

NEW SPECIES AND NEW RECORD OF THE GENUS TEUCRIUM SECT. POLIUM (LAMIACEAE) FROM IRAN

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Received 2024.05.01; accepted for publication 2024.06.16

Dinarvand, M. & Jamzad, Z. 2024.06.30: New species and new record of the genus *Teucrium* sect. *Polium* (Lamiaceae) from Iran. -*Iran. J. Bot.* 30(1):01-10. Tehran.

Species of *Teucrium* section *polium* are widely distributed in the Mediterranean and Irano-Turanian regions. This section contains the most diverse and taxonomically complicated taxa. Iran represents four species of section *Polium* including *T. polium*, *T. stocksianum*, *T. capitatum*, and the new species described in this paper, *T. khuzistanicum* sp. nov. During the floristic studies in Khuzistan province, interesting plant materials of the genus *Teucrium* were collected, expanding our understanding of this genus and resulting in some discoveries. *Teucrium khuzistanicum* is described as a new species from Iran. The new species is characterized by caespitose habit, long, dense oblong-cylindrical spike-like inflorescence, 1-3 mm long pedicels, and leaf dentations. It is closely related to *T. yemenense*, but differs from it in indumentum, calyx shape, and flower size and color. *Teucrium capitatum*, *T. polium*, and *T. stocksianum* are the other related species that differ from *T. khuzistanicum* in their habit, leaf shape, and inflorescence. Furthermore, *Teucrium capitatum* L. is reported here for the first time in the flora of Iran. In addition, illustrations of the new species, images of the herbarium specimens and living plants in their natural habitat, and an identification key to the species of section *polium* in Iran are presented, and a geographical distribution map of the new species and its relatives in Iran is provided.

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Keywords: Ajugoideae; Iran; new species; section *Polium*; *Teucrium*

گونه جدید و گزارش جدید از جنس کلپوره از تیره نعنائیان (*Lamiaceae-Teucrium*) از ایران
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گونه‌های جنس *Teucrium* از بخش *polium* پراکنش وسیعی در ناحیه مدیترانه‌ای و ایران توراخی دارند. این بخش دارای گونه‌های متنوع و با پیچیدگی‌های تاکسونومیک است. در ایران چهار گونه از این بخش حضور دارند که شامل گونه‌های *T. polium*, *T. stocksianum*, *T. capitatum* و گونه جدید شرح داده شده در این مقاله، *T. khuzistanicum* می‌باشد. طی مطالعات فلورستیک در استان خوزستان، نمونه‌های جالب از جنس *Teucrium* جمع‌آوری گردید که اطلاعات ما را در مورد این جنس ارتقاء داده و یافته‌های جدیدی از آن بدست آمد. گونه *Teucrium khuzistanicum* به‌عنوان گونه جدید از ایران شرح داده می‌شود. گونه جدید با ویژگی‌های فرم رویشی بالشتکی، گل‌آذین سنبله مانند مستطیلی-استوانه‌ای بلند و مترکم، گل‌های با دمگل‌های به طول ۱-۳ میلی‌متر و دندان‌های برگ تشخیص داده می‌شود. گونه جدید نزدیک به گونه *T. yemenense* است ولی با آن در نوع کرک، شکل کاسه گل، اندازه و رنگ گل متفاوت است. گونه‌های *T. capitatum*, *T. polium*،

T. stocksianum از سایر گونه‌های وابسته به گونه جدید هستند که با آن تفاوت‌هایی از نظر فرم رویشی، شکل برگ و گل‌آذین و کاسه گل دارند. هم‌چنین گونه *Teucrium capitatum* برای اولین بار از فلور ایران گزارش می‌شود. این گونه با داشتن گل‌آذین فشرده کروی - مستطیلی انتهایی از گونه *T. polium* تشخیص داده می‌شود. در این گزارش علاوه بر شرح گونه‌ها، کلید شناسایی گونه‌های بخش *polium* در ایران و تصاویر آنها در رویشگاه اصلی، تصاویر نمونه‌های هرباریومی و نقاشی از گونه جدید ارائه می‌گردد. نقشه پراکندگی جغرافیایی گونه جدید و گونه‌های وابسته به آن در ایران ارائه می‌شود.

