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TWO NEWLY RECORDED SPECIES OF *ELSHOLTZIA* WILLD. (LAMIACEAE) TO THE FLORA OF VIETNAM

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Summary

Elsholtzia flava (Benth.) Benth. and *Elsholtzia fruticosa* (D. Don) Rehder (Lamiaceae) are reported here as two new records for the flora of Vietnam. Detailed morphological descriptions, phenology, distribution, habitat information and medicinal uses by ethnic people are provided for both species, accompanied by photographic illustrations. Furthermore, a comprehensive key to the species of *Elsholtzia* currently recognized in Vietnam is presented to facilitate future taxonomic and ethnobotanical studies.

Keywords: *Elsholtzia flava*; *Elsholtzia fruticosa*; New record; Lamiaceae; Vietnam.

1. Introduction

Ethnobotanical surveys conducted across several northern mountainous provinces of Vietnam have revealed the significant traditional use of species belonging to the genus *Elsholtzia* (Lamiaceae). Local ethnic minority groups, notably Hmong and Dao, commonly utilize these plants. Specifically, the aerial parts of these *Elsholtzia* species are typically prepared as a decoction for bathing, a traditional remedy used to treat ailments such as urticaria, skin irritation, and common cold symptoms.

Elsholtzia Willd. is a taxonomically diverse genus, encompassing herbs, shrubs, and occasionally small trees [1],[2]. The genus exhibits a wide natural distribution across Europe, North America, and Asia. Prior to this investigation, the flora of Vietnam had recorded eight species of *Elsholtzia*, including *E. ciliata* (Thunb.) Hyland., *E. blanda* (Benth.) Benth., *E. pilosa* (Benth.) Benth., *E. penduliflora* W.W. Smith, *E. rugulosa* Hemsl., *E. communis* (Collett & Hemsl.) Dunn, *E. winitiana* Craib, and *E. kachinensis* Prain [3],[4],[5],[6].

2. Materials and Methods

The samples of two *Elsholtzia* species were collected in Lao Cai province (22°38'24.4"N 103°37'52.7"E; 22°38'05.2"N 103°37'16.1"E) in 2022. The specimens were preserved in the herbarium HNIP (Hanoi University of Pharmacy) with the following code: HNIP/18675-22 and HNIP/18676-22.

The description of *Elsholtzia* specimens was closely scrutinized in available literature [3], [4] and examination of specimens in the herbaria. The measurements and descriptions of floral and vegetative characters were made from fresh plants by a Labomed Luxeo-4Z stereo microscope (USA) and a Canon EOS 60D digital camera (Japan). The scientific names were identified by the literature of the Flora of China and the Flora of Vietnam.

3. Results and discussion

3.1. Taxonomic treatment

Elsholtzia flava (Benth.) Benth., Labiat. Gen. Spec. 161. 1833.

Type: Nepal, "Napalia", 1830, Wallich 1553 (holotype: **P** [P00737619]; isotype: **P** [P00737620].

Description

Shrubs erect, 0.8 – 1.2 m tall. Stems and branches greenish – brown, tuberculate and densely gray pubescent; cross-section quadrangular, slightly concave on four sides, 3 – 6 mm x 3 – 6 mm. Leaf simple, decussate. Petiole cylindrical, slightly swollen at the base, 3 – 6 cm long. Leaf blade broadly ovate to orbicular, 8 – 15 x 5 – 8 cm, base rounded, apex acute, margin serrate, adaxial surface dark green, pubescent; abaxial surface slightly whitish with numerous yellowish glandular dots; venation pinnate, lateral veins 5 – 6 pairs, prominent abaxially.

Special contracted cyme terminal and axillary, symmetrically, 4 – 10 cm, bearing many small

cymes. Each small cyme consists of 5–7 flowers; bracts ovate 3 – 4 mm long, green, pubescent; bracteoles lanceolate. Pedicel ca. 1 mm. Calyx 5-lobed, green, campanulate, 3 – 4 mm long, pubescent, glandular outside; glabrous inside; teeth subulate-linear, apex linear. Corolla 5-lobed, yellow, tube 3 – 4 mm, pubescent, glandular outside, funnellform, ca. 2 mm wide throat; upper lip short and shallowly divided into two equal lobes; lower lip with three lobes, middle lobe

subcircular, margin erose; lateral lobes suboblong, rounded. Stamens 4, slightly exerted, filaments slender, glabrous, whitish to purple, attached to the corolla, 5 – 6 mm long; anthers reuniform, 2-celled, dehiscing longitudinally, purplish-brown. Ovary glabrous; one style whitish-purple, glabrous, filiform, inserted at the base of the ovary between the locules, 5 – 7 mm long; ovary 4-loculed, each locule with one ovate ovule, yellowish-brown.

