



An overview on *Elsholtzia griffithii*, their species and morphology

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Abstract

The study of plant morphology is one of the important characteristics that put plants into the limelight in the form of their external structures. It is useful in plant identification, including comparative morphological analysis of different plant parts like stems, roots, rhizomes, and flowers in the same or different plant species. Plant morphology also contains studies of plant characters at the macro and micro levels. The micromorphological study includes structures of the cell at the micro level by taking sections and observing them microscopically. Due to botanical ambiguity in different regions of India, there is a need for morphological characterization of different varieties of *Elsholtzia* that have been collected. The present study includes morphological characterization of different ambiguous varieties of *Elsholtzia* and their morphological study at the macro morphological level. So the main focus of this study is to analyze structural morphological differences among these varieties. This study will provide essential baseline data for cultivators, researchers, and users, offering insights into the potential pharmacological applications of this lesser-known plant. Overall, it aims to contribute to the documentation of *Elsholtzia* sp. diversity and its potential in pharmacological drug discovery.

Keywords: *Elsholtzia*; Varieties of *Elsholtzia*; Morphological study; *Elsholtzia griffithii*

1. Introduction

The genus *Elsholtzia*, a member of the Lamiaceae family, comprises approximately 48 species, with 33 varieties distributed across East Asia mainly in China. *Elsholtzia* a green, aromatic herb[1], thrives at altitudes ranging from 400 to 1500 meters above sea level and is found in regions across East Asia, Africa, North America, and Europe. In North East India, particularly in states like Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura, it is widely cultivated and known by various vernacular names[2]. *Elsholtzia* has a rich history of traditional uses in North East India, serving as a flavoring agent in local cuisine and a remedy for various ailments such as cough, cold, skin inflammations, and menstrual disorders. Additionally, it has found applications in herbal tea, cosmetics, perfumeries, and aromatherapy[3]. Despite its economic significance and medicinal importance, the essential oils of *Elsholtzia* are still imported due to high demand in cosmetics, pharmaceuticals, and other industries. the study will assess the variation in *Elsholtzia* morphological and phytochemical characteristics in response to environmental conditions and geographic location, shedding light on different chemotypes within the species[4]. Morphology includes comparing different *Elsholtzia* species or plant groups. One of the best and most important concepts in this field of study is homology, which is the study of the homologous characteristics of plants, such as leaves, flowers, petals, etc[5]. Plant morphology is essential to accurately recognizing plants by examining them at both the macro and microscopic levels. Because it facilitates identification, nomenclature, classification, and phylogenetic analysis—which determines the evolutionary relationship between multiple plant species in the same family—plant morphology is crucial.[6]

DIAGNOSTIC CHARACTERS: [7,8,9,10,11,12,13]

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Elsholtzia griffithii although Hook. f. and *E. cyprianii* (Pavol.) S. Chow ex Hsu shares a similar morphology, Hook. f. can be differentiated from the former by having lanceolate bracts that are 3.0–4.0 mm long and longer than the flowers; five calyx lobes are unequal, with the anterior two lobes being shorter than the three posterior lobes (compared to *E. cyprianii*'s bracts up to 3.0 mm, which are typically shorter than flowers, and equal calyx teeth). Annual herbs range in height from 15 to 60 cm. Simple, upright, 4-angled stems that are either villous or thickly retrorse pubescent. Petiole: 0.5–2.0 cm; leaf blade: oblong to ovate-oblong, 2.0–8.0 cm × 1.0–2.5 cm; herbaceous, dark green adaxially, puberulent, densely pubescent abaxially, glandular, base broadly cuneate, decurrent, midrib prominent abaxially, lateral veins 4–6 paired, margin crenate-serrate to coarsely serrate, apex acute. Five lanceolate teeth, ca. 0.8 mm long, calyx green, tubular-campanulate, ca. 1.8 mm, thickly white pubescent on the outside, anterior two calyx lobes shorten, and the posterior frontal lobe is longer than two lateral lobes. The corolla is reddish or white, 2–2.5 mm, pubescent and glandular on the exterior and glabrous on the inside; it has two lips, an entire or emarginate upper lip, a circular central lobe on the lower lip, semicircular lateral lobes, and an entire margin. Four straight stamens that protrude from the corolla's upper lip, and two larger anterior stamens that are 3.0 to 3.5 mm long with filiform, glabrous filaments. The apex is equally two-cleft, and the style is significantly longer, 2.5–3.0 mm, as long as the posterior pair of stamens.