INTRODUCTION

The genus *Teucrium* L. (Ajugoideae, Lamiaceae) is widespread in the Mediterranean, Macaronesian, Irano-Turanian, and Saharo-Arabian regions with 434 taxa (Govaerts & al. 2013) in the world. Different authors have classified the genus into sections (Benth 1847; Boissier 1879; Briquet 1895-1897; Kästner 1989; Navarro & El Oualidi 1997). Phylogenetic studies conducted on the genus (Salmaki & al. 2016) have shed light on the relationships among its species, unraveling monophyletic groups that occasionally differ from prior classification systems. Navaro (2020), defined five major biogeographic and taxonomic groups based on the biogeographical distribution of the species of *Teucrium* and the main discriminant systematic characters in the genus, such as corolla and calyx lobes' structure (zygomorphy) as well as their indumentum types. *Teucrium* section *polium* is among the groups of sections (sections *Polium*, *Chamaedrys*, *Montana*, *Isotriodon*, and *Scordium*) characterized as subshrubs and half-shrubs with 1-lipped corolla and mainly subactinomorphic calyx (Navaro 2020). *Teucrium* sect. *Polium* is recognized as a well-defined infrageneric taxon in most classifications (Benth. 1847, Boissier 1879, Navarro & El Oualidi 1997), but Kästner (1986) recognized it as subsection *Polium* (Miller) Kästner in section *Chamaedrys* (Mill.) Schreb. The phylogenetic study of the genus (Salmaki & al. 2016) showed a well-supported *T. polium* species group, distinctly separate from *T. chamaedrys* L. species group, but a limited number of species in this section were examined in their study. In *T. sect. Polium* four subsections are recognized including subsect. *Polium* (Mill.) Kästner, 1989, subsect. *Simplisipilosa* S. Puech, 1978, subsect. *Pumila* (Lazaro Ibiza) Rivas Mart. 1974, and subsect. *Rotundifolia* M. E. Cohen ex Valdes Berm. & Sanchez-Crespo, 1978. These subsectional divisions give a better option to group and circumscribe the species based on their morphological characteristics. The genus *Teucrium* is present in the Flora Iranica area (Rechinger 1982) with 30 taxa and 24 taxa in the flora of Iran (Jamzad 2012) of which four (*Teucrium persicum* Boiss., *T. orientale* L. subsp. *gloeotrichum* Rech.f., *T. macrum* Boiss. & Husskn. ex Boiss. and *T. stocksianum*

Boiss. var. *gabrielae* (Bornm.) Jamzad) are endemics to Iran (Jamzad 2012). Species of *Teucrium* section *polium* are distributed in most parts of Iran, usually in the steppe and foot mountains. *Teucrium polium* is the most widespread species in the flora of Iran (Map 1), growing in steppes, arid, and semiarid regions. There are numerous records of *T. polium* from Iran. A total of 260 herbarium specimens of this species have been studied in TARI and the herbarium of Khuzestan Agricultural and Natural Resources Research Centre. The variation in morphological characteristics was very high among the examined specimens. There are many overlaps of characters, making it difficult to recognize the species and or subspecific taxa, which previously have been documented from Iran, i.e. *T. polium* var. *tonsum* Stapf, *T. polium* var. *gnaphaloides* Benth., upgraded to the species level later (Rechinger, 1982; Ranjbar & al. 2017). However, since all Iranian taxa have not been examined in a molecular phylogenetic study, changing their taxonomic status is a matter of the taxonomist's opinion.

Here we report new findings including a new species and a new record of *Teucrium* from southwest Iran. These species have distinct morphological features that discriminate them from the other previously described taxa.

