



On the Presence and Distribution of *Lycopus exaltatus* L.f. (Lamiaceae) in Türkiye

Lütfi BEHÇET¹, Hikmet CENGİZ^{2*}

¹Bingöl University, Faculty of Science and Art, Department of Molecular Biology and Genetics, Bingöl, TÜRKİYE, ²Bingöl University, Institute of Science, Department of Biology, Bingöl, TÜRKİYE

¹<https://orcid.org/0000-0001-8334-7816>, ²<https://orcid.org/0000-0001-6788-0012>

*: cenghikmet@hotmail.com

ABSTRACT

This study is about confirming the distribution of *Lycopus exaltatus* (Lamiaceae) in Türkiye, for which there is no reliable information about its existence in Türkiye. In addition, the description of *L. exaltatus*, besides the ecology information in the area where it spreads; differences with *Lycopus europaeus*, whose distribution is known in Türkiye, are also emphasized.

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ÖZET

Bu çalışma; Türkiye'de varlığına dair güvenilir bilgi bulunmayan *Lycopus exaltatus*'un (Lamiaceae) Türkiye'deki yayılışının doğrulanması ile ilgilidir. Ayrıca *L. exaltatus*'un tanımı, yayıldığı alandaki ekoloji bilgilerinin yanı sıra; Türkiye'de yayılışı bilinen *Lycopus europaeus* ile farklılıklar da vurgulanmıştır.

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INTRODUCTION

Lamiaceae is one of the biggest families of flowering plants with about 245 genera and 7.886 species (Stevens, 2017). In addition to *Clinopodium debile* (Bunge) Kuntze (Behçet & Altınsoy, 2023), the distribution of which has been newly determined in our country; Lamiaceae is represented by 787 taxa (608 species, 179 subspecies and varieties) belonging to 48 genera in Türkiye, together with recently published new taxa (Celep et al., 2022; Güner Ö, 2022; Aytaç et al., 2022; Duman et al., 2023). Members of the genus *Lycopus* L., which consists of about 15 species in the world, most commonly found in Europe, Asia, and North America. In the 7th volume of Flora of Turkey,

the distribution of only *L. europaeus* (Figure 4) among the *Lycopus* members is given and there is no information about the distribution of any other member of this genus in Türkiye.

Although the existence of *Lycopus exaltatus* L.f. in Türkiye is mentioned in the study titled Türkiye Bitkiler Listesi (Damarlı Bitkiler) (Dirmenci 2012); no locality information was given for this species.

There is also a note in the same source that confirmation of the existence of this species in Türkiye is required.

In addition, in Henderson's work on the genus *Lycopus* (1962), there is an explanation as follows: *L. exaltatus* ranges across Eastern Europe from Germany, Austria,

Hungary, and Italy through Russia and Türkiye to the Himalayan Region of India and into Siberia. Although Hendersen (1962) and Dirmenci (2012) mentioned the distribution of *L. exaltatus* in Türkiye; Dirmenci's note that "its presence in Turkey needs to be confirmed" regarding this species has led to doubts about the existence of this species in Türkiye. From this note, understood that there is no definite opinion about the distribution of *L. exaltatus* in Türkiye. Although there is very limited information about the distribution of the species in Türkiye in the mentioned source, the absence of any locality information, the absence of any numbered herbarium specimens, requires confirmation of its existence in Türkiye.

Lycopus is a perennial herb. Occurs mostly in low wetland areas and distinguished by several gross morphological characteristics such as dentate or pinnatifid leaves, flowers in compact, sessile verticillasters in the leaf axils, and a dry, tetrahedral, one-seeded nutlet with corky crests (Henderson, 1962; Moon and Hong, 2006).

An interesting *Lycopus* (very different from *Lycopus europaeus* L., which is very well known in Türkiye) population found in the field study carried out in the summer months (June/July) around the Yedisu district of Bingöl province. With the help of the literature, we reviewed (Henderson, 1962; Mill, 1982; Ball, 1972; Volkova, 1977), It was understood that the population belonged to *Lycopus exaltatus*. However, there is not enough data on the existence of this species in Türkiye. With this study, doubts regarding the distribution of *L. exaltatus* eliminated in Türkiye (Figure 1,3).

