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# A NEW SPECIES OF *THYMUS* (LAMIACEAE) FROM CENTRAL ANATOLIA (TURKEY)

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**Abstract**

A new species *Thymus baseri* (Lamiaceae) is described and illustrated from central Anatolia, Turkey. The new species grows on marble rocks and scree at 1640–1800 m. in central Anatolia (Eskişehir Province). A complete morphological description, detailed photographs are reported for the new species, including an identification key for related species. It's distribution, habitat and ecology, etymology, conservation status and diagnostic morphological, and taxonomic features with familiar species are discussed in this paper. Additionally, pollen and nutlet micromorphological characteristics of *T. baseri* are examined and using SEM analyses. Observations regarding the IUCN Red List category and the ecology of the population are noted. The geographic distribution of the new species has been mapped.

**Key words:** *Thymus baseri*, Lamiaceae, Taxonomy, Eskişehir, Turkey.

## Introduction

The mint family (*Lamiaceae* Martinov) includes about 220 genera and about 4000 species (Kumar & Sharma, 1995). This family has an almost cosmopolitan distribution (Ghasemi Pirbalouti *et al.*, 2015). Many of these species are typical for the Mediterranean area (Cosentino *et al.*, 1999; Azaz *et al.*, 2004). In Turkey, the family *Lamiaceae* is represented by 45 genera, 546 species, and 730 taxa, with an endemism rate of 44.2% (Akgül & Özcan, 1999). Among the aromatic plants belonging to the family *Lamiaceae*, the genus *Thymus*, one of the most important genera of the family, is noteworthy for its number of species and varieties growing wild plants (Jalas, 1971).

*Thymus* comprises about 350 species, approximately 66 of which grow wild in Europe (Mabberley, 1997). According to this last check list of vascular flora to Turkey titled "Türkiye Bitkileri Listesi (Damarlı Bitkiler)" (Güner & Aslan, 2012) the genus *Thymus* is represented in Turkey by 38 species and 64 taxa, with an endemism rate of 53% (Tumen *et al.*, 1998; Davis, 1988; Morales, 1997). The plants are shrubs, cushion like or perennial herbs, at least woody at the base. This genus also often taxonomical problems. Many aerial parts of *Thymus* species are used as tea for their medicinal properties and are the constituent of many pharmaceutical preparations (Alan *et al.*, 2007). *Thymus* is considered a well-defined genus, based on the morphological and chemical features of its species (Tzakou & Constantinidis, 2005). The high morphological variability in this genus has led to the description of more than 1000 species, with many nomenclatural and taxonomic synonyms (Bartolucci & Peruzzi, 2013).

In this study, as a new *Thymus* species is described from central Anatolia (Turkey) and its diagnosis, descriptive, and distributional features, and conservation status are given.

## Material and Methods

**Macro morphology:** Between 2015 and 2019, during a floristic study in Günyüzü (Eskişehir, central Anatolia), different *Thymus* specimens were collected by the authors. A Nikon D5300 camera (Minato, Tokyo, Japan) was used to photograph the specimens and their GPS locations were recorded using Garmin eTrex GPS (Olathe, KA, USA). The specimens were identified using the diagnostic key in Flora of Turkey and East Aegean Islands (Davis, 1988). Specimens of *Thymus baseri* sp. nov. were compared with herbarium materials of related taxa from different herbaria in Turkey (ANK, KNYA, OUFE).

**Scanning electron microscopy:** Scanning electron microscopy (SEM) was performed for the micromorphological studies. Seeds, fruit, and pollen were placed on slides using double-sided adhesive carbon bands. Each sample was plated using a Polaron SC7620 gold palladium splash (Quorum Technologies Ltd., Lewes, UK) under vacuum for 60 seconds. They were photographed using a JEOL 5600 LV SEM (Akishima, Tokyo, Japan) at an acceleration voltage of 20 kV at the Eskişehir Osmangazi University Electron Microscopy Unit.

## Result

As a result of detailed morphological studies and examination of the relevant herbaria materials (ANK, KNYA, OUFE) and the literature sources, it was concluded that the specimen do not belong to any species, therefore they should be described as a new species of the genus *Thymus* (Jalas, 1971; Kaynak & Ketenoğlu, 1986; Davis, 1988; Morales, 1997; Aytaç & Ekici, 1997; Alan *et al.*, 2007). This new species was found to be closely related to *T. cilicicus*, *T. parnassicus*, *T. cappadocicus*, *T. leucotrichus*, and *T. revolutus* and its distribution, ecology, and conservation status were defined. A more detailed comparison of the new species with relevant species is given in the Table 1.

