



## *Clinopodium eplingianum* (Lamiaceae), a new species from Oaxaca, Mexico

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### Abstract

Recent botanical exploration in grasslands in northwestern Oaxaca have revealed a *Clinopodium* (Lamiaceae) taxon that cannot be referred to any of the current described species. This plant is most similar to *C. hintoniorum* from northeastern Mexico, in Nuevo León, in general habit and architecture; however, it can be easily distinguished by leaf blade shape and width, calyx teeth shape and length, lack of tufts of hairs between them and a distinction in the relative proportion between calyx and corolla tube. This new species represents an addition to the flora of Oaxaca and to the biogeographic province of Sierra Madre del Sur, being endemic to these two areas. The taxon is here presented as *C. eplingianum* in honor to Carl Epling, the most prominent scholar in the study of American Lamiaceae. Morphological description, distribution map and illustration of the species are provided.

**Key words:** Coixtlahuaca, Mentheae, Mixteca, oak-savanna, “*Satureja* complex”

### Resumen

Exploraciones botánicas recientes en pastizales del noroeste de Oaxaca han revelado un taxon de *Clinopodium* (Lamiaceae) que no puede ser referido a alguna de las especies actualmente descritas. Esta planta es más similar a *C. hintoniorum* del noreste de México, en Nuevo León, en el hábito general y arquitectura; sin embargo, puede distinguirse fácilmente mediante la forma y anchura de la lámina foliar, la forma y longitud de los dientes del cáliz, la ausencia de mechones de tricomas entre los anteriores, y una distinción en la proporción relativa entre el cáliz y el tubo de la corola. Esta nueva especie representa una adición a la flora de Oaxaca y de la provincia biogeográfica de la Sierra Madre del Sur, a la par que es endémica a estas dos áreas. El taxon se propone aquí como *C. eplingianum* en honor a Carl Epling, el estudioso más prominente de las Lamiaceae americanas. Se provee una descripción morfológica, mapa de distribución y fotografías para ilustrar a la especie.

**Palabras clave:** Coixtlahuaca, “complejo *Satureja*”, Mentheae, Mixteca, sabana de encinos.

### Introduction

The phylogenetic structure of *Clinopodium* Linnaeus (1753: 587) is still unclear due to the wide morphological variation it exhibits and the high complexity in identifying diagnostic characters to delimit the genus (Epling & Játiva 1966, Harley *et al.* 2004, Bräuchler *et al.* 2005, 2010, Drew & Sytsma 2012, Drew *et al.* 2017). Although, Doroszenko (1986) tried to clarify its delimitation as part of the so called “*Satureja* complex” by a thorough analysis of anatomical, caryological and morphological characters, his taxonomic proposal was not formally published, and it requires a reexamination in face to recent phylogenetic studies (Bräuchler *et al.* 2010). The morphology of *Clinopodium* does not show any apparent synapomorphies or autapomorphies allowing its unambiguous distinction and cohesion of the species within it; in its current circumscription, the genus includes species either with radial or bilateral calyces and

corollas, straight or gibbous calyces, annulate or glabrous inside, and the androecium with 2 or 4 stamens (Harley *et al.* 2004). The combination of such deeply contrasting character states in a single genus has practical implications. For instance, identification keys result entirely artificial by relying only on generic characters broadly present in other labiates, or negative statements (such as lack of staminal lever mechanism, a dorsal scutellum in the calyx or a showy involucre subtending the flowers) (Pool 2012, Martínez-Gordillo *et al.* 2013, 2019, González-Gallegos *et al.* 2016); *Clinopodium* is even retrieved in 8 different leads in the identification key to the genera of tribe Mentheae (Harley *et al.* 2004). As for other plant genera including many species (Calvo & Aedo 2015, Wagensommer *et al.* 2016), *Clinopodium* is deemed as a challenging genus due to complex taxonomic relationships between species included in this genus. Hence, it is highly probable that *Clinopodium* will require several taxonomic rearrangements, such that the current application of this name can be considered provisional until having a stronger phylogenetic signal (González-Gallegos *et al.* 2023). Nonetheless, the taxonomic proposal of transferring American species of *Calamintha* Miller (1754: n.p.), *Gardoquia* Ruiz & Pavón (1794: 86), *Micromeria* Benth in Lindley (1829: sub t. 1282) and *Satureja* Linnaeus (1753: 567) into *Clinopodium* (Cantino & Wagstaff 1998, Harley & Granda-Paucar 2000) has at least stabilized the nomenclature of the species in America.