Phenology: —Flowering from May to August, fruiting from August to October.

Distribution and Habitat: — China (Guangxi), Bangladesh, India, Korea, Myanmar, Nepal, and Thailand Currently, *Elsholtzia griffithii* is found in southern China's Guangxi Province's Huanjiang County. At an elevation of 264–314 meters, it grows alongside *Bidens pilosa* Linnaeus (1753: 832), *Acalypha australis* Linnaeus (1753: 1004), *Oxalis corniculata* Linnaeus (1753: 435), *Cayratia japonica* (Thunb.) Gagnepain (1911: 349), and other plants on field or roadside rocks. There are currently just two known locations for *Elsholtzia griffithii* in Huanjiang County, Guangxi; however, more research may reveal other locales for this species [9]

2. Botanical and taxonomical profile [14,15,16,17,18]

2.1. Plant profile

- Common name : Manipuri Lomba
- Chinese name : Chang Bao Xiang Ru
- Botanical name : *Elsholtzia Griffithii*
- Family name : Lamiaceae (Mint family)
- ***Elsholtzia griffithii* – Manipuri Lomba**



Figure 1 *Elsholtzia griffithii* (Manipuri Lomba)

2.2. Taxonomic classification

Table 1 Taxonomical classification of *Elsholtzia Griffithii*

Kingdom	Plantae
Division	Pinophyta
Class	Equisetopsida
Subclass	Magnoliidae
Order	Lamiales
Family	Lamiaceae
Genus	Elsholtzia
Species	<i>Elsholtzia griffithii</i>

2.3. Species morphology and geographical distribution of *Elsholtzia* [17,18,19,20]

Herbs, subshrubs, or shrubs. Verticillasters in capitula or continuous or interrupted spikes; bracts oblong or flabellate to minute, thinner than calyx; spikes cylindric or second, frequently compact, occasionally in panicles. Calyx cylindric or campanulate, throat glabrous; 2 longer anterior or subequal teeth. The corolla is white, yellowish, or purplish, with two lips, hairy and glandular on the outside and hairy annulate or glabrous on the inside. The tube is funnel-shaped, straight or slightly curved, and slightly longer than the calyx. The upper lip is straight with an entire or emarginate margin, while the lower lip is spreading with three lobes on the lateral side, with the largest margin and an erose or emarginate apex. Anther cells 2 are divergent or divaricate, with a confluent apex; filaments glabrous; stamens 4 are typically exserted, anterior 2 longer, rarely underdeveloped, and free. Glabrous ovary. Apex confluent, anther cells 2, divergent or divaricate. Glabrous ovary. The style is often beyond the stamens, with a deeply to shallowly 2-cleft apex; the lobes are subulate, sublinear, or clavate, and are typically equal. Nutlets are smooth to tuberculate, ovoid to oblong, glabrous, or sparingly hairy.

2.4. Morphology of other Species [21-58]

Table 2 Species and Morphology of the *Elsholtzia* Plant

S no	Species Name	Morphology
1	<i>Elsholtzia rugulosa</i>	Long petiolate leaves that are elliptic to rhombic-ovate, adaxially coarsely corrugated, and obtusely serrate; verticillasters that are pedunculate and loosely capitate on the base of spikes; flower that is white, occasionally purple or yellowish.
2	<i>Elsholtzia myosurus</i>	Leaves sessile or short petiolate, lanceolate or oblanceolate, adaxially not coarsely corrugate, serrulate above base; verticillasters sessile, capitate; corolla white to green-yellow.
3	<i>Elsholtzia penduliflora</i>	widely spread lower verticillasters; pendulous flowers when open; glabrous calyx exterior.
4	<i>Elsholtzia Staunton</i>	second spikes; rose-purple flower about 9 mm; lanceolate to oblong-lanceolate leaves.
5	<i>Elsholtzia glabra</i> <i>Botanical realm</i>	Cylindric spikes; white, 4-mm flower; rhombic-lanceolate leaves.
6	<i>Elsholtzia capituligera</i>	Inflorescences capitate; leaves elliptic-oblong to oblong, 0.8-2 cm × 2-5 mm, thickly floccose-pubescent, shallowly crenate above base.
7	<i>Elsholtzia blanda</i>	second, loose spikes; bracts subulate to lanceolate-subulate; compact, cylindric spikes; lanceolate bracts.
8	<i>Elsholtzia fruticose</i>	lanceolate to elliptic-lanceolate, coarsely serrate, acuminate apex; ovate to oblong, crenate to crenate-serrate, acute apex.