**Table 1. Morphological differences of taxonomic importance in *T. baseri, T. cilicicus, T. leucotrichus, T. revolutus, T. parnassicus* and *T. cappadocicus*.**

| | *T. baseri* | *T. cilicicus* | *T. leucotrichus* | *T. revolutus* | *T. parnassicus* | *T. cappadocicus* |
|---|---|---|---|---|---|---|
| Habitus | Cushion-forming dwarf shrub | Shrublet forming dense tussocks | Dwarf shrub forming loose cushions or mats | Dwarf shrub with woody, slender, creeping | Cushion-forming dwarf shrub | Ascending and freely branching to form dense cushions |
| Stems | Quadrangular, puberulent | Hairy all around, hairs short, deflexed | Variably hairy all around. | Hairy all around with patent villous hairs | Puberulent to hirsute | Quadrangular, puberulent to hirsute |
| Flowering stem size (cm) | 5–9 | 3–15 | 1.5–6 | 2–9 | 1–3 | 2–3 |
| Leaves shape | Linear, pubescent, margins revolute, ciliate at more than half | Lanceolate- falcate, puberulent, margins revolute | Linear- lanceolate, mostly velutinous-puberulent with additional longer hairs | Lanceolate-falcate, all with revolute margins, hairy with long and short hairs, ciliate to near apex | Linear to narrowly elliptic- oblanceolate, velutinous- puberulent, margins revolute | Linear, acutish, margin revolute, ciliate at least in lower half |
| Leaves size (mm) | 4–8 × 0.7–0.9 | 3–4 × 0.3–0.5 | 4–9.5 × 0.6–1.3 | 8–13 × 0.7–0.9 | 4–7 × 0.5–0.7 | 3–9 × 0.4–0.8 |
| Inflorescence | Capitate | Capitate | Capitate | Capitate | Small few-flowered head | Few-flowered |
| Bracts shape | Broadly ovate-acuminate | Ovate, attenuate | Elliptic-ovate | Broadly ovate-acuminate | Ovate to almost orbicular | Leaf-like |
| Bracts size (mm) | 5–7 × 0.3–0.6 | 7.5–10×3–4 | 1.8–3 | 7–12 × 3.5–7.5 | 2–3.5 | 4–6.5 × 0.8–1.5 |
| Veins | c. 3–4 pairs | 4–5 pairs | 12(–3) pairs | 3–5 pairs | c. 3 pairs | Obsolete |
| Color | Purplish | Not colored | Not colored | Purplish | Not colored | Purplish |
| Bracteole sizes (mm) | 1–1.5 | c. 2 | 1–2.5 | Minute | c. 2 | 1.5–2.5 |
| Oil dots | Sparse, yellowish | Mostly sparse, yellowish | Few | Mainly numerous, orange to ruby | Sparse, yellowish | Sparse |
| Calyx Size (mm) | 4–5 | 3.5–5 | 3.5–5.2(–6.5) | 4–5 | 3.5–4.5 | 2.6–4 |
| Upper calyx teeth (mm) | 0.8–1.5 | 0.5–0.8 | 0.8–1.6 | c. 0.8 | 1.2–1.5 | 0.6–1.2 |
| Corolla color | Lilac to purple | Lilac to purple | Mauve to purple | Purple | Lilac | White to lilac |
| Corolla size (mm) | 4–5 | 5–6.5 | 6–8 | 6–8 | 6–7 | 5–6 |

## Taxonomic treatment

***Thymus baseri*** Öztürk, Yaylacı, Koyuncu & Ocak sp. nov. (Figs. 1–6).

**Type:** Turkey, B3 Eskişehir: Sivrihisar, Karacaören village, peak of Arayit (Eryiğit) Mountain, marble rocks and scree, 1560–1800 m, 39°17′47″ N, 31°45′08″ E, 18.06.2016 (Fig. 2), holotype: OUFE 20414 (Fig. 3), isotypes: KNYA, ANK.

***Thymus baseri*** Öztürk, Yaylacı, Koyuncu & Ocak

## Diagnosis

*Thymus baseri* is related to *T. cilicicus*. It differs from *T. cilicicus* mainly because it has habitus cushion forming dwarf shrub, stems quadrangular, puberulent, leaves shape linear, pubescent, ciliate at more than half, bracts shape broadly ovate-acuminate, veins c. 3–4 pairs, bracte color purplish, bracteole sizes (mm)- 1–1.5, upper calyx teeth (mm) 0.8–1.5 (Table 1).

