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Tripleurospermum parviflorum (Asteraceae): a new record for the flora of Greece

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Key words: Anthemideae, East Aegean Islands, Lesvos, new record, phytogeography

Ključne besede: Anthemideae, vzhodnoegejski otoki, Lezbos, novo odkritje, fitogeografija

Abstract

Tripleurospermum parviflorum, recently collected on the island of Lesvos, Greece, turned out to be a new floristic record for the country. A description based on the new material is provided, together with a distribution map of all the *Tripleurospermum* species occurring on the island. The diagnostic features that distinguish *T. parviflorum* from the remaining Greek species are highlighted and the chromosome number, as well as the karyotype formula of one, out of two newly discovered populations is presented. A dichotomous key for all the Greek *Tripleurospermum* species facilitates proper identification. The new discovery stresses the important presence of Anatolian elements in the flora of the East Aegean Islands in general and on Lesvos, in particular.

Izvleček

Za vrsto *Tripleurospermum parviflorum*, ki smo jo nedavno nabrali na otoku Lezbos v Grčiji, se je izkazalo, da gre za novo floristično najdbo v Grčiji. Podajamo opis, ki temelji na novem materialu, skupaj z zemljevidom razširjenosti vseh vrst iz rodu *Tripleurospermum*, ki se pojavljajo na otoku. Poudarjamo diagnostične značilnosti, po katerih se vrsta *T. parviflorum* razlikuje od preostalih vrst, ki jih najdemo v Grčiji, predstavljamo pa tudi število kromosomov ter formulo kariotipa ene od novoodkritih populacij. Dihotomni ključ za vse grške vrste iz rodu *Tripleurospermum* bo olajšal pravilno identifikacijo. Novo odkritje poudarja pomembno prisotnost anatolskih elementov v flori vzhodnoegejskih otokov na splošno in še posebej na Lezbosu.

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Introduction

Tripleurospermum Sch.Bip. (Asteraceae, Anthemideae) comprises ca. 40 species with a native distribution in the Northern Hemisphere: Europe, North Africa, temperate Asia and North America (Oberprieler et al., 2022). Only seven species are undoubtedly reported from Greece (Dimopoulos et al., 2024). An eighth member, *Tripleurospermum disciforme* (C.A.Mey.) Sch.Bip. may occur in the north-eastern part of the country (Dimitrov, 2021), but its presence in the area has not been confirmed in the last 110 years. As is the case with many Anthemideae genera, *Tripleurospermum* has a rather complicated taxonomic and nomenclatural history (see Inceer & Beyazoglu, 2004). The genus was successfully delimited following molecular phylogenetic analyses (Oberprieler, 2001; Inceer et al., 2018), but the distinction among its species remains problematic and species identification may be difficult, particularly in cases of incomplete herbarium specimens, i.e., when mature achenes are lacking.

The island of Lesvos is located in the eastern part of Greece and belongs to the floristic region of the East Aegean Islands (EAe; Strid & Tan, 1997). This area neighbours Anatolia (Turkey) and has been floristically enriched with several Anatolian elements (Davis, 1965). The flora of Lesvos, in particular, presents several affinities with the flora of western Turkey, as indicated by the numerous shared taxa (Bazos, 2005). Two *Tripleurospermum* species have been reported on Lesvos Island so far: *T. rosellum* (Boiss. & Orph.) Hayek (Enayet Hossain, 1975) and *T. conoclinium* (Boiss. & Balansa) Hayek (Bazos & Yiannitsaros, 2004). The latter is an East Mediterranean element shared between Lesvos and Anatolia (Greuter, 2006+; Strid, 2016b, 2024; POWO, 2024). Field work in the central part of Lesvos by the second author revealed two *Tripleurospermum* populations that morphologically deviated from the two reported species on the island and all the remaining Greek species. After careful examination, we concluded that these populations belong to a species that has not been previously reported from Greece. This study documents the first record of the species in the country.

Material and Methods

Plant material of *Tripleurospermum* was recently collected on Lesvos Island. Specimens were both flowering and fruiting, as ripe achenes are important for proper identification. Dried specimens have been deposited in ATHU (the acronym follows Thiers, 2024, continuously updated). Areas with similar habitat features on Lesvos were explored, in order to locate any additional *Tripleurospermum* populations. The following major floristic works were used for identifying the specimens: Flora of the USSR, Volume 26 (Pobedimova, 1961), Flora of Turkey and the East Aegean Islands, Volume 5 (Enayet Hossain, 1975), and Flora Europaea, Volume 4 (Kay, 1976).