9	<i>Elsholtzia eriocalyx</i>	bracts prominent; calyx thickly lanate-pilose externally; leaves subsessile; bracts dull; calyx yellowish white tomentose externally; petiolate leaves
10	<i>Elsholtzia ochroleuca</i>	Calyx golden white tomentose outside; leaves petiolate; bracts noticeable; calyx thickly lanate-pilose externally; leaves subsessile.
11	<i>Elsholtzia cephalantha</i>	Capitate, loose inflorescences; annual dispersed herbs; compact, spiky inflorescences; erect herbs (except <i>E. pilosa</i>).
12	<i>Elsholtzia winitiana</i>	Inflorescences inserted on stem and branch apices; corolla white; inflorescences terminal, axillary; flower rose-purple or purple.
13	<i>Elsholtzia pilosa</i>	Plants pubescent; bracts either pilose or pubescent; bracts thickly, rigidly, spreading white ciliate. Plants pilose-hispid.
14	<i>Elsholtzia stachyodes</i>	In flower, spikes measure 5(-8) mm in diameter; leaves are rhombic-ovate, incised-serrate above the base, and sparsely glabrous adaxially. Flowers have 8-10 mm-diameter spikes; leaves are oval to oblong, serrate to crenate, puberulent or villous on the adaxial surface.
15	<i>Elsholtzia communis</i>	Plants with strong citral fragrance; calyx apex conspicuously curved forward after anthesis, densely lanate-villous; cultivated species, rarely naturalized
16	<i>Elsholtzia cyprianii</i>	Plants without citral fragrance; calyx apex straight curved forward, densely pubescent; native species
17	<i>Elsholtzia flava</i>	Leaves broadly ovate to subcircular, 8-15 cm, Leaves not broadly ovate or subcircular, 0.5-12 cm.
18	<i>Elsholtzia strobilifera</i>	Spikes cylindric, not second, Spikes secund.
19	<i>Elsholtzia luteola</i>	Corolla white to yellowish; bract with numerous, irregular subulate teeth (entire or 1- or 2-toothed in var. <i>holostegia</i>), Corolla rose-purple; bracts 1-mucronate.
20	<i>Elsholtzia heterophylla</i>	Stems straight, unbranched or few branched on the upper part, with slender, basal stolons; leaves heteromorphic
21	<i>Elsholtzia bodinieri</i>	Stems prostrate, ascending, base branched, sometimes with numerous short stolons; leaves not heteromorphic.
22	<i>Elsholtzia eriostachya</i>	Corolla yellow; calyx densely yellow moniliform villous, cylindric
23	<i>Elsholtzia densa</i>	Corolla purplish; calyx densely purple moniliform villous, subglobose.
24	<i>Elsholtzia oldhamii</i>	Abaxial leaf surface densely puberulent, $\pm$ pilose on veins, Abaxial leaf surface finely pilose or puberulent.
25	<i>Elsholtzia kachinensis</i>	Plants prostrate, producing adventitious roots on basal part of stem; leaves ovate to ovate-lanceolate; bracts pilose outside.
26	<i>Elsholtzia saxatilis</i>	Plants erect, without adventitious roots on lower part of stem; leaves lanceolate to linear-lanceolate; bracts glabrous outside.
27	<i>Elsholtzia pygmaea</i>	Leaves 1-1.5 cm, linear to linear-lanceolate, Leaves more than 1.5 cm, oblong or ovate to lanceolate.
28	<i>Elsholtzia hunanensis</i>	Leaf blade base rounded to shallowly cordate, auriculate-dentate; corolla rose red, 2-3 mm.
29	<i>Elsholtzia ciliata</i>	Calyx teeth unequal, anterior 2 longer; leaves ovate to elliptic-lanceolate; corolla ca. 4.5 mm.
30	<i>Elsholtzia splendens</i>	Calyx teeth subequal; leaves ovate-triangular to oblong-lanceolate; corolla 6-7 mm.
31	<i>Elsholtzia argyi</i>	Calyx teeth $\pm$ equal; petiole 8-25 mm; plants 50-100 cm.
32	<i>Elsholtzia souliei</i>	Petiole white floccose; leaf blade lanceolate, base attenuate, margin serrate, apex acuminate; corolla ca. 6 mm.