MATERIALS AND METHODS

In the course of floristic studies in Khuzestan province, a comprehensive collection was conducted, encompassing all regions of the province. While identifying the Lamiaceae specimens in the herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center, we observed certain specimens within the genus *Teucrium*, different from the known species previously documented in the flora of Iran, suggesting the potential presence of either new species or new records within the genus *Teucrium* in Iran. Further studies using the main literature on the flora of Iran (Rechinger 1982; Jamzad 2012), regional Floras (Flora of Pakistan), and other sources i.e. POWO (Plants of the World Online), and other recently published works, revealed their novelty. Meanwhile, the fieldwork during floristic studies helped us better

understand the diversity and morphological variation within the genus, their habitat, and accompanying species. The voucher specimens are documented in the Herbarium of the Research Institute of Forests & Rangelands (TARI) and the Herbarium of Khuzestan Agricultural and Natural Resources Research and Education Center.

RESULTS AND DISCUSSION

A new species of the genus *Teucrium* for Iran is described below.

Teucrium khuzestanicum Dinarvand & Jamzad **sp. nov.** (Figs.1, 2, 3, 5, 6A)

Section: *polium* (Mill.) Schreb.

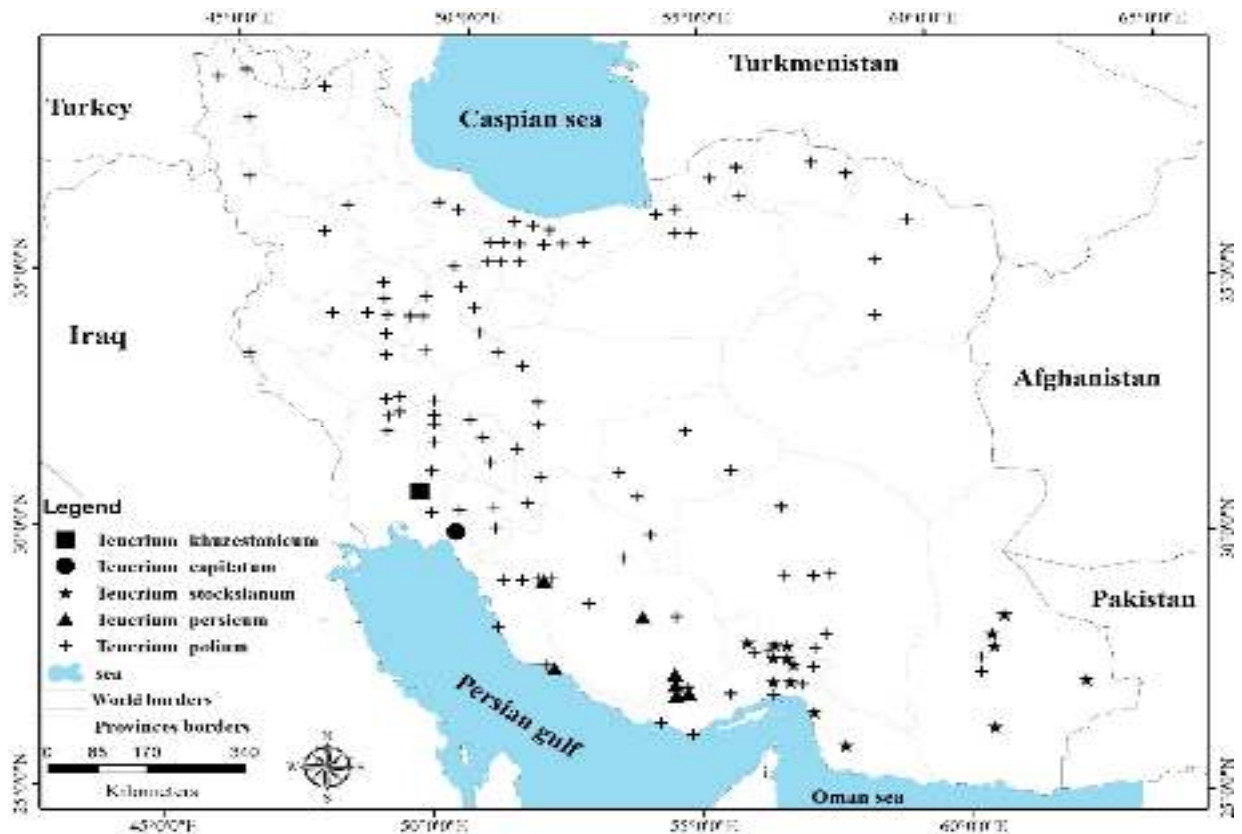
Typus: Iran: Khuzestan Province, Road of Haftgel to Baghmalek, 34 85 37 N, 37 32 02 E, 645 m, Dinarvand, and Rostami, 10975. May 2022. (holotypus TARI, isotypus Khuzestan Agricultural and Natural Resources Research and Education Center Herbarium).