## Description

Diagnostic features of *T. baseri* sp. nov were based on the leaves, habitat, indumentum, inflorescence, bracts, bracteole, calyx, and corolla. Cushion-forming dwarf shrub, with procumbent primary branches. Flowering stems 5–9 cm, quadrangular puberulent. Leaves 4–8 × 0.7–0.9 mm, linear, pubescent; glands sparse, yellowish; margins strongly revolute, ciliate to above middle. Bracts 5–7 × 0.3–0.6 mm wide, broadly ovate-acuminate, lateral veins c. 3–4 pairs, purplish. Bracteoles 1–1.5 mm. Inflorescence capitate. Calyx 4–5 mm, lips ± unequal; upper teeth 0.8–1.5 mm, mostly ciliate. Corolla lilac to purple, 4–5 mm, exceeding calyx. Pollen isopolar, pollen shapes are suboblate (P/E 0.82), oblatae-spheroidal and oblatae. The distance between the colpus (mesocolpium) is not equal. Therefore, the polarity is paraizopal. Colpus 6 and colpus granules are granular. *Thymus baseri* pollen ornamentation is retikulat, spheriodal, polar axis 26.93 µm, equatorial axis 33.02 µm (Fig. 4). Exine 1.6 µm thick in equator, 1.9 µm thick at poles. Colpi with pointed end long. clg 19.2 µm, Clt 3.4 µm. Intine 0.72 µm. Distance between colpi ends 5.2 µm. Colpus membrane is granulate. Exine sculpturing microreticulate in SEM (Fig. 5). Regarding to previous works, the network pattern of nuts is an important feature to distinguish the genera of the Lamiaceae family (Hassan & Dar 2012, Kaya & Dirmenci 2008, Botanica 2009, Tutin *et al.*, 1964). Moon *et al.*, (2009) morphology of the abscission scar, mentioned that the nutlet shape, distribution of trichomes and surface sculpture can be used for species identification in Lamiaceae. Moon *et al.*, (2009) showed the importance of nutlet micromorphology in character Evolution of the Tribe Mentheae (Nepetoideae, Lamiaceae). Nutlet shape prolate, nutlet colour light brown, abscission scar position basal, cell shape rectangular or pentagonal, periclinal surface weakly wrinkled (Fig. 6).




Fig. 1. *Thymus baseri*: (a) general appearance in nature, (b) habit with flowers, (c) shape of the inflorescence and leaf.