33	<i>Elsholtzia feddei</i>	Petiole pubescent; leaf blade ovate, base rounded to broadly cuneate, margin crenate, apex obtuse; corolla ca. 8 mm.
34	<i>Elsholtzia amurensis</i> -	Amur region of Russia.
35	<i>Elsholtzia angustifolia</i>	annual herb with an aquare stem and height of 30-50 cm. The leaves of both female and hermaphroditic plants are linear, and other taxonomies of the same genus wich are ovate, oblong or lanceolate.
36	<i>Elsholtzia beddomei</i>	Herb annual, erect, branched, 20-35 cm high.stem purple, leaves opposite, coriaceous, leaf blade ovate,3.5-4.5 cm, glabrous adaxially, petiole 2.0-3.2 cm, margin serrate.spikes second 3.5-4.5 cm.
37	<i>Elsholtzia byeonensis</i>	South Korea. Petiole white floccose; leaf blade lanceolate, base attenuate, margin serrate, apex acuminate; corolla ca. 6 mm.
38	<i>Elsholtzia capituligera</i>	Tibet, Sichuan, Yunnan
39	<i>Elsholtzia concinna</i> <i>Vautier</i>	Nepal, Sikkim, Bhuta.
40	<i>Elsholtzia griffithii</i> <i>Hook</i>	lanceolate bracts exceeding the flowers, 3.0-4.0 mm long, five calyx lobes, white purple flower.
41	<i>Elsholtzia Hallasanensis</i>	Island in Korea.
42	<i>Elsholtzia Elsholtzilitangensis</i>	Sichuan
43	<i>Elsholtzia myosurus</i>	Dunn - Sichuan, Yunnan
44	<i>Elsholtzia nipponica</i>	Japan Small fragrant annual herb, 5-26 cm tall, stems slender, branched or not almost glabrous or with tomentose white glandular hairs Leaves ovate-elliptic, 2*1 cm.Leaf Shape: The leaves are regularly arranged and oval to lanceolate in shape.Leaf Texture: They have a slightly hairy texture which is common among many members of the mint family.Flowers: The flowers appear in clusters (verticillate) and exhibit a unique tubular shape.Growth Habit: This plant grows upright, giving it a bushy appearance
45	<i>Elsholtzia Pubescens</i> <i>Benth</i>	Java, Bali, Lombok, Timor, Sulawesi
46	<i>Elsholtzia serotina</i> <i>Kom</i>	northern China, Japan, Korea, Primorye
47	<i>Elsholtzia strobilifera</i>	Benth. – Small fragrant annual herb, 5-25 cm tall, stems slender, branched or not almost glabrous or with tomentose white glandular hairs Leaves ovate-elliptic, 2*1 cm.
48	<i>Elsholtzia winitiana</i>	Herbs erect, 1-1.7 m tall branches densely white floccose-villous. Petiole 0.7-1.5 cm, densely gray villous, leaf blade oblong-lanceolate.

Thirty-three of the 48 species are found in East Asia, primarily in China. *Elsholtzia* plants have long been used as a folk remedy in China to heal illnesses and alleviate symptoms like colds, fevers, pneumonia, and so on.[53]

3. Conclusion

The present study provides valuable information regarding the morphology, anatomy, and micromorphology, of the medicinally and economically important *Elsholtzia* Species, which is distributed in China Koria, Africa America, and India. In particular, the morphological description of the species has expanded based on a large amount of living materials. This is the first study of the anatomy and the frond and spore micromorphology of *Elsholtzia* Species in China Koria and India. Our investigations aim to contribute to the comprehensive understanding of the taxonomy, systematics, and paleobotany of the genus *Elsholtzia*, including the family Lamiaceae. However, additional molecular frameworks

are required to address the challenges of the relationships and taxonomy of this genus. Further studies involving a broader range of genus *Elsholtzia* and extensive sampling would enhance our understanding of the taxonomic and systematic implications.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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