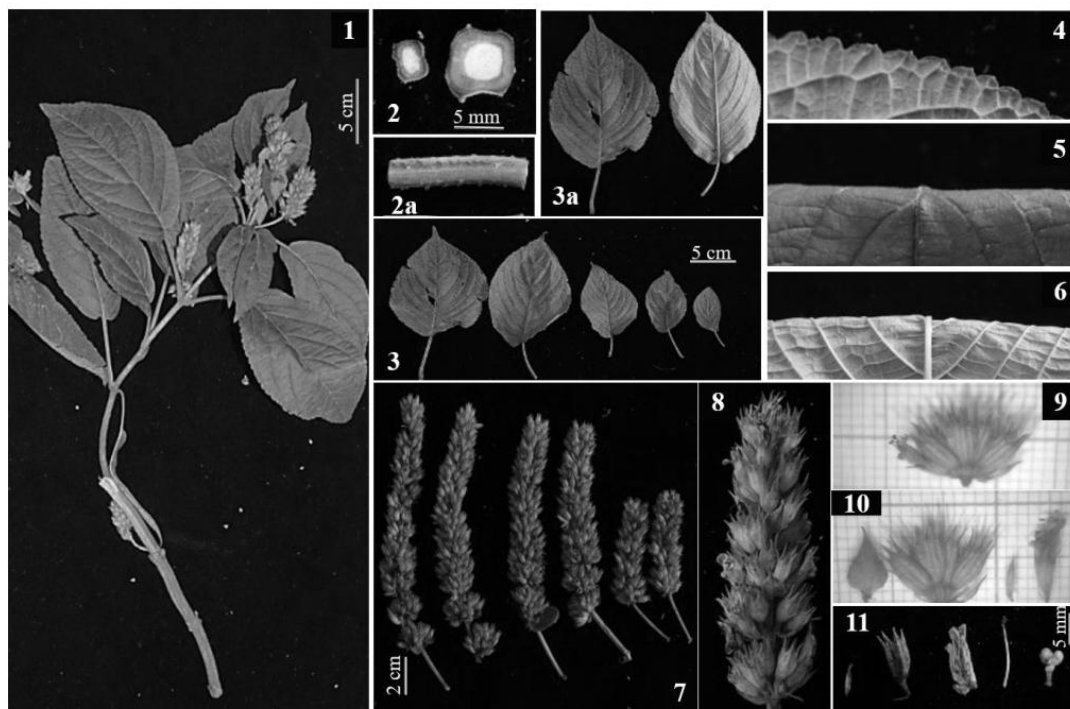


Fig. 1. *Elsholtzia flava* (Benth.) Benth. 1. Branch with leaves and inflorescences; 2. Cross-section of stem; 2a. Surface of stem; 3, 3a. Leaves; 4. Leaf margin; 5. Leaf adaxial surface; 6. Leaf abaxial surface; 7, 8. Inflorescence; 9, 10. Flower; 11. Parts of a flower: bract, calyx tube, corolla, style, ovary. Photographs: 1-11 photographed by N.D. Trong

Distribution: Lao Cai province

Phenology: Flowering: from July to September; Fruiting: from October to November.

Vietnamese name: Kinh giới hoa vàng

Medicinal uses: In Vietnam, our surveys in Y Ty, Bat Xat (Lao Cai province) reported that the aerial parts of *Elsholtzia flava* are used together with several Lamiaceae species to prepare steam baths for treating colds and to bathe for skin conditions. In China, this species has been documented in traditional medicine for its antipyretic properties [7].

Elsholtzia fruticosa (D.Don) Rehder, in Sargent, Pl. Wilson. 3: 381. 1917.

Type: Nepal, "Napalia", 1821, Wallich 1554 (lectotype: HBG [HBG518634]; isoelectotypes: E [E00301387], K [K000881693, K000881694, K000881695, K0001113429-431].