In order to investigate the chromosome number of the new *Tripleurospermum* populations, mature achenes were sown in pots at the facilities of the Department of Biology, National and Kapodistrian University of Athens. The seedlings were transferred in individual pots and root tips were collected. The pretreatment of the roots and the preparation of the metaphase plates follow Goula & Constantinidis (2023). The KaryoType software (Altınordu et al., 2016) and the nomenclature of Levan et al. (1964) were used for the construction of the idiogram and the classification of the chromosomes, respectively. Additional information on the chromosome numbers and karyotype structure of *Tripleurospermum* was taken from recent literature (Avetisian & Oganesian, 1995; Inceer & Beyazoglu, 2004; Inceer & Hayırlıoğlu-Ayaz, 2010). The map was created in QGIS (v. 3.28.12), based on the localities reported by the authors during field work and, additionally, on localities provided by Strid (2024).

Results

Tripleurospermum parviflorum (Willd.) Pobed., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 21: 354 (1961) (Figure 1)

Synonyms: *Chamaemelum praecox* (M.Bieb.) Vis. in Osserv. Matric.: 13 (1845), *Chrysanthemum praecox* (M.Bieb.) DC. in Prodr. 6: 69 (1838), *Gastrosulum praecox* (M.Bieb.) Sch.Bip. in Tanaceteen: 30 (1844), *Matricaria parviflora* (Willd.) Poir. in J.B.A.M.de Lamarck, Encycl., Suppl. 3: 608 (1814), *Matricaria praecox* (M.Bieb.) Poir. in J.B.A.M.de Lamarck, Encycl., Suppl. 5: 729 (1817), *Pyrethrum parviflorum* Willd. in Sp. Pl., ed. 4. 3: 2158 (1803), *Pyrethrum praecox* M.Bieb. in Fl. Taur.-Caucas. 2: 324 (1808), *Tripleurospermum praecox* (M.Bieb.) Bornm. in Beih. Bot. Centralbl. 60B: 192 (1939)

Description: Annual. Stems usually numerous, erect or ascending, 4–35 cm long, unbranched above. Leaves 1–3-pinnatisect, ultimate segments subulate or lanceolate-subulate. Capitula solitary, on long, pubescent to glabrescent peduncles. Involucre (4–)9–12 mm wide. Involucral bracts glabrescent, oblong to ovate-oblong, obtuse, with wide, reddish-brown to dark brown membranous margins. Receptacle conical to elongate-conical. Ligulate florets present, ligules white, 2.5–8 mm long. Disc florets yellow, eglandular at corolla lobes. Achenes oblong, slightly incurved, 1.9–2.1 mm long including the corona, dark brown to blackish at maturity, copiously

Figure 1: Morphology of *Tripleurospermum parviflorum* plants from Lesvos Island: a) a specimen cultivated at the National and Kapodistrian University of Athens, b) close-up of a capitulum with immature achenes, c) a voucher collected on Lesvos, deposited in ATHU herbarium, d) the habitat of the species at the area of Kalloni salt pan, e) achenes of the species. Scales: b) 4 mm, c) 5 cm, e) 2 mm. Photos: Katerina Goula (a, e), Charalambos Chiotelis (b, c, d).

Slika 1: Morfologija rastlin vrste *Tripleurospermum parviflorum* z otoka Lezbos: a) primerek, gojen na Nacionalni in Kapodistrijski univerzi v Atenah, b) košek od blizu z nezrelimi rožkami, c) vavčer, nabran na Lezbosu, shranjen v herbariju ATHU, d) življenjski prostor vrste na območju solin Kalloni, e) rožke vrste. Merila: b) 4 mm, c) 5 cm, e) 2 mm. Fotografije: Katerina Goula (a, e), Charalambos Chiotelis (b, c, d).

mucilaginous, anteriorly with two longitudinal striations and two circular, reddish-brown resin glands, posteriorly with three thickened ribs. Achenes corona lobate, funnel-shaped, whitish, usually 0.4–0.6 mm long, ca. 1/3 to 1/4 as long as achene.

Examined specimens: GREECE. Lesvos Island, the area of Kalloni salt pan, saline soil next to the sea, 1 m a.s.l., 39°12'N/26°14'E (WGS84), 20.03.2023, *Chiotelis s.n.* (ATHU, det. K. Goula). Lesvos Island, ca. 900 m E of Achladeri settlement, grazed meadow, 25 m a.s.l., 39°09'N/26°17'E (WGS84), 22.03.2023, *Chiotelis s.n.* (ATHU, det. K. Goula).

Distribution: *Tripleurospermum parviflorum* is distributed in Eastern Europe and the Caucasus, extending through Turkey and the Middle East to the Arabian Peninsula and northwestern India (POWO, 2024). In Greece, the two neighbouring localities are found in the central part of Lesvos Island (Figure 2).