Mexico, with 16 species, occupies the second place in *Clinopodium* richness among American countries, only below Peru (25 spp.), and above the United States (13), Ecuador (10), Colombia (9) and Bolivia (8) (Brako & Zarucchi 1993, Harley 1999, Funk *et al.* 2007, Wood *et al.* 2011, Acevedo-Rodríguez & Strong 2012, Pool 2012, Scandaliaris & Barboza 2013, Fernández-Alonso & Aymar 2016, Zuloaga *et al.* 2019, González-Gallegos *et al.* 2023, Canadensis 2024, Re flora 2024, USDA 2024). The relatively high species richness is also reflected in the wide morphological variation embraced. There are two major groups in Mexican species differentiated mainly by the combination of calyx shape, corolla size and color: a) radial calyces with triangular teeth, corolla tube less than 11 mm long, and white or with pale hues of blue, pink or violet [*C. brownei* (Swartz 1788: 88) Kuntze (1891: 514), *C. chandleri* (Brandege 1905: 195) Cantino & Wagstaff (1998: 69), *C. ganderi* (Epling in Lewis & Epling 1940: 24) Govaerts (1999: 17) and *C. ludens* (Shinners 1962: 96) Pool (2008: 509)], b) bilateral calyces with either triangular and/or subulate teeth, corolla tube above 11 mm long, and corollas red to orange or rarely violet, light purple, or pink to magenta *C. haraverianum* González-Gallegos *et al.* (2023: 593), *S. jaliscanum* (McVaugh & Schmid 1967: 266) Govaerts (1999: 17), *S. macrostemum* (Moc. & Sessé ex Benth 1834: 395) Kuntze (1891: 515), *S. maderense* (Henrickson 1981: 211) Govaerts (1999: 17), *C. nepeta* (Linnaeus 1753: 593) Kuntze (1891: 515) and *C. selerianum* (Loesener 1910: 213) Govaerts (1999: 19)]. However, there are species with intermediate states that dilute the distinction between such groups; for example, although *C. mexicanum* (Benth 1840: 50) Govaerts (1999: 18) has red-orange corollas with tube between 21–31 mm long, the calyces are actinomorphic with triangular teeth; or the most aberrant in morphology, *C. palmeri* (Gray 1876: 100) Kuntze (1891: 515) with resupinate corollas, declinate stamens instead of ascending and with unswollen connective (Table 1).

An additional Mexican *Clinopodium* has been discovered during ongoing research on the ecology and plant diversity of Mexican intertropical grasslands to promote their reappraisal (Martorell *et al.* 2017, Martorell *et al.* 2023). This new species is one of those cases not matching one of the two major morphological patterns in the Mexican *Clinopodium* species, but showing an intermediate position. The goal of the present contribution is to communicate the finding and provide a name and description for the new species.

**TABLE 1.** Comparison of major morphological characters between Mexican *Clinopodium*. Habit, he: herbs, sh: shrubs; calyx symmetry, bi: bilateral, ra: radial; calyx teeth, su: subulate, tr: triangular.