Diagnose

The new species is closely related to *Teucrium Yemenense* DeFlers (1889) but differs from it in

indumentum dense grey tomentose, with branched and simple hairs (vs. tomentose ± antrorse), leaves 9-12x4-5 mm (vs. 12-25x2.5-8mm), oblong (vs. ovate to narrowly oblong), margin dentate with 5 teeth at each side (vs. 3-6 teeth at each side towards the apex), Calyx 4-5 mm, campanulate, with ±equal acute teeth (vs. calyx 5-7 mm, slightly inflated on ventral side near the base, slightly contracted at the mouth, teeth ±equal), corolla 6-7 mm long, white (vs.7.5-10 mm, pink, mauve or purple).

It differs from *T. polium* in dense caespitose form (vs. small bush, woody at the base, with many-branched stems), inflorescence dense oblong-cylindrical, spike-like, 4-6 cm long (vs. branched ovoid heads, 1-2 cm long), pedicle 1-3 mm long (vs. flowers sessile). The new species differs from *T. capitatum* in caespitose habit (vs. bushy, simple, and branched stem), leaves revolute (vs. leaves flat), inflorescence dense oblong- cylindrical, 4-6 cm long spike-like (vs. condensed terminal rounded or ovoid flower heads), flowers with 1-3 mm pedicels (vs. flowers sessile), (Figs. 5-6).



Map 1. Geographical distribution of *Teucrium* species of section *Polium* in Iran.