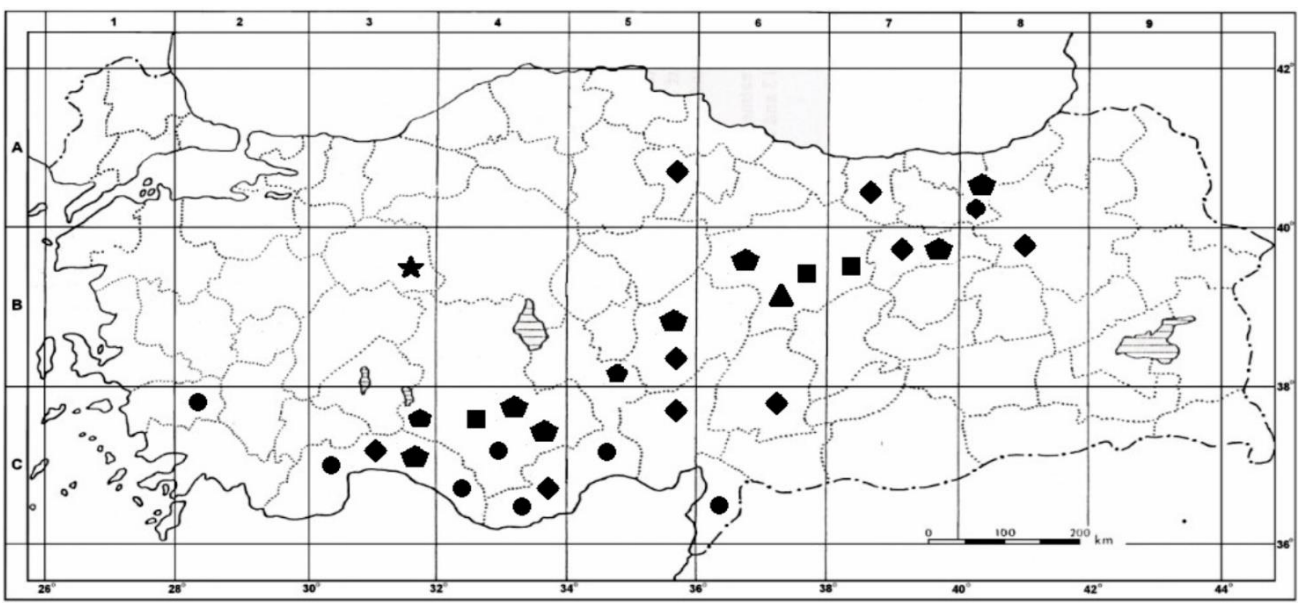


Fig. 2. Distribution map of *T. baseri* (★), *T. cappadocicus* (■), *T. parnassicus* (▲), *T. cilicicus* (●), *T. leucotrichus* (⬟), and *T. revolutus* (◆) in Turkey.




Fig. 3. Holotype of *Thymus baseri* from the herbarium OUFE: OUFE 20414, (isotypes: KNYA, ANK).

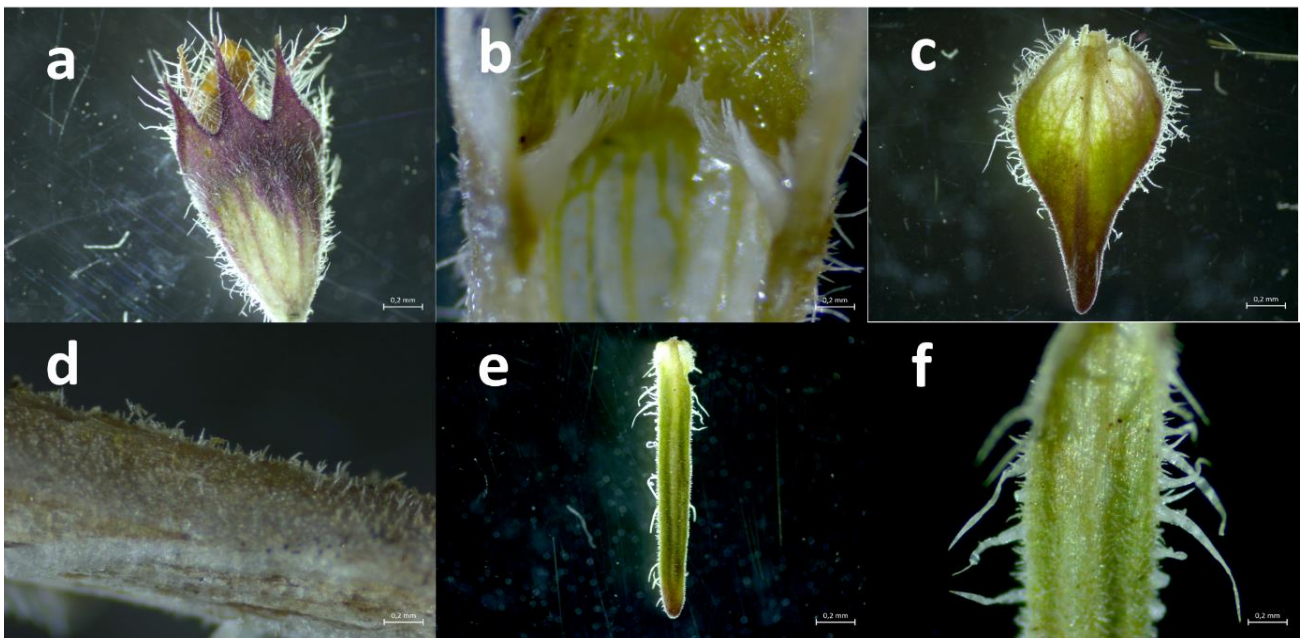


Fig. 4. Indumentum of *Thymus baseri*: (a) calyx, (b) surface of the sepal, (c) bract, (d) stem, (e) lower surface of the leaf. (f) upper surface of the leaf.