Species	Habit	Calyx symmetry	Calyx teeth	Corolla tube length (mm)	Corolla color
<i>C. amissum</i>	he	bi	su	5–6.5	Lavender with purple marks
<i>C. brownei</i>	he	ra	tr	4–6	White to pale lavender or pink with violet to purple marks
<i>C. chandleri</i>	sh	ra	tr	7.3–8.9	white, rarely with shades of pale violet
<i>C. eplingianum</i>	sh	ra	su	8.6–13.5	violet to light purple
<i>C. ganderi</i>	sh	ra	tr	5.6–10.3	pale lavender to pale violet and with purple marks
<i>C. haraverianum</i>	he	bi	tr/su	(15–)16.8–18.5	red to orange with longitudinal strands of darker tones alternate with paler ones

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**TABLE 1.** (Continued)

Species	Habit	Calyx symmetry	Calyx teeth	Corolla tube length (mm)	Corolla color
<i>C. hintoniorum</i>	sh	ra	tr	13.5–17.2	violet to light purple
<i>C. jaliscanum</i>	sh	bi	tr	18–24	red-orange to yellow (pink to violet when dried)
<i>C. ludens</i>	he	ra	tr	3–5	blue to pale violet
<i>C. macrostemum</i>	sh	bi	tr/su	20–25	red-orange
<i>C. maderense</i>	he	bi	su	24.7–31.2	lavender-rose to red-purple
<i>C. mexicanum</i>	sh	ra	tr	21–31	red-orange
<i>C. micomerioides</i>	sh	ra	su	9.3–13.1	pale violet
<i>C. nepeta</i>	he	bi	tr/su	(7–)12.9–15.3	violet to pale pink with darker marks
<i>C. palmeri</i>	he	bi	tr/su	4–4.8	violet
<i>C. procumbens</i>	he	bi	tr/su	8–11	pink, violet to blue
<i>C. selerianum</i>	sh	bi	tr	25–39	bright red

**TABLE 2.** Morphological comparison between *Clinopodium eplingianum* and the most similar species. Data on distribution, habitat and elevation is also provided.

Character	<i>C. eplingianum</i>	<i>C. chandleri</i>	<i>C. ganderi</i>	<i>C. hintoniorum</i>
Leaf shape	ovate to ovate-deltoid, apex acute, base rounded, margin minutely and sparsely serrate	orbicular to broadly ovate, apex obtuse, base truncate and then abruptly cuneate, margin crenate-serrate to entire	ovate, apex obtuse, base rounded and then attenuate to subcuneate, margin subcrenate	ovate, apex acute, base abruptly tapering upon the petiole, margin entire
Petiole length (mm)	2–4.2	4.4–6.6	3–10	4–7
Petiole basal articulation	present	absent	present	present
Leaf blade size (mm)	12–26 × 6–17	8.9–17 × 9.5–15	6.5–13.5 × 4–10	15–20 × 6–8
Flowers per cyme	3–5	1–4	1–3	3
Peduncle length (mm)	1.9–3.5	1–3	1–3	3–4
Calyx tube size (mm)	4.9–6.2 × 1.3–1.8	4.5–6.5 × 2–3.4	5.3–8 × 2–3	3.8–5.2 × 1.3–1.9
Upper calyx lip length (mm)	3–3.8	1–2.4	2–2.5	1–1.6
Calyx lobes shape	long subulate	triangular	triangular	triangular to short subulate
Hairs between calyx lips	absent	present	absent	present
Corolla color	violet to light purple	cream white	lavender, lavender-pink, light violet, white	violet
Corolla tube size (mm)	8.6–13.5 × 1.9–3.8	8–9 × 2–3	7.4–10 × 2–3.7	11–15.5 × 2.5–3.8
Distribution	Mex: Oaxaca	Mex: Baja California; USA: California	Mex: Baja California	Mex: Nuevo León
Habitat	sabanoid oak forest	coastal sage scrub and chaparral	coastal sage scrub and chaparral	oak chaparral and oak forest
Elevational range (m)	2600–2640	350–1100	50–500	2000–2470

## Materials & methods

Botanical specimens were collected and prepared according to standard recommendations (Lot & Chiang 1986, Davies *et al.* 2023). Quantitative and qualitative characters were evaluated in the specimens to prepare the morphological description. These were collated against the Mexican species of *Clinopodium* to verify its status as a new species

and extract the diagnostic characters. Specialized literature was consulted to obtain the descriptions of Mexican *Clinopodium* for the comparisons (Gray 1876, Brandegee 1905, Lewis & Epling 1940, Henrickson 1981, Turner 1993, Pool 2008, González-Gallegos *et al.* 2016, 2023, Martínez-Gordillo *et al.* 2019); data was complemented by the examination of scanned images of type specimens through JSTOR database (2024), as well to iNaturalistMX (2024), which was especially helpful in documenting corolla color.