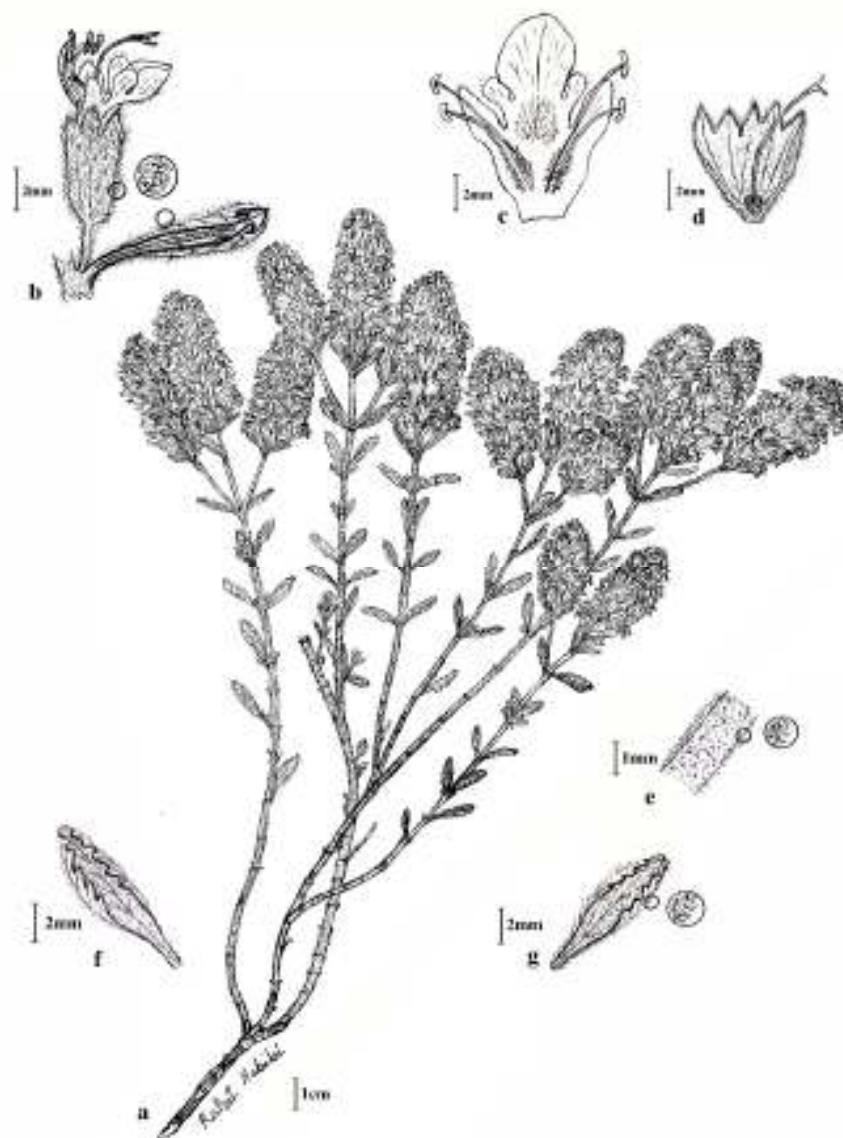


Fig. 1. Illustration of *Teucrium khuzestanicum* Dinarvand & Jamzad, sp.nov.; a, general view; b, flower and bract; c, corolla dissected, d, calyx; e, indumentum of the stem; f, middle stem leaves; g, upper stem leaves.

Description

Perennial, caespitose, aromatic herb. Stems simple or branched, 50 cm high, with dense white branched, simple, and glandular trichomes. Leaves oblong, crenate-dentate, margin revolute, both sides densely covered with white simple and branched trichomes and glands, sessile or subsessile, cuneate at base, 9-12 mm long, 4-5 mm wide; the margin dentate, with 5 teeth on each side, apex obtuse. Inflorescence spike-like, consisting of verticillasters condensed in oblong-cylindrical terminal heads, simple or branched, 4-6 cm long, 10-15 mm wide. Bracts 5-8 mm long and 2-3 mm

wide, oblong-lanceolate margin with short teeth to entire. Pedicels of lower flowers 2-3 mm and the uppers 1-1.5 mm long. Calyx 4-5 mm long, with \pm equal teeth, 0.4-1.3 mm long, triangular, acute, densely covered with white trichomes and glands. Corolla white, 6-7 mm long, middle lobe 2-3 mm, lateral lobes 0.5-1 mm, covered with simple, trichomes and distinct glands on lower surface. Stamens 4, 2-4 mm long, filaments with tin simple hairs. Style 6 mm long, bifid, with tin simple hairs. Nutlets obovoid, 2 mm long, 1 mm wide, rugulose, black.



Fig. 2. Image of *Teucrium khuzestanicum* in its natural habitat on the road between Haftgel and Behbahan, Khuzestan province (photo by M. Dinarvand).



Fig. 3. A close-up image of the inflorescence of *T. khuzestanicum*.



Fig. 4. Image of *T. capitatum* in its natural habitat in Behbahan, Tange Tekab (photo by M. Dinarvand).

Habitat: Arid hills with gypsum soil. The other species present in the area along with *Teucrium khuzestanicum* are as follows: *Pycnocycla caespitosa* Boiss. & Hausskn. ex Boiss., *Platychaete velutina* Boiss. & Hausskn., *Astragalus fasciculifolius* Boiss., *Convolvulus reticulatus* Choisy, *Convolvulus gonocladus* Boiss., *Halocharis sulphura* Moq.

Conservation status

According to our observations, the distribution of *Teucrium khuzestanicum* is restricted to one location in Iran, Khuzestan province. The AOO is measured ca. 0.5 km² and the number of individuals is about 50. According to IUCN categories and criteria (IUCN 2017), based on the geographic range (B1 and B2, extent of occurrence, area of occupancy, and C, small population size, *Teucrium khuzestanicum* is defined as Critically Endangered (CR) [criteria B1b (iii, iv) + B2b (iii, iv) + C2 (i)].