MATERIALS and METHODS

Interesting *Lycopus* specimens were collected from Güzgülü village (Yedisu, Bingöl/Türkiye) during botanical trips. These specimens could not be identified according to Flora of Turkey. (Mill, 1982). Eventually, specimens identified as *Lycopus exaltatus* L.f. using the generic account in Flora Europaea volume 3 (Ball, 1972) and Flora of the USSR volume 21 (Volkova, 1977). The examples mentioned are; it was also compared and checked with images of *L. exaltatus* specimens (Figure 1) in Moscow University Herbarium (MW) (Serengin 2023). Photographs of specimens were taken in the field and morphological observations were made using an Olympus SZ51 stereo microscope. Specimens deposited in BIN (the Herbarium of Bingöl University, Arts and Science Faculty).

RESULTS and DISCUSSION

Lycopus exaltatus L.f. Suppl. Pl. 87 (1781) (Figure 1,3)

Homotypic Synonyms

• *Lycopus europaeus* var. *exaltatus* (L.f.) Lej., Rev. Fl. Spa: 7 (1825)

Heterotypic Synonyms

- *Lycopus europaeus* var. *laciniatus* Nyman, Consp. Fl. Eur., Suppl. 2: 259 (1890)
- *Lycopus exaltatus* var. *ovatus* Benth., A.P.De Candolle, Prodr. 12: 180 (1848)
- *Lycopus italicus* L. ex B.D.Jacks., Index Linn. Herb.: 100 (1912), not validly publ.
- *Lycopus laciniatus* Rouy, Bull. Soc. Bot. France 20(Rev. Bibliogr.): 32 (1883), nom. illeg.
- *Lycopus pinnatifidus* Pall., Reise Russ. Reich. 3: 655 (1776), nom. nud.

Turkish name: az kurtayağı (Dirmenci, 2012)

Description: Perennial; rhizome thickened, oblique, sometimes with long creeping stolons; stem 50-100 cm long, 4-angled, erect, simple, rarely branched, sparsely covered in upper part with subappressed hairs and scattered small glands; leaves oblong-ovate, short-petioled or subsessile, deeply pinnatisect (sometimes nearly to midvein), with lanceolate or oblong-lanceolate, mucronate, entire or few-toothed segments, 5-10 cm long, 2-7 cm broad, punctate-glandular, glabrous or short-haired above, the veins (especially the midvein) covered with rather long hairs; flowers numerous, in compact, 15-20-flowered whorls; bracts 6-9 mm; especially the outer, mostly exceeding the whorls, lance-subulate, rigid, hispid; calyx campanulate, 5-toothed, 3.5-4 mm long, glandular, the teeth (1.3-)1.5(-2.0) mm, 3-nerved, the middle tooth conspicuous, aristate; corolla white, 3.5 (4) mm long, 4-lobed, cut to one-third into unequal lobes, the upper lobe slightly emarginate, the lower purple-speckled; stamens exerted one-third their length; nutlets 1 mm long, glandular above, with thickened margins.

Flowering time: June-August

Habitat: Sand and pebble shallows and shores of river and lakes, wood margins, riverside thickets, inundated forests and canals.

Distribution: *Lycopus exaltatus* ranges across Albania, Altay, Austria, Belarus, Bulgaria, Buryatiya, Central European Rus, Czechoslovakia, East European Russia, Germany, Greece, Hungary, Irkutsk, Italy, Kazakhstan, Kirgizstan, Krym, North Caucasus, Northwest European R, Poland, Romania, South European Russi, Transcaucasus, Ukraine, West Himalaya, West Siberia, Xinjiang, Yugoslavia (POWO, 2022) (Figure 2).

Specimens examined: Türkiye (B8 square), Bingöl: Yedisu town; Güzgülü village, wet places, 22.06.2021, 1518 m, 39°25'36.50"K, 40°29'15.98"D, H.CENGİZ 3706.