## Taxonomy

*Clinopodium eplingianum* J.G.González, Martorell & D.García, *sp. nov.* (Figure 1 & 2).

**Type:**—MEXICO. Oaxaca, Mpio. San Francisco Teopan: paraje Hoya del Malacate, 17°51'7" N, 97°30'44" W, 2640 m, 2 October 2023, D. García-Meza X1131 (holotype CIIDIR, isotypes FCME, HUAP, IBUG, IEB, MEXU, OAX).

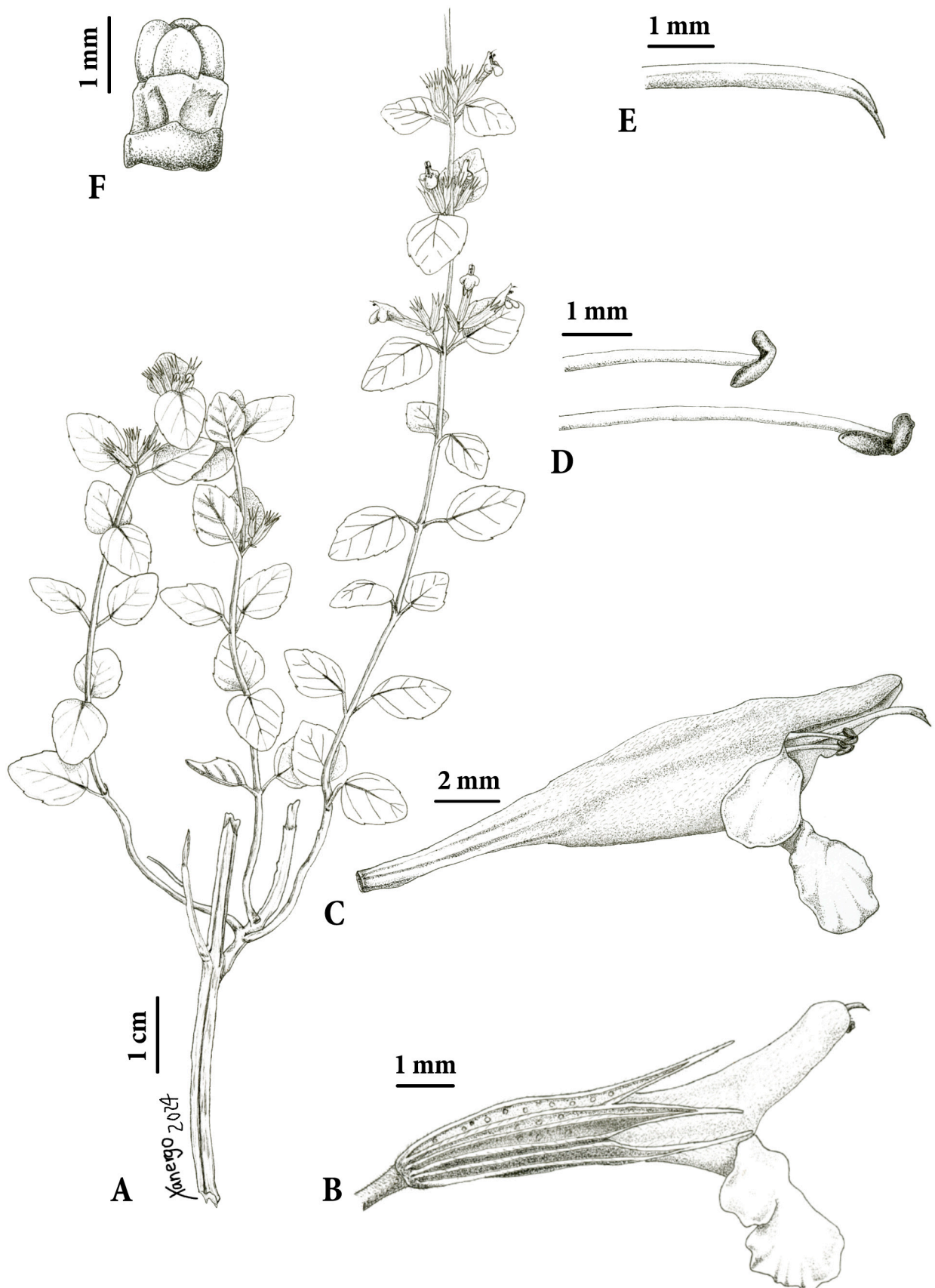
**Diagnosis:**—*Clinopodium hintonianum maxime similis, praecipue in habitu et ramificatione, sed laminae basi rotundata* (vs. *in petiolum abrupte decrescens*), *marginibus minute sparsimque serratis* (vs. *integris*), *foliorum lamina comparate latiore* (6–17 vs. 6–8 mm), *calyce dentibus subulatis et nudis inter se* (vs. *triangularis et pubescentibus inter se*) *et dentibus superis longioribus* (3–3.8 vs. 1–1.6 mm longis), *et corollae tubo calycem aequantes* (vs. *plus quam duplo longiore*) *differt.*