Taxonomic notes

The new species is distinguished by its distinctive cushion form growth habit, dense oblong-cylindrical inflorescences, and crenate-dentate revolute leaves. *Teucrium khuzestanicum* belongs to *T.* sect. *polium*. The other species of this section in Iran are *T.*

stocksianum Boiss. (with two subspecific taxa), the widely distributed *T. polium* and the new record, *T. capitatum*. *Teucrium polium* differs from the new species by its bushy form with lax, branched stems, much-branched inflorescence, and small flower heads. The other member of this section is *T. stocksianum* which is easily distinguished from the new species in its inflorescence consisting of unbranched terminal heads. The endemic *T. persicum* (section *Isotriodon*), is a species with subtropical southern Iran's highlands distribution; easily recognized from *T. polium* species group by its leaves, indumentum, and long racemose inflorescence (Figs.5 & 6). *Teucrium yemenense* with a distribution range in Africa and Middle Eastern countries is the closest relative of *T. khuzestanicum* (Table 1). *Teucrium spicastrum* Hedge & A.G. Mill., [Notes Roy. Bot. Gard. Edinburgh 35(2): 191 (1977)] was described as a species with no close relative by Hedge & Miller (1977). This taxon was later considered a heterotypic synonym of *T. yemenense* Deflers (1889). The comparison of morphological characteristics of the two species shows similarities between them.