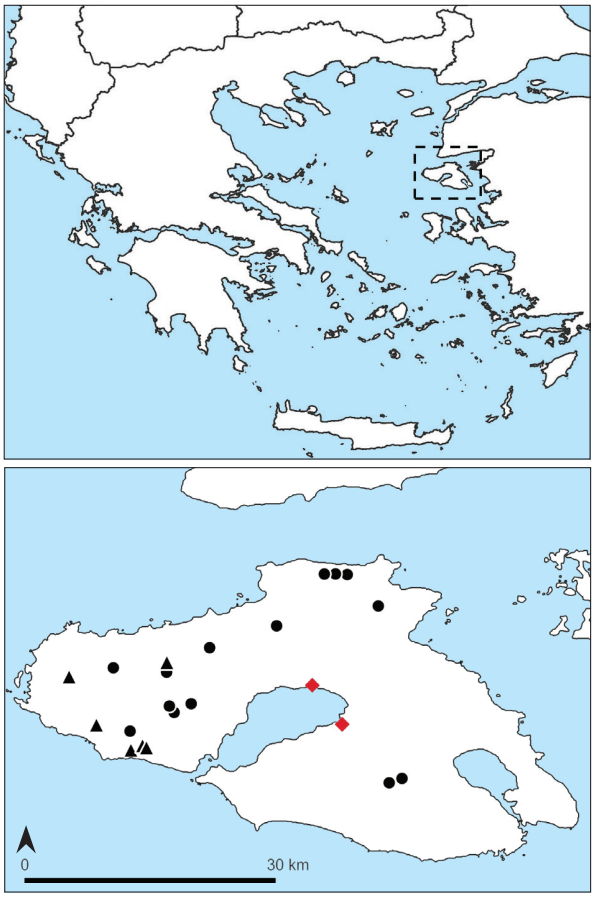

Figure 2: Distribution map of the *Tripleurospermum* species on Lesvos (East Aegean Islands, Greece). Triangles indicate the localities of *T. conoclinium*, red squares *T. parviflorum* and circles *T. rosellum*.

Slika 2: Zemljevid razširjenosti vrst iz rodu *Tripleurospermum* na Lezbosu (Vzhodni Egejski otoki, Grčija). Trikotniki označujejo nahajališča vrste *T. conoclinium*, rdeči kvadrati *T. parviflorum* in krogi *T. rosellum*.

Habitat and phenology: Grazed meadows, saline soils, near the sea. Flowering from March to April, fruiting from the end of March to May.

Karyology: $2n = 2x = 18 = 10m + 4sm + 4st^{4sat}$ (Figure 3)

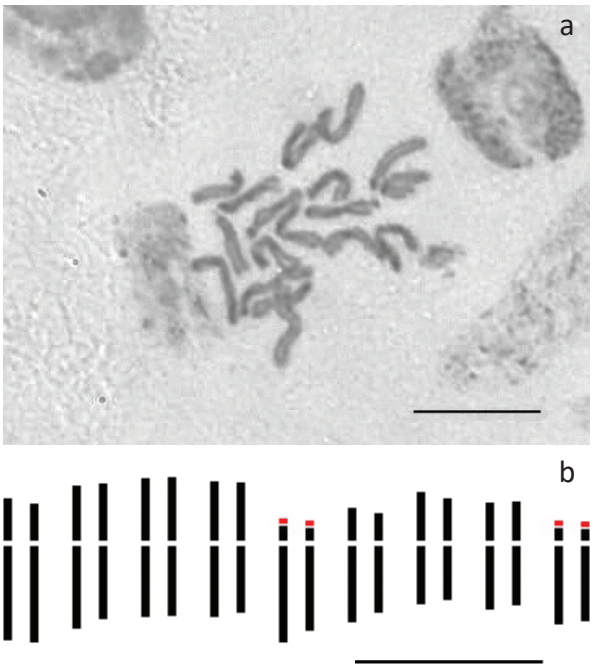

Figure 3: Metaphase plate (a) and idiogram (b) of *Tripleurospermum parviflorum* from Lesvos Island, Greece. Red parts of the idiogram indicate satellites. Scale bars = 10 µm.

Slika 3: Metafazna plošča (a) in idiogram (b) vrste *Tripleurospermum parviflorum* z otoka Lezbos v Grčiji. Rdeči deli idiograma označujejo satelite. Merila = 10 µm.