Shrub, erect, up to 1 m tall; profusely branching, stems of the branchlets hispidulous with the hairs slightly retrorse, older branches glabrescent to glabrous. Leaves with a strong minty scent; petioles 2–4.2 mm long, articulated into a thicker and more lignified base (especially those from older branches), hispidulous with slightly retrorse hairs, and with translucent golden glandular dots; blade elliptic, ovate to ovate-deltoid, 1.2–2.6 × 0.6–1.7 cm, apex acute, base rounded, margin minutely and sparsely serrulate, both surfaces with hispidulous hairs along the veins and puberulent, beneath with profuse translucent golden glandular dots. Inflorescences in cymes in the axils of progressively reduced leaves to the terminal portion of the branches, regularly 2–8 floral nodes, compact or with internodes up to 4 cm long, cymes with peduncles 1.9–3.5 mm long, 3–5 flowered; floral bracts linear, 1.6–2.1 mm long, bracteoles linear, 1–1.4 mm long; floral axes, bracts and bracteoles pubescent as the stems and with some translucent golden glandular dots. Flowers with pedicels 0.7–1.9 mm long, puberulent, hispidulous and with translucent glandular hairs. Calyx tubular and slightly arcuate upwards, tube 4.9–6.2 × 1.3–1.8 mm, plicate by the elevated veins, hispidulous, puberulent and covered with translucent golden glandular dots, internally glabrous to sparsely puberulent, no inner tube hairs projected between the calyx teeth; lips scarcely differentiated, lobes linear, similar in shape and partially in size, ciliated along the margin; three upper lobes basally fused by 0.5–0.8 mm, 3–3.8 mm long, two lower ones free and 2–2.9 mm long. Corolla violet to light purple, with irregular white marks on the lower lip an close to the throat, tubular, gradually amplified from the middle to the throat, slightly arcuate upwards as the calyx, externally short pilose with the hairs concentrated to the lips, glabrous inside except by the bifurcation line between the throat and the lower lip and the attachment line of the lower filaments, being short pilose, tube 8.6–13.5 × 1.9–3.8 mm; upper lip emarginate, slightly galeate, (1.4–) 2.8–4.1 mm long; lower lip trilobate, patent to deflexed, 3.9–5 × (4.4–) 6–7.8 mm, extended. Stamens 4, included below upper corolla lip, didynamous, the lower (anterior) pair with filaments 3.3–5.6 mm long and thecae 0.4–0.8 mm long, the upper (posterior) pair with filaments 1.9–2.9 mm long and thecae 0.4–0.6 mm long, filaments glabrous except by the base of the lower ones, being hispidulous, thecae sparsely hispidulous, basally divergent by a gap due to the thickened connective, this 0.3–0.4 × 0.2–0.3 mm. Gynobase 1–1.3 mm long; style 12.3–15.3 mm long, glabrous, stigmatic branches minute and usually appressed, the upper 0.1–0.5 mm long, the lower 0.8–1 mm long. Mature mericarps not seen, the immature ovoid, glabrous and concolorous.