Ecology: The first author collected specimens of *Lycopus exaltatus* from the humid slopes 1500-1600 meters above sea level around Güzgülü village of

Yedisu town of Bingöl. The climax vegetation of Güzgülü village and its surroundings is composed of oak forests (*Quercus petraea* (Matt.) Liebl. subsp. *pinnatiloba* (K.Koch) Menitsky and *Q. libani* G.Olivier taxa are the dominant cover). Oak species in places; woody shrub members of *Crataegus* L., *Lonicera* L., *Sorbus* L., *Rosa* L. genera are included. The covers of cultivated plants such as *Salix alba* L. and *Populus*

alba L. also draw attention along the streams. Taxa such as *Atriplex laevis* Ledeb., *Bidens tripartita* L., *Bunium simplex* (K.Koch) Klyuikov, *Epilobium hirsutum* L., *Eremurus spectabilis* M.Bieb., *Chaerophyllum bulbosum* L., *Cirsium macrobotrys* (K.Koch) Boiss., *Cucubalus baccifer* L., *Gentiana cruciata* L., *Geranium divaricatum* Ehrh., *Inula salicina* L., *Juncus atratus* Krock., *Lepidium latifolium*



Figure 1. General view of *Lycopodium exaltatum* from Seregin 2023.
Şekil 1. *Lycopodium exaltatum*'un genel görünümü (Seregin 2023'den)

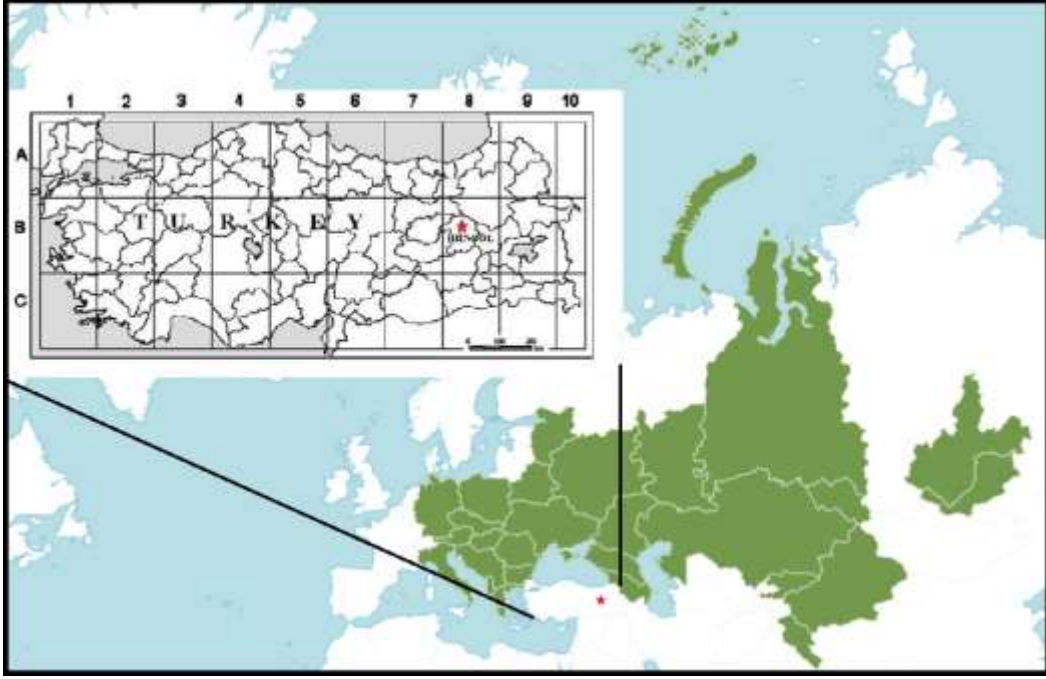


Figure 2. Distribution map of *Lycopus exaltatus* in the World (■) (from POWO 2022) and Türkiye (★)
Şekil 2. *Lycopus exaltatus*'un Dünya (■) ve Türkiye'deki (★) yayılış haritası (POWO 2022'den)



Figure 3. *Lycopus exaltatus* A- habit (Photo by Hikmet CENGİZ), B- close-up view of the flowers, C- Lower (1), median cauline (2,3,4) to upper cauline (5) leaves

Şekil 3. *Lycopus exaltatus* A- genel görünüm (Fotoğraf Hikmet CENGİZ tarafından), B- çiçeklerin yakından görünümü, C- en alt (1), orta (2,3,4) ve en üste (5) doğru gövde yaprakları