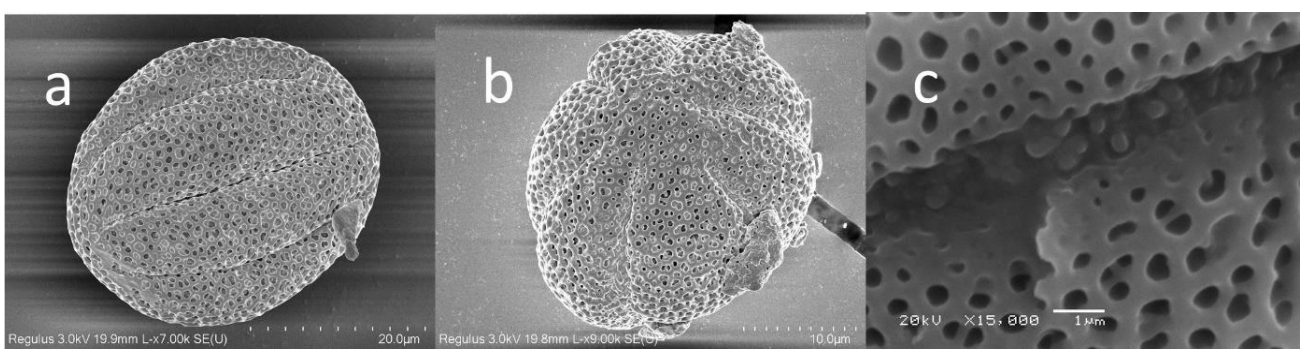


Fig. 5. Pollen microphotography of *Thymus baseri* (a: Equatorial view of a pollen in SEM; b: Polar view of a pollen in SEM; c: Surface ornamentation of a pollen in SEM).

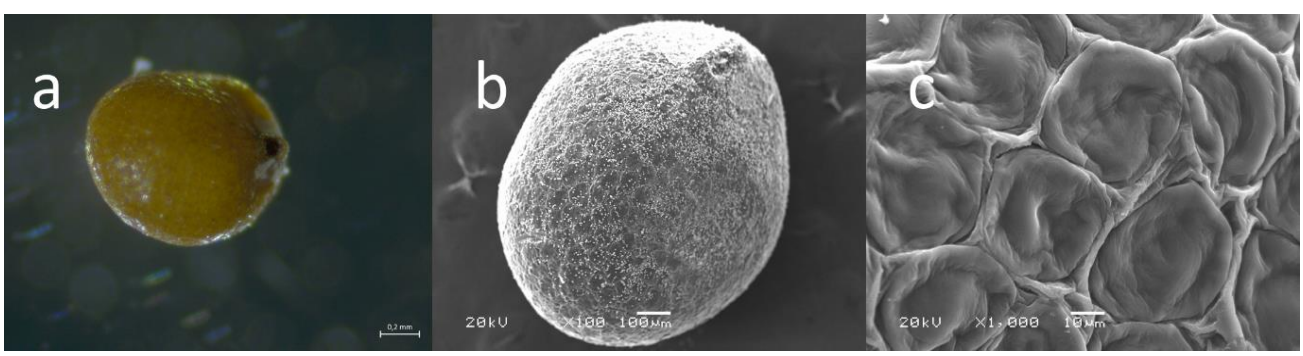


Fig. 6. *Thymus baseri*: (a) general view of the nutlet (b), general view of the nutlet under SEM, and (c) surface structure of the nutlet in under SEM.

**Habitat:** Marble rocks and scree.
**Flowering and fruiting time:** June–July.
**Etymology:** This species is named in honour of Prof. Dr. Hüsnü Can BAŞER, who is a botanist in the field of pharmaceutical botany at the Faculty of Pharmacy, Near East University, Cyprus. The Turkish name of this plant was assigned as "Can kekiği", according to the guidelines of Güner *et al*., (2012).

**Distribution and ecology:** *Thymus baseri* is endemic to Turkey and grows in central Anatolia and Irano-Turanian areas. The species is only known from the type locality. Its habitat is marble rocks and scree, steppe where it grows along with *Scorzonera pygmaea* Sibth. & Sm., *Hypericum sechmenii* Ocak & Koyuncu, *Alyssum niveum* Dudley, *Asperula nitida* Sm., *Aubrieta canescens* (Boiss.) Bornm., *Hesperis kotschyi* Boiss., *Aethionema subulatum* (Boiss. &

Heldr.) Boiss., *Galanthus gracilis* Celak., *Astragalus oxytropifolius* Boiss., *Muscari sivrihisardaghlarensis* Yild. & B. Selvi , *Anthemis tinctoria* L., *Astragalus aduncus* Willd., *Centaurea lanigera* DC. and *Veronica ersinyucelii* Yaylacı, O.Koyuncu & Ocak.