**Distribution, habitat and ecology:**—*Clinopodium eplingianum* is currently considered endemic to northwestern Oaxaca, in the Mixteca region and Coixtlahuaca district, nestled in Sierra Madre del Sur biogeographic province; since it has been recorded just at about 12 km (air distance) to the border with Puebla state, it is also probable that it would eventually be found there (Figure 3). It grows in semiarid oak-savanna vegetation at an elevation between 2600–2700 m. The highly diverse continuous herbaceous layer is dominated by *Bouteloua chondrosioides* (Kunth 1816: 173) Benth. ex Watson (1883: 179), *Microchloa kunthii* Desvaux (1831: 179), *Cyperus seslerioides* Kunth (1815: 209), *Thymophylla aurantiaca* (Brandegee 1908: 258) Rydberg (1915: 175), and *Tridax coronopifolia* (Kunth 1820: 200) Hemsley (1881: 207), with scattered *Quercus deserticola* Trelease (1924: 79) trees. Even though these areas are not flooded, large sections are covered by *Isoetes mexicana* Underwood (1888: 93). *Clinopodium eplingianum* shares its habitat with several threatened or rare species, such as *Echeveria longissima* Walther (1938: 147), *Calochortus*



*nigrescens* Ownbey (1940: 530), *Lobelia oaxacana* Rzedowski (2016: 14) and *Salvia tetramerioides* Martínez-Gordillo *et al.* (2016: 217). The latter is also probably microendemic to these savannas.