A key to the genus *Tripleurospermum* in Greece:

1. Plants annual 2
   – Plants biennial or perennial, occasionally rhizomatous 3
2. Disc florets with glandular corolla lobes; achenes non-mucilaginous ..... *T. inodorum*
   – Disc florets with eglandular corolla lobes; achenes mucilaginous ..... *T. parviflorum*
3. Disc florets with eglandular corolla lobes 4
   – Disc florets with glandular corolla lobes 5
4. Achenes with a 1–1.5 mm long corona ... *T. caucasicum*
   – Achenes with a corona shorter than 1 mm, usually 0.4–0.6 mm long ..... *T. oreades*
5. Achenes non-mucilaginous; corona absent or, if present, shorter than 0.3 mm 6
   – Achenes at least slightly mucilaginous; corona absent or, if present, longer than 0.3 mm 7

6. Involucral bracts with pale margins; achenes black at maturity with a corona 0.1–0.3 mm long..... ..... *T. tempskyanum*
   – Achenes usually pale brown at maturity, corona lacking or, if present, up to 0.3 mm, but then involucral bracts dark-margined ..... *T. tenuifolium*
7. Achenes without a corona..... 8
   – Corona of the achenes at least 0.3 mm long..... ..... *T. rosellum*
8. Ligulate florets absent; involucral bracts with pale margins; achenes only slightly mucilaginous..... ..... *T. disciforme*
   – Ligulate florets present; involucral bracts with brown margins; achenes copiously mucilaginous .... *T. conoclinium*

Discussion

The newly discovered *Tripleurospermum* populations on the island of Lesvos belong to *T. parviflorum* (Willd.) Pobed., a species that has never been previously recorded in Greece.

A quick diagnostic character that distinguish this species from *Tripleurospermum conoclinium* and *T. rosellum*, the two species also found on Lesvos, is its annual lifespan (reported by Pobedimova, 1961; Enayet Hossain, 1975; Kay, 1976). As additional features, *T. conoclinium* has achenes without a corona (see Enaet Hossain, 1975; Kay, 1976; Strid, 2016a), whereas *T. parviflorum* has achenes with a corona measuring 0.4 – 0.6 mm long (Pobedimova, 1961; Enayet Hossain, 1975; our counts). According to specimens examined from Lesvos, *T. rosellum* has brown achenes with an even longer corona, usually 0.6 – 0.9 mm, whereas *T. parviflorum* has achenes that become dark brown to blackish at maturity (Enayet Hossain, 1975). Among the rest of the species that occur in Greece, only *T. inodorum* (L.) Sch. Bip. is annual, but it has disc florets glandular at the corolla lobes and non-mucilaginous achenes with a very short, marginiform corona (Pobedimova, 1961; Enayet Hossain, 1975; Kay, 1976; our observations). *T. parviflorum*, on the other hand, lacks glandular corolla lobes at the disc florets and its achenes are copiously mucilaginous (Enayet Hossain, 1975; our observations).

The chromosome number of $2n = 2x = 18$ has been reported for *Tripleurospermum parviflorum* in material from Armenia (Avetisian & Oganesian, 1995), north-east Turkey (Inceer & Beyazoglu, 2004) and west Turkey (Inceer & Hayırlıoğlu-Ayaz, 2010). The karyological study of the Armenian population also revealed the presence of a B chromosome in some metaphases ($2n = 2x = 18 + 1B$, Avetisian & Oganesian, 1995). Our count from the Greek population is in accordance with the previous records and also showed a diploid complement ($2n = 2x = 18$). This is the fourth chromosome count for *Tripleurospermum parviflorum*. The examination of the karyotype formula of the Greek population (plants from the Kalloni area were investigated) revealed that most chromosomes are metacentric (m), while there is an equal number of submetacentric (sm) and subtelocentric (st) chromosomes in the complement, as follows: $2n = 2x = 10m + 4sm + 4st^{4sat}$. All st chromosomes bear small satellites on their short arm. The karyotype formula of the Greek population slightly differs from that published by Inceer & Beyazoglu (2004) in the number of sm and st chromosomes and the lack of sat-DNA on the st chromosomes ($2n = 2x = 10m + 6sm + 2st$).

Tripleurospermum parviflorum reported herein from Lesvos Island is a new record for the Greek flora. Its discovery further supports an assemblage of plant species shared between Lesvos and Anatolia (Turkey), among which *Anthemis aciphylla* Boiss., *Centaurea reuteriana* Boiss., and *Tripleurospermum conoclinium* are good examples from the Asteraceae family. They all indicate phytogeographical bounds between the two areas as the result of spatial proximity and palaeogeographical connections (Drinia et al., 2002; Bazos, 2005). Therefore, the presence of *T. parviflorum* on Lesvos should not be considered as a surprise. The species has been recorded in the Turkish provinces of Çanakkale and İzmir (Enayet Hossain, 1975; GBIF, 2024), which surround the island of Lesvos. The closest Turkish locality to the Greek *T. parviflorum* populations lies at approximately 70 km linear distance to the north-northwest, on the Turkish island of Bozcaada (Tenedos; Rechinger, 1943). The populations on Lesvos and Bozcaada seem to form the westernmost known distribution for the species.

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