**Recommended IUCN threat category listing:** —*Thymus baseri* is known from just one locality (criterion B2 a), with an estimated area of occupancy of less than 15 $km^2$ (criterion B2). The population is unhealthy, with less than 250 individuals (criterion C). Therefore, it should be classified as "Critically Endangered [CR: B2ab(i)]" based on the criteria of the IUCN Red List Categories (Anon., 2017).

**Additional specimens examined:**—*Thymus parnassicus* Halácsy: TURKEY 500–2000 m, 22.07.2013, (Ephoto!) (http://www.greekflora.gr/el/flowers/1189/Thymus-parnassicus). Herbarium Turcicum, 25.08.1910, (Ephoto!) (https://science.mnhn.fr/institution/mnhn/collection/p/item/p03886204)-*Thymus cilicicus* Boiss. & Balansa: –TURKEY: C4 Icel, Mut, between Suçatı village and Evren village, 300 m, 20.07.1977, M. Vural, Herbarium Turcicum, 460. C3 Antalya, Bozburun Mountain, P.H. Davis, Herbarium Turcicum, 15557. C4 Iskenderun, Sogukoluk, Karlık tepe, amanos mountain, 1300 m, 24.07.1966, Y. Akman, Herbarium Turcicum, 3352. C4 Konya, Çavuş village, 450 m, 11.02.1982, M Vural, Herbarium Turcicum, 1111. C3 Antalya, Melik Plateau, 26.07.2003, 1340 m, H. Demirelma, KNYA Herbarium, 2788. *Thymus leucotrichus* Halácsy: – TURKEY: B6 Sivas, Sarıkışla, Kale village, 1500 m, 07.09.1950. Herbarium Turcicum, 42500. A8 Gümüşhane, Mine Mountain, 2800 m., Ball & Bouly, Herbarium Turcicum, 540. *Thymus leucotrichus* subsp. *leucotrichus* (Synonym); B7 Erzincan, Sipiköy Mountain, 1760 m., 26.06.1934, Ball & Bouly, Herbarium Turcicum, 1326. B5 Kayseri, Erciyes Mountain, 14.07.1973, R. Çetic, KNYA Herbarium, 4209. C4 Konya, Taurus Mountain, 1800 m, B. Eyce, A. Sweet, H. Serin, KNYA Herbarium, 9345. C4 Karaman, Hacıbaba hill, South skirt, 2100 m, 20.06.1984, M. Serin, KNYA Herbarium, 2253. There is *Thymus leucotrichus* var. *austroanatolicus* Jalas (Synonym); C3 Any Antalya, Bozburun, PHDavis, Herbarium Turcicum, 15686. B5 Nigde, Melendiz Mountain, Farm, 2050 m, 30.06.1982, H. Ocakverdi, Herbarium Turcicum, 1984. *Thymus revolutus* Celak.: C3 Antalya, Gebiz, Pınar yolu , 150–200 m, 26.05.1972, Y. Akman, Herbarium Turcicum, 13644. C4 Mersin, 9 km west of Anamur, 110 m, 21.05.1976, M. Vural, R. Cetik, KNYA Herbarium, 4908–4909. *Thymus cappadocicus* Boiss.: *Thymus cappadocicus* var. *globifer* Jalas (Synonym); C. Dural, Herbarium Turcicum, 1342. C4 Konya, Obruk, Kızıltepe slopes, 1350 m, 01.07.1981, H. Dural, Herbarium Turcicum, 732.

The identification key, an excerpt from Flora of Turkey, contains those species thought to be related to *Thymus baseri*:

**Identification key**

| | | |
|---|---|---|
| 1a. | Leaf margin revolute | |
| 1b. | Leaf margin involucrate | 2 |
| 2a. | Inflorescence shape capitate | 3 |
| 2b. | Inflorescence shape a small few-flowered head | 6 |
| 3a. | Bracts colored | *T. baseri* |
| 3b. | Bracts not colored | 4 |
| 4a. | Leaves of long shoots with flat margins, those of axillary fascicles with revolute margins | *T. cilicicus* |
| 4b. | All leaves with revolute margins | 5 |
| 5a. | Upper calyx teeth (mm) up to 1.6 | *T. leucotrichus* |
| 5b. | Upper calyx teeth (mm) up to 0.8 | *T. revolutus* |
| 6a. | Bracts not similar to leaves | *T. parnassicus* |
| 6b. | Bracts similar to leaves | *T. cappadocicu* |

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