L., *Lathyrus pratensis* L., *L. rotundifolius* Willd. subsp. *miniatus* (M.Bieb. ex Steven) P.H.Davis, *Lithospermum arvense* L., *Medicago lupulina* L., *Melissa officinalis* L. subsp. *officinalis*, *Pastinaca sativa* L. subsp. *urens* (Req. Ex Gren. & Godr.) Çelak., *Phleum pratense* L., *Phlomis tuberosa* L., *Poa trivialis* L., *Polygonatum orientale* Desf., *Potentilla recta* L., *Senecio mollis* Willd., *Sium sisarum* L. var. *lancifolium* (M.Bieb.) Thell., *Scutellaria galericulata* L. *Tragopogon albinervis* Freyn & Sint., *Silene vulgaris* (Moench) Garcke subsp. *commutata* (Guss.) Hayek, *Stachys setifera* C.A.Mey. subsp. *lycia* (Gand.) R.Bhattacharjee, *S. spectabilis* Choisy ex DC. *Trifolium pratense* L. var. *americanum* Harz., *Verbena officinalis* L. and *Vicia sativa* L. subsp. *nigra* (L.) Ehrh. var. *nigra*, which generally prefer humid-aquatic environments, participate in important species that develop together with the *Lycopus exaltatus*.

There is no mention of a member of the *Lycopus exaltatus* species in Türkiye in 11 volumes of 'Flora of Turkey'. However, in the book '*Türkiye Bitkileri Listesi (Damarlı Bitkiler)*' published by Güner et al., 2012, it is mentioned that there are two species of the genus *Lycopus*, which are *Lycopus exaltatus* and *Lycopus europaeus*. Although one of these species is

Lycopus exaltatus, but the author of this genus made a note under this species, 'confirmation of its existence in Turkey is required.' There is not enough information about this species in the sources related to the Flora of Turkey. The native range of this species is Europe to South Siberia and West Himalaya. In some studies; although it is mentioned that there is a spread of this species in Türkiye, no details are given. Therefore, it was necessary to confirm its distribution in the Flora of Turkey. As a result of the literature review we made, it was determined that the samples we collected belonged to *Lycopus exaltatus* by looking at the flora of Europe and Russia. With this study, data on the distribution, locality, ecology and habitat of this species in the Flora of Turkey were revealed and the presence of this species in the Flora of Turkey was confirmed.

Although *Lycopus exaltatus* is similar to *L. europaeus*; it is better developed, robust and its leaves are pinnatifid or pinnatisect from base to apex; bracts 6-9 mm; calyx-teeth (1.3-)1.5(-2.0) mm; *Lycopus europaeus* leaves pinnatifid or pinnatisect at base, toothed or shallowly lobed at apex (Figure 4); bracts 3-5 mm; calyx-teeth c. 2 mm.



Figure 4. General view of *Lycopus europaeus* (Photo by Lütfi Behçet)

Şekil 4. *Lycopus europaeus*'ün genel görünümü (Fotoğraf Lütfi Behçet tarafından çekilmiştir)

Identification key for the genus *Lycopus* distributed in Türkiye:

Lower cauline leaves evenly pinnatifid with forward-angled, linear, acute lobes.

- Leaves pinnatifid or pinnatisect to the apex (not just the leaves at the base and lower part of the stem); bracts 6-9 mm*L. exaltatus*
- Leaves pinnatifid or pinnatisect at base, toothed or shallowly lobed at apex; bracts 3-5 mm*L. europaeus*

As a result of these studies, it was concluded that the *Lycopus* specimens collected from the Yedisu district of Bingöl province belonged to *Lycopus exaltatus*, and the presence of *L. exaltatus* in Türkiye was revealed and its distribution area was specified. With the determination of the habitat of *L. exaltatus* from Bingöl, the number of taxa of the genus *Lycopus* in Türkiye increased to 2 and numbered specimens of *L. exaltatus* collected from Türkiye are kept in the herbarium of BIN. We hope that it will be useful for the Illustrated Flora of Turkey studies to be written and for those who are interested in the subject.

Author's Contributions

The contribution of the authors is equal.

Statement of Conflict of Interest

Authors have declared no conflict of interest.

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