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Confirmation of the Natural Distribution of *Euphorbia condylocarpa* M.Bieb. (Euphorbiaceae: Sect. *Helioscopia*, Subsect.*Galarhoei*) in Türkiye

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ABSTRACT
This study; it is about the verification of the distribution of *Euphorbia condylocarpa* Boiss. & Heldr. (Euphorbiaceae), for which there is no reliable information about its existence in Türkiye. Because, the most important website regarding the distribution of plants distributed in Türkiye(Bizimbitkiler website) and the most up-to-date and comprehensive study called "Bizim Bitkiler Listesi (Damarlı Bitkiler)" do not accept the existence of this species in Türkiye. It is stated that the existence of this species in Türkiye needs to be confirmed. The closest species to the *E. condylocarpa*, which we focused on in order to eliminate doubts about its distribution in Turkey, is in tuberous form *Euphorbia apios* L.. It is distinguished from *E. apios* by the fact that the cauline leaves of *E. condylocarpa are* cordate–auriculate at the base and the number of axillary rays is more than 6 (to 30). In addition, the description of *E. condylocarpa*, the ecological information in the area where it develops, and some features of the species that differ from the known description are also emphasized.

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Türkiye'den *Euphorbia condylocarpa* M.Bieb. (Euphorbiaceae: Sect. *Helioscopia*, Subsect. *Galarhoei*) 'nın Tabii Yayılışının Teyidi

ÖZET
Bu çalışma; Türkiye'de varlığına dair güvenilir bilgi bulunmayan *Euphorbia condylocarpa* Boiss. & Heldr. (Euphorbiaceae)'nın Türkiye'de yayılışının doğrulanmasıyla ilgilidir. Zira, Türkiye'de yayılışı olan bitkilerin dağılışı ile ilgili en önemli web sitesi (Bizimbitkiler veb sitesi) ve en güncel ve kapsamlı çalışma olan "Türkiye bitkileri listesi (Damarlı bitkiler)" adlı çalışma bu türün Türkiye'de varlığını kabul etmemekte ve bu türün varlığının teyidinin gerektiğini belirtmektedirler. Türkiye'de yayılışı hakkındaki şüpheleri gidermek için üzerinde durduğumuz *E. condylocarpa*'ya en yakın tür tuberli formdaki *Euphorbia apios* L.'dir. *E. condylocarpa*'nın gövde yapraklarının tabanda kordat–aurikülat olmaları ve aksillar ray sayısının da 6'dan fazla (30'a kadar) olması ile *E.apios*'tan ayırt edilmektedir Ayrıca, *E. condylocarpa*'nın tanımı, geliştiği alandaki ekoloji bilgileri ve türün bilinen tanımından farklılık gösteren bazı özellikleri üzerinde de durulmuştur.

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INTRODUCTION
The Euphorbiaceae has around 8000 members of 340 genera worldwide (Radcliffe-Smith, 2001; Wurdack et al. 2004; Yang et al., 2012; Islam et al., 2019). Some of the members of this family (such as *Acalypha indica* L,

Croton bonplandianum Baill, *Euphorbia hirta* L, *E. thymifolia* L, *Jatropha gossypifolia* L, and *Ricinus communis* L) have significant medical uses, and some taxa such as *Ricinus communis* are widely cultivated due to their medical importance (Islam et al.,2019). Although members of this genus are distributed in various parts of the world; it has more diversity in the arid and semi-arid parts of the tropical and subtropical regions. *Euphorbia* L. genus is represented in Turkey with 107 members; it has a rich diversity and these taxa are considered as members of 2 subgenus (subg. *Chamaesyce* Raf. and sung. *Esula* Pers.) (Şafak Odabaşı, 2023).