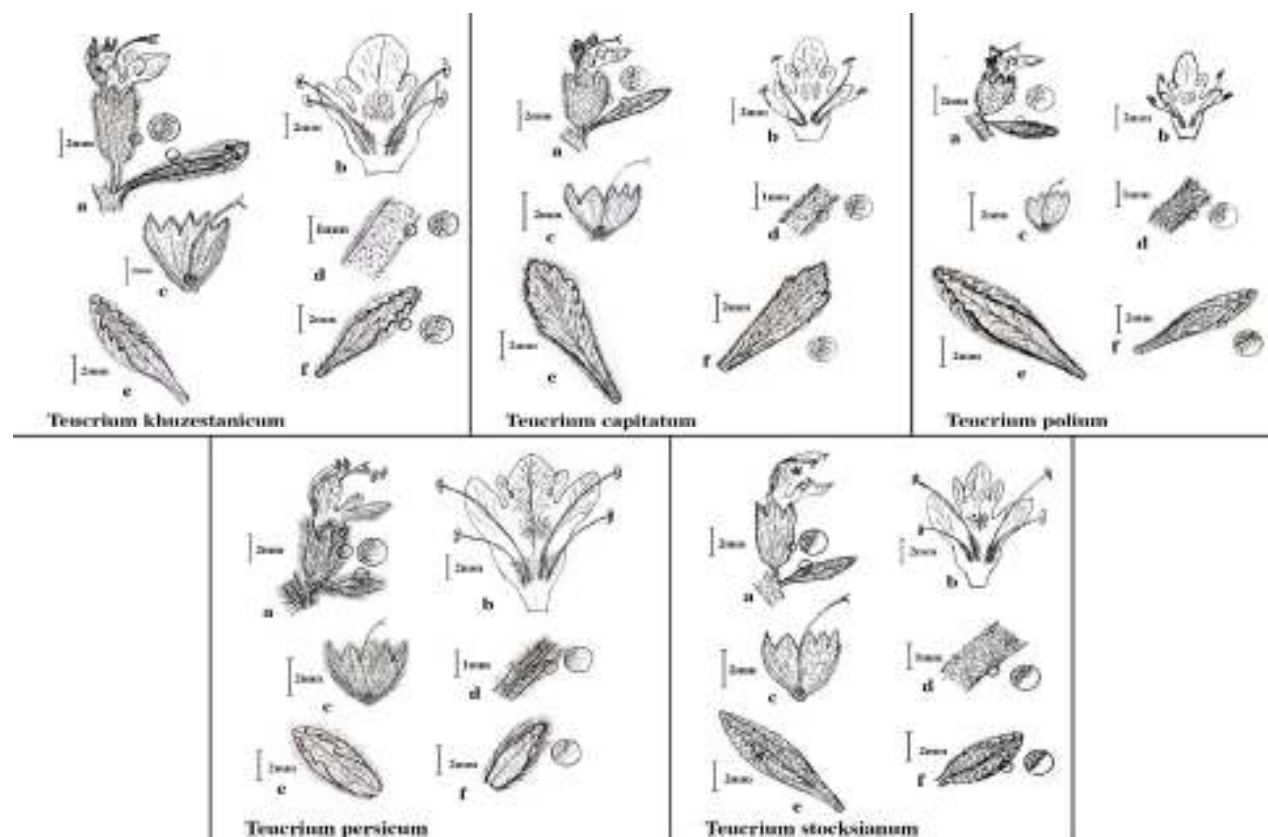


Fig. 5. Comparison of diagnostic characters in species of *Teucrium* section *Polium* and *T. persicum* (sect. *Isotriodon*): a, flower and bract; b, flower dissected; c, calyx dissected; d, stem indumentum; e-f stem and upper leaves.



Fig. 6. Images of herbarium specimens of the examined species. A, *Teucrium khuzestanicum*; B, *T. capitatum*; C, *T. polium*; D, *T. persicum*; E, *T. stocksianum*.

Nomenclatural note

In the original description of *Teucrium yemense* Deflers (1889), and the current databases (IPNI & POWO) the specific epithet seems incorrect since the name is based on the geographical name of Yemen. The suffix for the geographical epithet is *ense* for *Teucrium* (neuter name), so the correct name for this taxon must be *Teucrium yemenense*. Hence, the name is corrected as *Teucrium yemenense* here.

A new record of *Teucrium* Sect. *polium* for Iran is noted below.

Teucrium capitatum L. Sp. pl. 566 (1753), (Figs. 4,5,6B).

Synonyms: *Chamaedrys capitata* (L.) Raf. In Fl. Tellur. 3: 85 (1837); *Polium capitatum* (L.) Mill. In Gard. Dict., ed. 8.: no. 5 (1768); *Teucrium commune* subsp. *capitatum* (L.) Rouy in G. Rouy & J. Foucaud, Fl. France 11: 244 (1909), nom. Illeg.; *Teucrium polium* subsp. *capitatum* (L.) Arcang. In Comp. Fl. Ital.: 559 (1882).

Table 1. The Comparison of diagnostic morphological characteristics of *Teucrium khuzestanicum* and its close relatives.

Species	Habit	Indumentum	Leaf margin	Inflorescence	Inflorescence length	Pedicel	Calyx length	Calyx teeth relative size and apex	Corolla length	Corolla color
<i>Teucrium capitatum</i>	Bush, stems simple or branched	Branched & simple trichomes and glands	Flat, with 3-4 teeth	Branched ovoid heads	1.5-2 cm	0	5-6 mm	Unequal, acute	7 mm	White
<i>T. khuzestanicum</i>	Dense caespitose	Branched & simple trichomes and glands	Revolute, with 5teeth	Cylindrical spike-like, simple, or branched	4-6 cm	1-3 mm	4-5 mm	±Equal, acute	6-7 mm	White-cream
<i>T. persicum</i>	Caespitose	Long simple patent hairs	Flat, with 5-7 teeth	Racemose	7-10 cm	0	5-7 mm	Unequal, acute	10-12 mm	Red
<i>T. polium</i>	Bush, woody at the base, with many-branched stems	Branched and simple tomentose trichomes and glands	Revolute, with indistinct or 7 teeth	Branched ovoid heads	1-2 cm	0	4-5 mm	Equal, obtuse	8 mm	White-cream
<i>T.stocksianum</i>	Bush, woody at the base, with many-branched stems	Retrorse white trichomes and glands	Slightly revolute, with indistinct or 5 teeth	Compound ovoid heads	1-1.5 cm	0	5-9 mm	Equal, acute	10 mm	Cream, yellow,
<i>T. yemenense</i>	Lax caespitose	White patent simple and glandular hair and sessile glands	Sub-revolute, entire to dentate towards the apex	Spike-like, simple, or branched	4-5	1 mm	6mm	±Equal, acute	11 mm	Pink, mauve, purple