Description

Shrubs erect, 0.8 – 2 m tall, slightly odorous. Stems and branches green, covered with long, yellow tomentose; cross-section quadrangular, 3 – 5 mm x 3 – 5 mm. Leaf simple, decussate. Petiole short, cylindrical to obsolete, brownish yellow, pubescent. Leaf blade narrowly ovate, 4 - 12 x 1.5 - 4 cm, base cuneate to slightly obtuse, apex acuminate, margin coarsely serrate; adaxial surface dark green; abaxial surface slightly brownish yellow,

thick, white pubescent, densely at veins; lateral veins 5 - 7 paired, prominent abaxially.

Inflorescences cymose, condensed at the tip of branches, symmetrically, 8 – 14 cm long, densely flowered, arranged in small cymes; each cyme with a subulate bract 1 – 2 mm long, green, pubescent, and 3 – 7 or 9 flowers of unequal size, the central flower being the largest and the earliest to open. Pedicel cylindrical, green, pubescent, 0.5 – 2 mm. Calyx 5-lobed, green, campanulate, tube 0.8 – 1.0 mm long, apically divided into 5 triangular teeth 0.2 – 0.4 mm high. Corolla

bilabiate, tube 4 – 5 mm long, 5-lobed, upper lip erect into two small lobes; lower lip 3-lobed, the median lobe circular, lateral lobes semicircular, pale yellow. Stamens 4, exerted, filaments slender, glabrous, ivory-white, inserted near the base of the corolla tube, 5 – 7 mm long, anthers ovoid, 2-celled, dehiscing longitudinally, purplish red. Ovary glabrous, 4-locular, with 4 smooth, green, ovoid ovules; style filiform, translucent white, glabrous, inserted at the base of the ovary between the locules, 4 – 5 mm long.

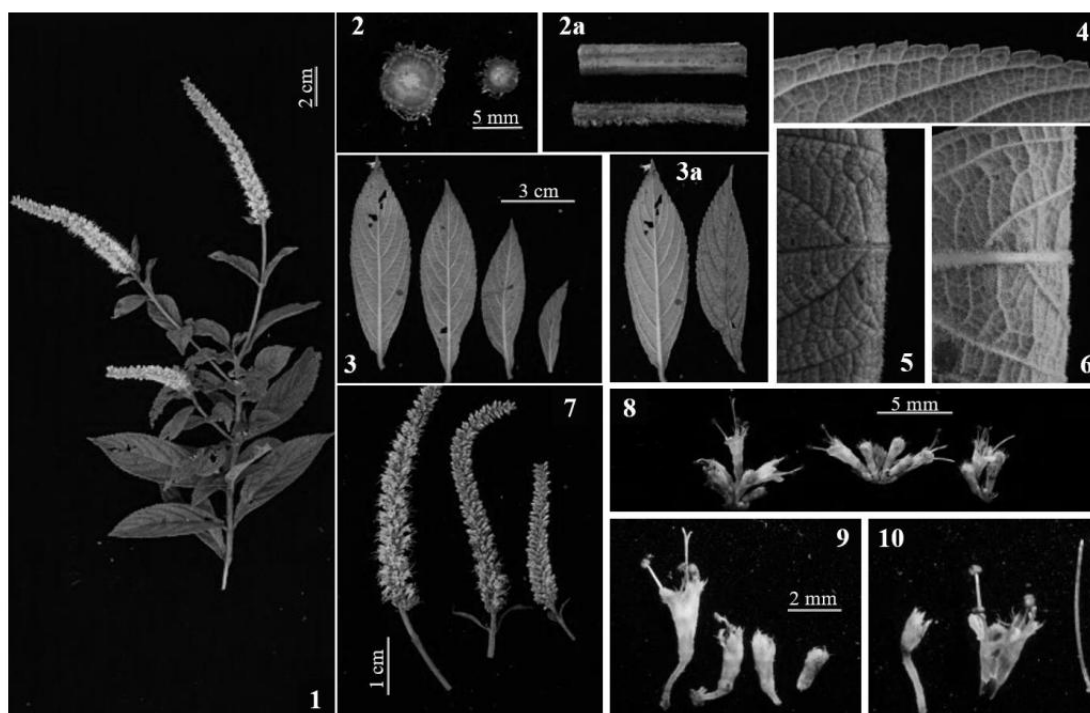


Fig. 2. *Elsholtzia fruticosa* (D.Don) Rehder 1. Branch with leaves and inflorescences; 2. Stem cross-section; 2b. Stem surface; 3-3a. Leaf blade; 4. Leaf margin; 5. Leaf adaxial surface; 6. Leaf abaxial surface; 7. Inflorescence; 8. Verticillaster; 9. Flowers (from bud to mature); 10. Parts of a flower: calyx tube with pedicel; 4 stamens fused to the corolla tube, style. Photographs: 1-10 photographed by N.D. Trong

Distribution: Lao Cai Province.