Interesting tuberous *Euphorbia* L. (members of this genus are known as **sütleğen** in Turkish) specimens (Figure 1-3) were collected during the botanical trips carried out on 20.04.2024 on the stony steppe slopes and off the oak (*Quercus infectoria*_Oliv. subsp. *Ferris* (A.Kern) Meikle and *Q. libani* Oliv.) communities of the mountainous part north of the Odabaşı village of Baskil district(Elazığ/Türkiye). According to Walter (1962), divides the Irano-Turanian phytogeographic region of Türkiye into two parts, Baskil district; it is located in the forest area dominated by deciduous trees. The area where *Euphorbia* specimens were collected also includes steppe and rocky areas in the area between the locally destroyed oak communities. The distribution of 950 taxa was determined in the flora of Baskil district, where tuberous *Euphorbia* samples were collected (Behçet 2020). In addition to this flora, a significant part of which is determined to be composed of elements of the Irano-Turanian phytogeographic region, some new species have recently been published in the field for the scientific world (Behçet 1998; Behçet & İlçim 2018; Hamzaoğlu & Behçet 2022). In addition, in recent years, new records for Turkey (Yapar & Behçet 2022) and new taxon studies (Behçet et al. 2019; Behçet & Gülbasan 2024) have been published within the borders of Elazığ province where *E. cardophylla* Boiss. & Heldr. was collected.

These collected samples; according to the "Flora of Turkey and the East Aegean Islands and Flora of the USSR" identification keys, they are members of *Helioscopia* Dumort. Emend. Tutin section and *Galarhoei* (Haw.) Boiss. Ex Pax emend. Radcliffe –Smith. Subsection (Group B) (Radcliffe-Smith,1982; Prokhanov,1974). The fruits of our perennial herbaceous specimens are verrucose, the seed surfaces are smooth and many other features comply with the definition of *Euphorbia cardiophylla* Boiss. & Heldr.(Radcliffe-Smith,1982). However, in Öztekin (2012a and 2012b)'s current studies regarding the distribution of *Euphorbia* genus members in Türkiye, it is stated that *E. cardiophylla* is a synonym for *E. condylocarpa* M.Bieb. and the existence of *E. condylocarpa* in Türkiye should be confirmed. In addition, the website (Öztekin, 2012b) shows the distribution areas of each of the vascular plants distributed in Türkiye on a map; no distribution area is specified on the map given for *E. condylocarpa*. In this case, it is not clear whether *E. condylocarpa* is distributed in Türkiye and it is necessary to prove the existence of natural distribution of this species in Türkiye.

On the other hand, although the definition and information of localities of *Euphorbia condylocarpa* (which is included in the 7th volume of the Flora of Turkey as *E. cardiophylla* and in the 10th volume as *E. condylomata*) in7th the 10th volumes of Flora of Turkey (Radcliffe-Smith,1982; Davis et al., 1988) is given; Öztekin's (2012a) study evaluated the distribution of the said species in our country as suspicious. When you visit the website (Öztekin, 2012b) showing the distribution of plants growing in Türkiye, it is seen that there is no distribution map or information provided for the *Euphorbia cardiophylla* species in Türkiye. Also on the same website no distribution area is given for *Euphorbia condylocarpa* within the borders of Türkiye and regarding this species, the statement "Confirmation of its existence in Türkiye is required" is given, and there is a note "Fl. Taur.-Caucas. 1: 377 (1808)" regarding the distribution of this species. The fact that the existence of this species in Turkey is considered suspicious and requires confirmation may be due to the fact that specimens that fully reflect the characteristics of the species in question are not available in Türkiye or have not been seen. The reasons stated above; necessitates the elimination of doubts about the distribution of *Euphorbia condylocarpa* in Türkiye.

In this study, the main features of *Euphorbia condylocarpa* that distinguish it from its related species; it is evidenced by field and scan photographs (Figure 1-5). In addition, locality information and ecological characteristics of the species were given and doubts about the distribution of the species in Türkiye were eliminated.

MATERIALS and METHODS

Specimens of *Euphorbia condylocarpa* were collected from the Baskil district of Elazığ province in Türkiye (Figure 6). While describing *Euphorbia condylocarpa*, in addition to the description of the distribution of the species in the Flora USSR (Prokhanov, 1974), some variations seen in our samples (especially sometimes, in addition to the development of sterile branches on the stem, tuber sizes, tuber division and, although rare, flattening) are also presented by taking into account the samples we collected from Baskil. Also in the given definition; The characteristics of this species, which is known to be distributed in the Caucasus, in the Russian flora (Prokhanov, 1974) were compared with the photographs of live and dry *Euphorbia condylocarpa* specimens

on the Gbif website (2024). Photographs of specimens were taken in the field, scanning device(*hp*), and morphological observations were made using an Olympus SZ51 stereo microscope. The herbarium specimens are deposited in BIN (the Herbarium of Bingöl University).