Perennial, aromatic herb; stems simple or branched, 35-50 cm high, densely covered with white simple and branched trichomes and glands. Leaves narrowly elliptic to oblong, both surfaces tomentose, adults with slightly prominent nerves, crenate, sessile or subsessile, 5-17 mm long and 3-8 mm wide; apex obtuse, margin crenate-dentate, flat in stem leaves, densely covered with white trichomes and glands. Inflorescence condensed, terminal rounded, or ovoid flower heads, subtended by leaf-like oblong to linear, crenate, or entire bracts, as long as or longer than calyces. Bracts 5-6 mm long and 1-1.5 mm wide, oblong-lanceolate, at the margin entire. Flowers sessile. Calyx 5-6 mm long; teeth of upper lip equal, triangular, those of lower lip triangular-lanceolate somewhat longer than upper. Corolla 7 mm long, white, middle lobe 2-2.5 mm long, 1-1.5 mm wide. Nutlet obovoid, with a rugulose-reticulate surface, 2 mm long, 1 mm wide, black.

Specimens examined: Iran, Khuzestan province, 17 km after Behbahan, Tange Tekab. 30 68 77 N, 50 35 43 E, 700 m, Dinarvand & Arami, 10937; 2023. 06.07, Khuzestan Agricultural and Natural Resources Research and Education Center Herbarium and TARI. (Fig. 4, 5, 6B)

Distribution: The native range of this species is the Mediterranean region to Afghanistan, Turkmenistan, Saudi Arabia, Iran, Turkey, the North Caucasus, and Africa. It is a subshrub and grows primarily in the subtropical biome.

Habitat: Arid hills and gypsum rock outcrops.

Taxonomic notes

There are different taxonomical treatments for this taxon. It was first described as a distinct species by Linnaeus (1753), but in later treatments, it was recognized as a subspecies of *T. polium* L. (*T. polium* subsp. *capitatum* (L.) Arcang. In Comp. Fl. Ital.: 559 (1882). Later works have considered the subspecific status of this taxon, i.e., in a study of *Teucrium* species in Egypt (Fayed & al, 2015), *T. capitatum* was considered a subspecies of *T. polium*. Furthermore, some previously described species are recognized as subspecies of *T. capitatum* i.e. *T. capitatum* subsp. *gracillimum* (Rouy) Valdés Berm. (1979); *T. capitatum* subsp. *majoricum* (Rouy) Nyman (1990), and *T. capitatum* subsp. *carthaginense* (Lange) O. Bolòs ex Rivas Goday & Borja (1961). Meanwhile, a phylogenetic study of *Teucrium* (Salmaki & al. 2016) showed that *T. capitatum* is distinct from *T. Polium*. However, a few samples of *T. polium* complex were examined in this work. *Teucrium abolhayatensis* Ranjbar & Mahmoudi, (2017) was described as a new species from south Iran, Fars province. The comparison of the descriptions and images of this species with *T. capitatum* reveals similarities between them. We

propose them as synonymous species. However, a comprehensive sampling of the taxa within the *T. polium* s.l. for a molecular phylogenetic study is needed to finalize the status of all taxa described so far within this complex.

Key to the species of *Teucrium* section *Polium* in Iran.

1. Indumentum with simple, branched hairs and glands. Inflorescence branched 2
- Indumentum with unbranched hairs and glands. Inflorescence terminal, unbranched *T. stocksianum*
2. Stem leaves with revolute margin. Inflorescence consisting of dense or lax flower heads, calyx teeth equal 3
- Stem leaves not revolute. Inflorescence globose or ovoid heads. Calyx teeth unequal *T. capitatum*
3. Plant caespitose. Inflorescence terminal, oblong-cylindric, spike-like, 4-6 cm long unbranched or shortly branched at the end *T. khuzistanicum*
- Bush, stem branched. Inflorescence much branched, with small heads, 1-2 cm long *T. polium*

ACKNOWLEDGEMENTS

We extend our gratitude to Ms. Rafat Habibi for drawing the illustrations and preparing the herbarium specimens and their images.

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