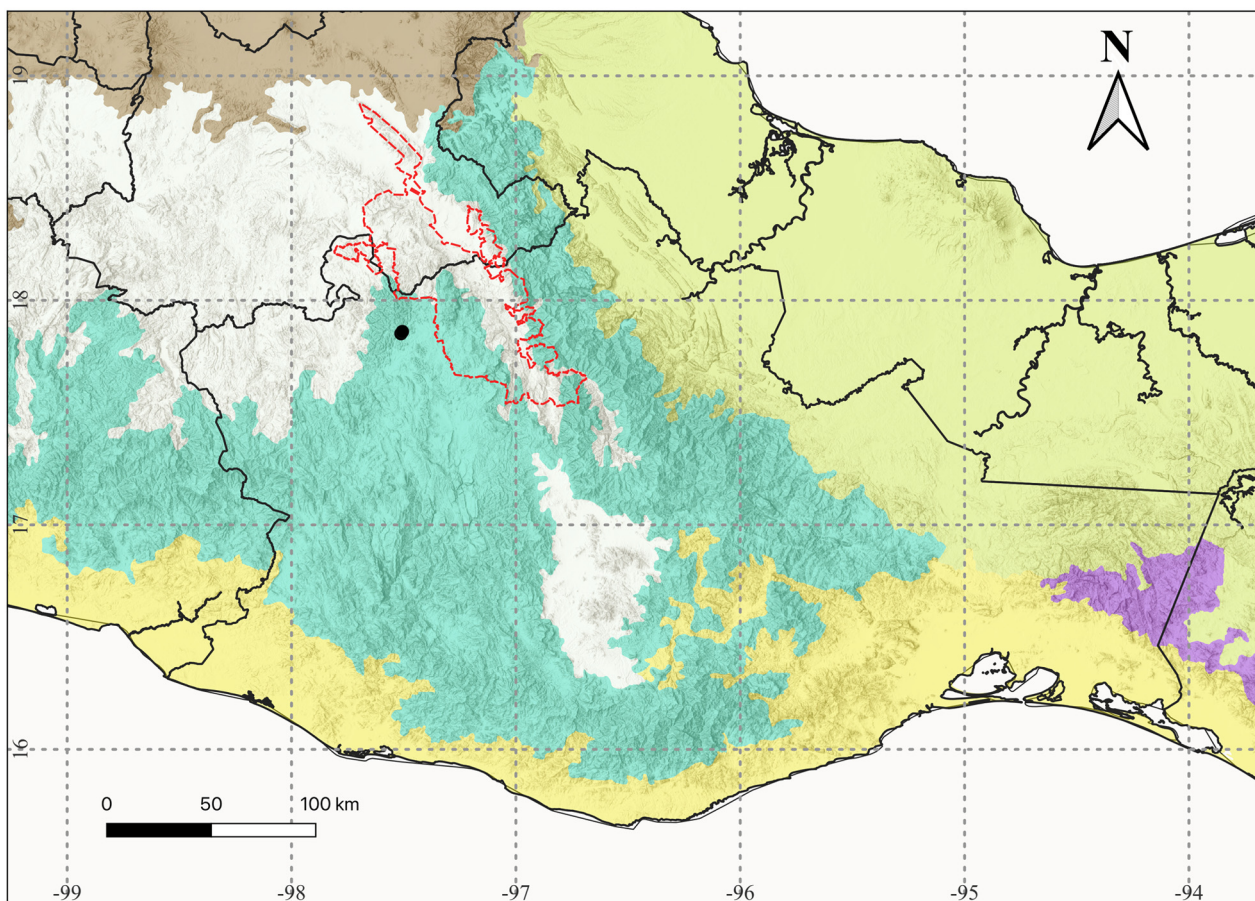


**FIGURE 1.** *Clinopodium eplingianum* A. Portion of a plant with flowering branches, B. Flower, C. Lateral view of the corolla, D. Upper and lower stamens, E. Apical portion of the style showing the stigmatic branches, F. Gynobase and carpels (Drawn from the type specimens by J.G. González-Gallegos).



FIGURE 2. Holotype specimen of *Clinopodium eplingianum*.





**FIGURE 3.** Distribution map of *Clinopodium eplingianum*. Color shades representing the biogeographic provinces according to Morrone *et al.* (2017): Balsas Basin (white), Chiapas Highlands (violet), Pacific Lowlands (yellow), Sierra Madre del Sur (green emerald), TransMexican Volcanic Belt (brown), and Veracruz (yellow-green). Tehuacán-Cuicatlán Biosphere Reserve boundaries with red dashed line as reference.

**Phenology:**—It probably flowers from late autumn through the winter, fruiting at the end of winter and through the spring, deduced from the type specimens collected with flowers and immature fruits at the beginning of October. The specimens collected in March had few flowers and reduced leaves, hence most likely being late flowering individuals.

**Etymology:**—This new *Clinopodium* is named in honor to Carl Epling (1894–1968), a very prolific researcher who is still the main reference for the understanding of the New World labiates. He produced more than 100 publications from 1925–1968, the largest portion dealing with taxonomic revisions of Lamiaceae genera and contributions by treatments of this family to floras at country or regional scale (Mathias 1970). Seven species have already been dedicated on his name (Tropicos 2024).

**Conservation status:**—*Clinopodium eplingianum* is currently known from two very close localities, with a straight distance no more than 1.4 km. There are not specific threats identified for the species. Therefore, applying criterion B of IUCN (2024), the new species is not threatened. However, it is desirable to increase botanical exploration in the region to better document its distribution and conservation status. It would be also possible that the species could be found within the polygon of the Tehuacán-Cuicatlán Biosphere Reserve, being that it is located at about 15.5 km from the closest boundary of the reserve. Therefore, we previously assess *C. eplingianum* as Data Deficient (IUCN 2024).

**Uses:**—This species is locally known as chipito morado, “purple chipito”, and used as an infusion for treating intestinal disorders. “Chipito” is an ethnotaxon that comprises a few aromatic Lamiaceae with medicinal uses, such as *Salvia regla* Cavanilles (1799: 33). Despite the apparent geographic rarity of *C. eplingianum*, the plant is locally abundant in one of its known sites and it is likely to occur in small patches in the vicinity of the collection sites where it can be easily accessible to the many pastoralists that constantly comb these oak savannas. The exhaustive checklist

of medicinal flora of Oaxaca (Cruz-Pérez *et al.* 2021) mentions three other useful *Clinopodium* species (*C. brownei*, *C. macrostemum*, and *C. mexicanum*), none of which can be mistaken for this new species. It thus seems unlikely that it has been previously reported under any other name.