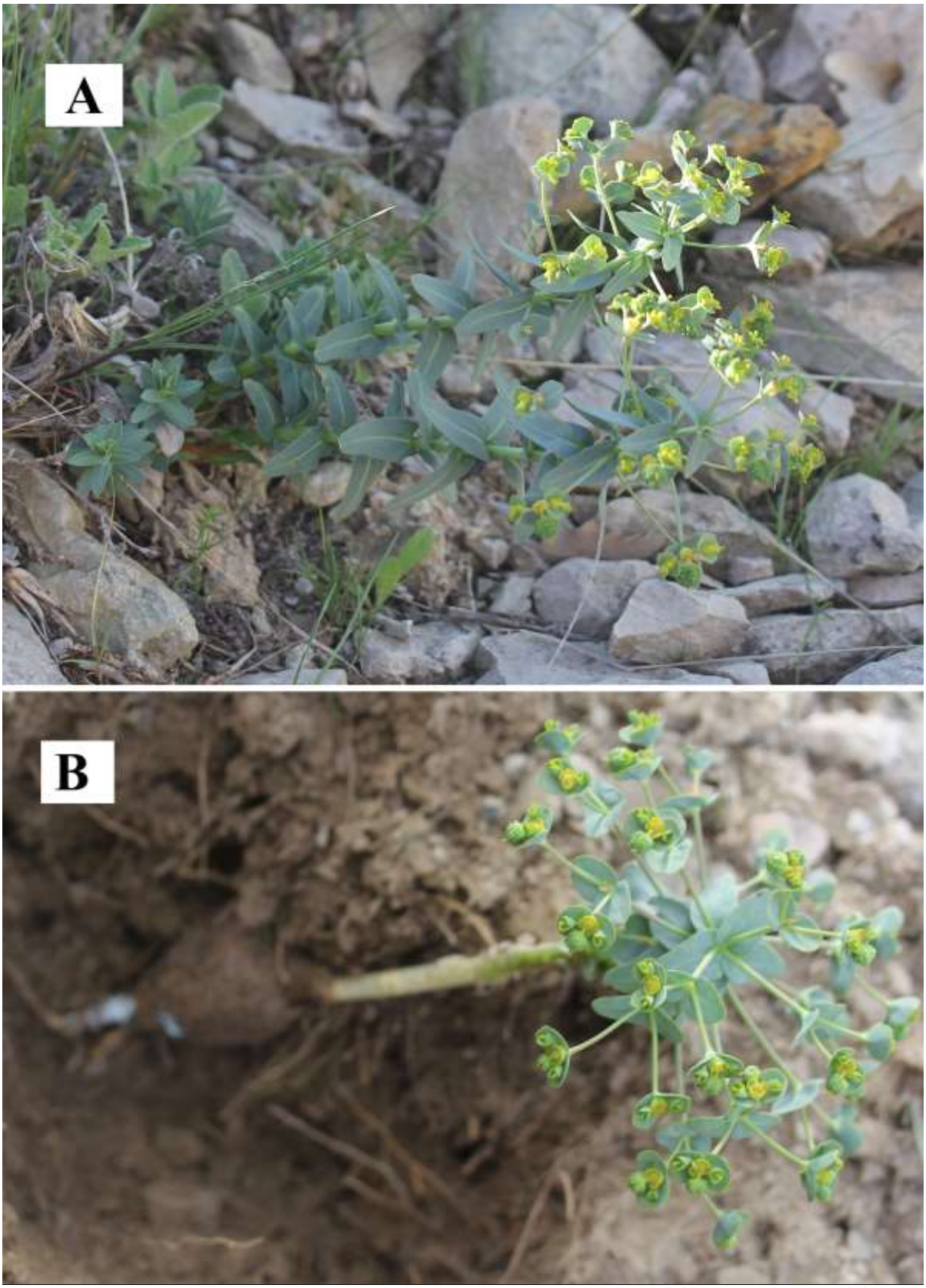

Figure 1. View of *Euphorbia condylomata* in its original habitat (A) and with tuber (B)
Şekil 1. Euphorbia condylocarpa 'nın orijinal habitatında(A) ve yumrulu(B) görünümü

Figure 2. Scanned habit of *Euphorbia condylocarpa* with a single flattened tuberous and chordate-based leaf (from BIN 12197).

