found this species with a similar altitude of about 1450 m. We predict that at a similar altitude to its occurrence in Vietnam and probably should be expected elsewhere.

4. Conclusion

The morphological characteristics of *Lysimachia otophora* C.Y. Wu have been described, with information on distribution, research samples, color photos, maps. Our research for the first time reports the occurrence of *Lysimachia otophora* in Vietnam. Therefore, the total number of species in this genus is 23 species and 1 variety.

Acknowledgment

We are grateful to Chi-Ming Hu (South China Botanical Garden, Chinese Academy of Sciences) for encouragements. This research was funded by IDEA WILD in 2020-2021 and the Vietnam Academy of Science and Technology (VAST) (project No. VAST 04.03/20-21).

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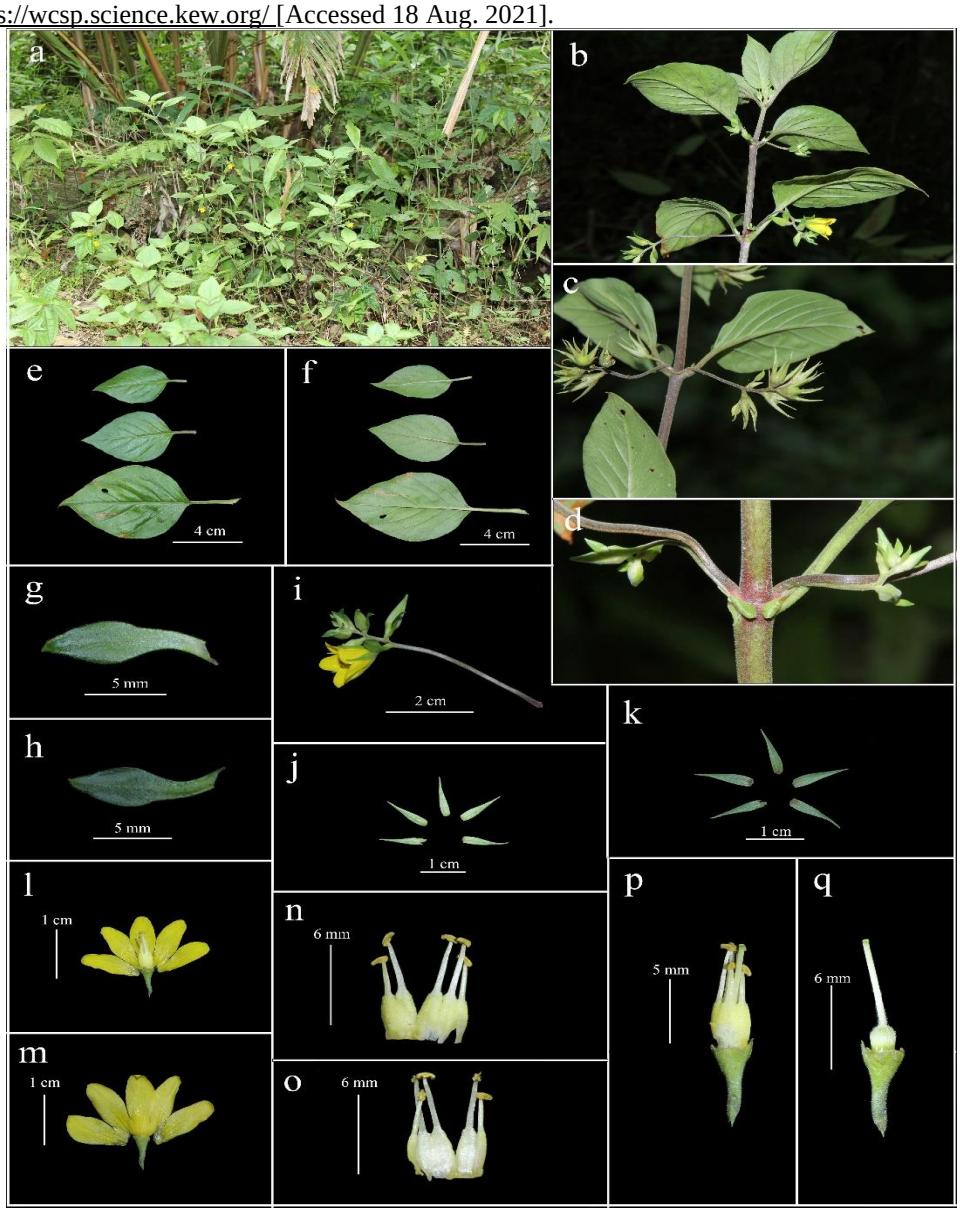

Figure 1. *Lysimachia otophora* C.Y.Wu

a- Habitat; b- Plant in flowering; c- Plant in fruit; d- petiole; e- Adaxial leaf; f- Abaxial leaf; g- Bracts inside views; h- Bracts outside views; i- Flowers; j- Calyx outside viewrs; k- Calyx inside views; l- Flower, lateral view; m- Flower, back view; n- Stamens outside; o- Stamens inside; p- Stamens and Pistil; q- Pistil (Photos by T. D. Binh)

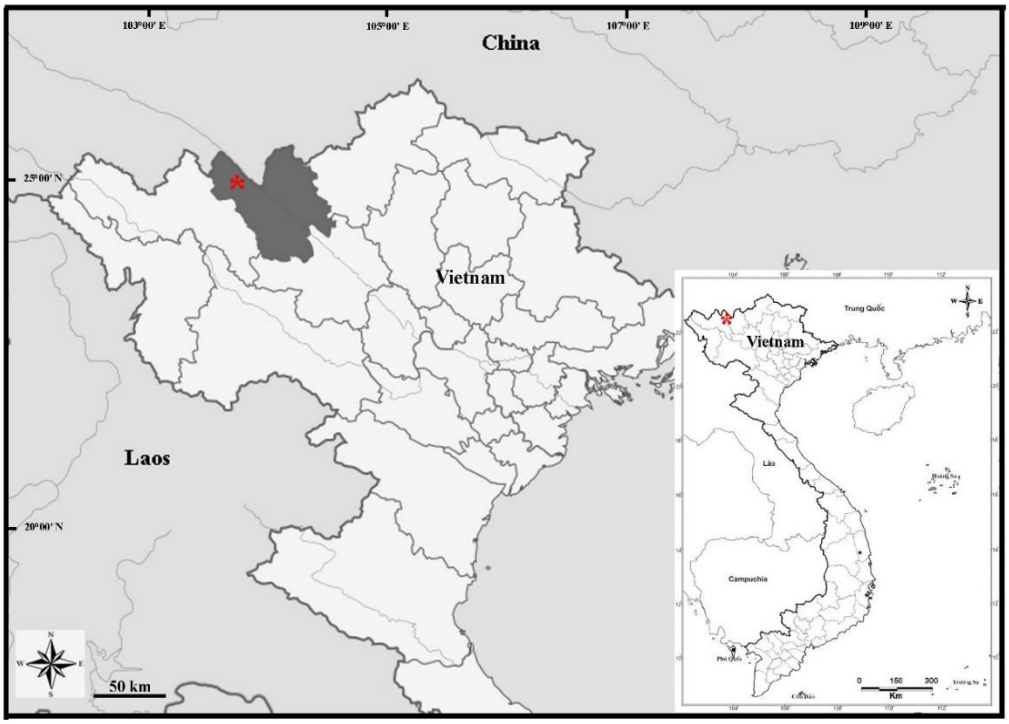

Figure 2. *The distribution of Lysimachia otophora C.Y.Wu in Vietnam*