**Additional specimen examined:**—MEXICO. Oaxaca, Mpio. San Pedro Teopan: Cuseya, 17°51'39" N, 97°30'22" W, 2600 m, 14 March 2022, *C. Martorell & D. García-Meza X852* (CIIDIR).

**Notes:**—Following the recently published identification key to Mexican *Clinopodium* species (González-Gallegos *et al.* 2023), *Clinopodium eplingianum* is most similar to a set of three shrubby species from northern Mexico. Two of the species come from the California Floristic Province, *C. chandleri* and *C. ganderi*, and the other from Nuevo León, *C. hintoniorum* (Turner 1993: 411) Govaerts (1999: 17). These species are similar to *C. eplingianum*, additionally to the shrubby habit, in having petioles longer than 1 mm, leaves wider than 5 mm, cymes up to 6-flowered, included stamens, and bluish to pale violet or purple corollas. There is no clear morphological close affinity to either of them, since some characters are akin to the Californian species and others to *C. hintoniorum*, though it resembles the latter species the most in general habit and architecture. The new species can be distinguished from *C. hintoniorum* by the rounded leaf blades at the base (*vs.* abruptly tapering upon the petiole), minutely and sparsely serrate margins (*vs.* entire), relatively wider leaves (6–17 *vs.* 6–8 mm), subulate calyx teeth without protruded hairs between them (*vs.* triangular with hair tufts between them), the upper teeth also longer (3–3.8 *vs.* 1–1.6 mm long), and the corolla tube as long as the calyx with only the lips surpassing the calyx teeth (*vs.* corolla tube more than twice the total length of the calyx, then with a large portion of the tube surpassing calyx teeth). *Clinopodium chandleri* differs in the obtuse apex of the leaves (*vs.* acute), truncate and abruptly cuneate bases (*vs.* rounded), relatively longer petioles (4.4–6.6 *vs.* 2–4.2 mm), the absence of a thicker basal articulation in the petiole, wider calyx tube (2–3.4 *vs.* 1.3–1.8 mm), shorter upper calyx lip (1–2.4 *vs.* 3–3.8 mm), triangular calyx lobes (*vs.* long subulate) and reflexed in fruit resembling a star in frontal view (*vs.* straight), presence of protruding hairs between calyx lobes, and corolla color (cream white *vs.* violet to light purple). *Clinopodium ganderi* sets apart also by different shape in the apex and base of the leaves (apex obtuse, base rounded and then attenuate or subcuneate *vs.* acute and rounded, respectively), usually longer petioles (3–10 *vs.* 2–4.2 mm) and often shorter leaf blades (6.5–13.5 *vs.* 12–26 mm), wider calyx tube (2–3 *vs.* 1.3–1.8 mm), and shorter upper calyx lip (2–2.5 *vs.* 3–3.8 mm) and different in shape (triangular *vs.* long subulate), and in corolla color variation (lavender, lavender pink, light violet or white *vs.* violet to light purple; according to specimens' labels, corolla color varies markedly depending on the degree of corolla maturation in *C. ganderi*).

*Clinopodium eplingianum* also differs in biogeography an ecological affinity, being a plant restricted to the biogeographic province of Sierra Madre del Sur, according to the delimitation of Morrone *et al.* (2017), inhabiting semiarid oak-savanna. In contrast, both Californian species grow in the California province mainly in coastal sage scrub, and in chaparral under a Mediterranean climatic regime (Wiggins 1980, Rebman & Roberts 2012). *Clinopodium hintoniorum* is also the most similar in habitat to the new species, it also grows mainly in semiarid vegetation with scattered low oaks and ample areas with grasses (oak chaparral); however, it is nested into the northern portion of Sierra Madre Oriental Province with an air-line distance of about 720 km.

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