Şekil 2. Euphorbia condylocarpa'nın taranmış tek yumrulu ve kalpsi tabanlı yaprağa sahip olan habitusu (BIN 12197'den)

These tuberous *Euphorbia* specimens collected from Baskil were found to be very similar when compared to the *Euphorbia condylocarpa* images on the Gbif website (Figures 4 and 5).

RESULTS and DISCUSSION

Euphorbia. condylocarpa M. Bieb. Fl. taur.-cauc. I (1808) 377, et III, 328; Ldb. Fl. Ross. Ill, 567; Boiss. In DC. Prodr. XV, 2, 126; Fl. Or. IV, 1102.- *E. amplexicaulis* Ledeb Fl. Ross. Ill (1849—1851) 567.—

Tithymalus condylocarpus (M. Bieb.) Klotzsch & Garcke in Abh. Akad. Berl. 1859(1860)78, nomen altera. - Ic: Boiss. Ic. Euph. Tab. 77.

Type: in Leningrad (LE).

Syn.: Homotypic synonym

Tithymalus condylocarpus (M.Bieb.) Klotzsch & Garcke in Abh. Königl. Akad. Wiss. Berlin 1859: 78 (1860)

Heterotypic synonyms

Euphorbia amplexicaulis Ledeb. In Fl. Ross. 3: 567 (1850), nom. illeg.

Euphorbia cardiophylla Boiss. & Heldr. İn P.E.Boissier, Diagn. Pl. Orient. 12: 107 (1853)
Tithymalus amplexicaulis Klotzsch & Garcke in Abh. Königl. Akad. Wiss. Berlin 1859: 80 (1860)
Tithymalus cardiophyllus (Boiss. & Heldr.) Klotzsch & Garcke in Abh. Königl. Akad. Wiss. Berlin 1859: 78 (1860)

Figure 3. Scanned habit of *Euphorbia condylomata* with sterile branches, chordate-based leaf and 3-tube red: A-General view of habitus B-Fruits and glands appearances in the inflorescence part (from BIN 12197)
Şekil 3. Euphorbia condylocarpa'nın taranmış çiçeksiz dallı, kalpsi tabanlı yaprağa sahip olan ve 3 yumrulu habitusu: A-Habitusun genel görünümü B- Çiçek durumundaki meyve ve glandların görünümleri (BIN 12197'den)

Figure 4. Photograph of fresh specimens of *Euphorbia condylomata* (from GBIF 2024)
Şekil 4. Euphorbia condylocarpa'nın taze örneklerine ait fotoğraf (GBIF 2024'den)

Figure 5. Image of *Euphorbia condylomata* in the Herbarium of Moscow State University (MW1007566) (from GBIF 2024)

Şekil 5. Moskova Devlet Üniversitesi Herbaryumundaki Euphorbia condylocarpa'nın görüntüsü (MW1007566) (GBIF 2024'den)

Description: Perennial. **Rootstock** is tuberous, tuber entire or **branching, 1–6 cm wide**, those that develop in the rock area are **flattened due to bilateral** rock compression. **Stems:** 10–45(54) cm high, 2–8 mm thick, l–several, often branched, prostrate, decumbent-ascending or ± erect, **with** or without **sterile branches**, glabrous, thinner at the base, densely leafy, with internodes 3–6(rarely 10) mm long. **Leaves:** basal leaves are scarious, deciduous, the basalmost squamiform; cauline leaves sessile, dilated-cordate and amplexicaul at base, ovate-oblong, oblong, elliptic-oblong or linear-oblong, (0.5–)1.3–3.5(–5) cm long, (4)5–16(–18) mm wide, obtuse or acute, serrate. **Inflorescence:** paniculate; bearing above 6–40 axillary peduncles 1–4.5 cm long, terminal peduncles 1–3 cm long, often inconspicuous; axillary peduncles many, like the terminal, bifurcate; raylet leaves ovate-rhombic to transversely ovate, oblongtriangular or rhombic-ovate, (3)8–18 mm long, (3)5–13(–16) mm wide, usually more or less serrate or entire, obtuse, sometimes abruptly cuspidate, often more or less reddish. **Cyathium:** subglobular-turbinate, ca. 1.5 mm long, 2 mm in diameter, glabrous, with short broad transversely oblong lobes; nectaries 5, transversely elliptic; styles 0.5–1 mm long, nearly free, cleft. **Schizocarp** trilobate, short-stalked, subglobulose

3–4.5x3.5-5 mm, covered with shortly cylindrical or conical green or purplish warts, glabrous. **Seeds** compressed ovate, ca.2.5 mm long, brown, smooth. Fl.3-4-Fr. 4-6.