Phenology: Flowering: from July to September; Fruiting: from October to November.

Vietnamese name: Kê cốt sài.

Medicinal uses: In Vietnam, our surveys in Y Ty,

Bat Xat (Lao Cai province) reported that *Elsholtzia fruticosa* leaves are used in baths to relieve itching, while its branches and leaves are used to treat bone and joint pain. In China, the species is valued for its anti-inflammatory properties [7].

3.2. Key to species of *Elsholtzia* in Vietnam

- | | |
|---|---------------------------|
| 1A. Bracts lanceolate, subulate or linear..... | 2 |
| 2a. Abaxial surface of leaves white tomentose | 1. <i>E. rugulosa</i> |
| 2b. Abaxial surface of leaves glabrous or hairy | 3 |
| 3a. Abaxial surface of leaves puberulent on veins | 2. <i>E. penduliflora</i> |

- 3b. Abaxial surfaces of leaves variously hairy.....4
 4a. Shrubs or subshrubs; corolla white or yellow; inflorescences spicate5
 5a. Spikes $\pm$ secund, loose; bracts subulate to lanceolate-subulate..... 3. *E. blanda*
 5b. Spikes cylindric, compact; bracts lanceolate..... 6
 6a. Leaves lanceolate to elliptic-lanceolate, coarsely serrate, apex acuminate.....4. *E. fruticosa*
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 8a. Plants pilose-hispid; inflorescences 4-7 cm x 0.8-1.0 cm 6. *E. pilosa*
 8b. Plants pubescent; inflorescences 2-5 cm $\times$ 0.4-0.7 cm7. *E. communis*
 1B. Bracts flabellate, subcircular, or $\pm$ broadly ovate9
 9a. Leaves broadly ovate to subcircular, 8-15 cm 8. *E. flava*
 9b. Leaves not broadly ovate or subcircular; spikes secund10
 10a. Spikes cylindric; leaves ovate to ovate-lanceolate; bracts pilose outside.....9. *E. kachinensis*
 10b. Spikes secund; leaves oblong or ovate to lanceolate, base attenuate, cuneate, decurrent; bracts glabrous or subglabrous10. *E. ciliata*

3.3. Discussion

The comparative notes of two new recorded species are as follows: *Elsholtzia flava* (Benth.) Benth. and *E. fruticosa* (D.Don) Rehder can be distinguished from morphologically similar species (e.g. *E. ciliata* (Thunb.) Hyland. and *E. blanda* (Benth.) Benth.) by several characteristics. *E. flava* differs from *E. ciliata* by its broadly ovate to orbicular leaves (vs. narrowly lanceolate in *E. ciliata*). *E. fruticosa* differs from *E. blanda* by its densely tomentose stems (vs. sparsely pubescent in *E. blanda*), narrowly ovate leaves with coarsely serrate margins (vs. finely serrate in *E. blanda*), and pale yellow bilabiate petals (vs. white or pink in *E. blanda*). Both new recorded species exhibit distinctive inflorescence structures: *E. flava* and *E. fruticosa* possess symmetrically arranged inflorescences, in contrast to the laterally displaced inflorescences of *E. ciliata* and *E. blanda*.

As part of a broader investigation into the biodiversity, essential oil composition, and antibacterial activity of *Elsholtzia* species in

Vietnam, the present report helps to document two *Elsholtzia* species newly recorded for the flora of Vietnam, based on ethnobotanical surveys conducted in Lao Cai Province.

4. Conclusion

Two species, *Elsholtzia flava* (Benth.) Benth. and *E. fruticosa* (D.Don) Rehder, are reported as new records for the flora of Vietnam, increasing the total number of *Elsholtzia* species known from the country to ten. The key to *Elsholtzia* species in Vietnam is also provided. These findings highlight the need to continue floristic surveys in the north of Vietnam, which could reveal undocumented species.

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Conflict of interest: The authors declare no conflict of interest.

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