Forests and shrubby formations, stony and rocky slopes.- Gen. distr.: Iran, Türkiye. Described from the mineral source Narzan (Kislovodsk) in the foothills of the Caucasus.

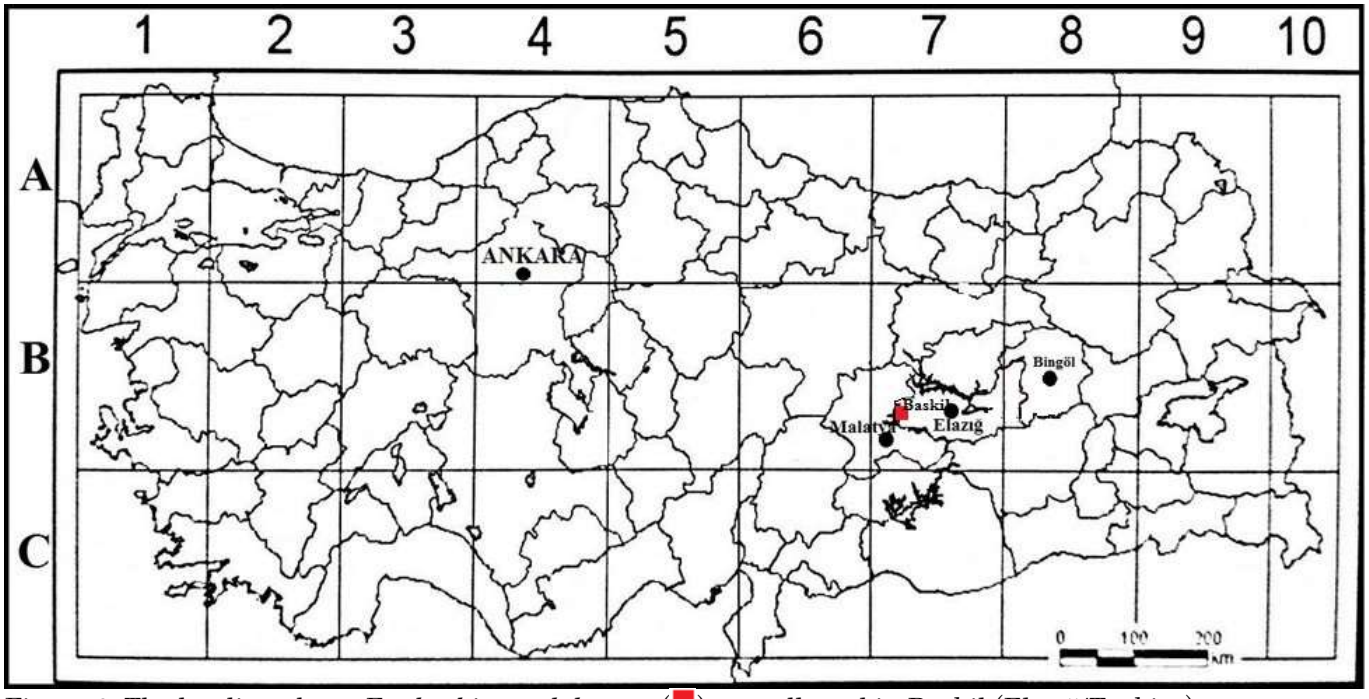

Figure 6. The locality where *Euphorbia condylomata* (■)was collected in Baskil (Elazığ/Türkiye)
Şekil 6. Euphorbia condylocarpa (■)'nın Baskil (Elazığ/Türkiye)'de toplandığı lokalite

Flowering: March-April

Fruiting: April-June

Distribution: North Caucasus, Transcaucasus, Iran, Iraq, Türkiye (POWO, 2024).

Type: in Leningrad (LE).

Specimens examined: *Euphorbia. condylomata*: Türkiye, B7 square: Elazığ, Baskil district, the mountainous part north of the Odabaşı village, on the stony steppe slopes and off the oak(*Quercus infectoria*_Oliv. subsp. *Ferris* (A.Kern) Meikle and *Q. libani* Oliv.) communities, 1500-1600 m, 20.04.2024, *L.Behçet* 21188, BIN 12197.

Ecological preferences: In the area where *Euphorbia condylomata* grows at 1500-1600 m on the mountain slopes north of Odabaşı village; there is a distribution of oak communities (*Quercus infectoria* Oliv. subsp. *veneris* (A.Kern.) Meikle and *Q. libani* Oliv.) and the shrub-like *Cerasus macrocarpa* (C.A.Mey.) Boiss. subsp. *microcarpa and Cotoneaster nummularius* Fisch. &C.A.Mey., *Ficus carica* L. subsp. *rupestris* Browicz. In these communities where *E. condylocarpa* develops and in the steppe areas between them; other important plants that grow alongside spiny or xerophytic taxa such as *Acantholimon acerosum* (Willd.) Boiss., *Helichrysum plicatum* (Nab.) P.H.Davis & Kupicha, *Marrubium parviflorum* Fisch. & C.A.Mey. subsp. *parviflorum*, *Noaea mucronata* (Forssk.) Asch. & Schweinf are: *Alyssum menicoides* Boiss., *A. simplex* Rudolph, *Arabis montbretiana* Boiss., *Astragalus lanigerus* Desf., *Bromus tectorum* L.,*Carlina involucrata* subsp. *libanotica* (Boiss.) Meusel & Kästner, *Centaurea virgata* Lam., *Cerastium dichotomum* L. subsp. *dichotomum, Clypeola jonthlaspi* L., *Crepis foetida* L. subsp. *commutata* (Spreng.)Babcock, *Crocus cancellatus* Herb. subsp. *damascenus* (Herb.)B. Mathew, *C. pallasi* Goldb., *Draba verna* L., *Erodium cicutarium* (L.) L'Herit subsp. *cicutarium, Euphorbia macroclada* Boiss., *Geranium rotundifolium* L., *Holosteum umbellatum* L. var. *glutinosum* (M.Bieb.) Gay, *Muscari neglectum* Guss. ex Ten., *Myosotis refrecta* Boiss. subsp. *refracta*, *Saxifraga tridactylites* Sm. *Ranunculus isthmicus* Boiss. subsp. *stepporum* P.H.Davis, *Viola occulta* Lehm., *Valeriana dioscoridis* Sm., *Taraxacum pseudonigricans* Hand. -Mazz., *Thalictrum isopyroides* C.A.Mey., *Thlaspi perfoliatum* L.

Members of the *Euphorbia* genus are called **sütleğen** in Turkish due to the milk-like white latex secretion they contain in their tissues. Tuber root feature is not a well-known feature in the members of this genus, which has many annual and perennial members. Therefore, *E. condylocarpa* is an interesting plant with its globose root

feature. Although *E. candyllocarpa* is similar to *E. apios* L., which is known to be distributed in Türkiye, with its tuberous root structure, verrucose fruit characteristics, and the ability to produce flowers and fruits between March and June; it differs from cauline leaves in that they are cordate-auriculate at the base and have a higher number of axillar rays (to 30).

In the collected samples, the tuber width is 1–6 cm (not 1–4 cm wide), the tuber shape is rarely flattened due to compression (not only globose), and the tubers are sometimes branched (not continuously entire) and there are sterile shoots on their stems (not always sterile branches absent) differ from the known definition of *E. candyllocarpa* (Figure 3). *E. candyllocarpa* is distinguished from the *E. apios* species, which is known to be distributed in Türkiye, as follows:

–Cauline leaves ± rounded at base; axillary rays rarely more than 3 .....**apios**

–Cauline leaves cordate-auriculate at base; axillary rays to 30 ..... **candyllocarpa**

We hope that there will be no doubt or hesitation with this study about the distribution of this plant in Türkiye, whose detailed characteristics we have given.

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