

Tripleurospermum insularum (Asteraceae, Anthemideae), a new species from Turkey

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Tripleurospermum insularum Inceer & Hayırlıoğlu-Ayaz *sp. nova* (Asteraceae, Anthemideae) is described and illustrated. It grows in open places and on rocky slopes in Gökçeada, one of the Aegean Islands. The chromosome number is $2n = 2x = 18$. The diagnostic morphological characters that distinguish it from morphologically similar species are discussed and a conservation status is suggested.

The critical and taxonomically difficult group *Tripleurospermum* is a small genus in the tribe Anthemideae of the family Asteraceae. It consists of ca. 40 species, mainly distributed in Europe, temperate Asia, North America, and North Africa (Oberprieler *et al.* 2007, Himmelsreich *et al.* 2008). The genus has ca. 30 taxa in Turkey, of which 14 are endemic (Inceer *et al.* 2012). It is difficult to determine the exact number of species without a monographic treatment of the genus, because its species have often been referred to other Anthemideae genera, such as *Anthemis*, *Chamaemelum*, *Chrysanthemum*, *Matricaria*, *Pyrethrum*, or *Tanacetum* (Pobedimova 1995, Inceer & Hayırlıoğlu-Ayaz 2010).

In April 2009, during a field trip on Gökçeada (Çanakkale province), Turkey's largest island, the first author collected some intriguing *Tripleurospermum* specimens. At first sight the specimens appeared to possess characters quite distinct from those of known *Tripleurospermum* taxa. After observing the morphological charac-

ters, checking specimens in the herbaria ANK, B, E, EGE and GAZI, and consulting relevant floras and other works in the literature (Enayet Hossain 1975, Kay 1976, Mouterde 1983, Podlech 1986, Kral 1990, Avetisyan & Oganessian 1995, Pobedimova 1995, Inceer & Hayırlıoğlu-Ayaz 2008), we concluded that the specimens represented an undescribed species.

For cytological study, root tip meristems obtained from germinated achenes were used. Samples were pretreated with 0.05% colchicine for 2–5 h. They were then fixed in absolute ethanol–glacial acetic acid (3:1) for at least 24 h at 4 °C, hydrolysed in 1 N HCl at 60 °C for 10 min, and finally rinsed in tap water for 2–3 min (Inceer & Hayırlıoğlu-Ayaz 2007). Staining was carried out in 1% aqueous lactopropionic-orcein for 12–18 h at room temperature; squash preparations were made in 45% acetic acid and mounted in Entellan. The best metaphase plates were photographed using a Leica DM 4000 microscope and a Leica DFC 490 digital camera.



Fig. 1. *Tripleurospermum insularum*. — A and B: Habit. — C: General view of type locality.

***Tripleurospermum insularum* Inceer & Hayırlıoğlu-Ayaz, sp. nova (Figs. 1–3)**

TYPE: Turkey. Çanakkale, Gökçeada, 30 m a.s.l., 17 April 2009 Inceer 717 (holotype KTUB; isotypes ANK, GAZI, E).

ETYMOLOGY: The epithet is derived from the type locality (Lat. *insula* = island).

Annual, 8–14 cm tall plant. Stems 2 to many, unbranched, occasionally with 2 small branches near base. Leaves one- to three-pinnatisect, laciniae thin, linear, terminating in a cusp, rarely pubescent, hairs simply unbranched, uniseriate; bottom leaves 7–12 mm long, 2–4 mm wide, petioled; cauline leaves 6–11 mm long, 2–4 mm wide, sessile, with axis widened at base beset with short linear segments. Capitula heterogamous, radiate, solitary, terminal, peduncles 15–30 mm, naked or puberulent, especially dense below head; involucre $6.5\text{--}9 \times 2.5\text{--}3$ mm, hemispherical with ca. 20–25 bracts arranged in

2–3 rows, imbricate; outer bracts $2\text{--}3 \times 0.7\text{--}0.9$ mm, glabrous, triangular-acute, margins brownish-black membranous; inner bracts $2.5\text{--}3.5 \times 0.85\text{--}1.4$ mm, glabrous, oblong-obtuse, margins brown membranous. Receptacle ovate-conical, epaleate. Ray florets female, 13–18 per capitulum, limbs white, broadly elliptic, shallowly 3-lobed at apex, $5.5\text{--}6.5 \times 1\text{--}2.2$ mm. Disc florets numerous, hermaphrodite, yellow with 5 deltoid lobes $0.15\text{--}0.25$ mm, tube $1.6\text{--}1.8$ mm, cylindric, widening at base and enveloping top of achene, corolla lobes eglandular at tips; anthers 5, coherent along most of their length and forming a tube around style, appendages conical, blunt at base; style of ray longer than tube bifid; style of disc florets shorter than florets, two-parted. Achenes shortly oblong, \pm incurved, $1.1\text{--}1.5 \times 0.6\text{--}0.9$ mm, black or dark brown at maturity, copiously mucilaginous, dorsal side smooth, ventral side 3-ribbed, ribs thickened, fissures deep; corona

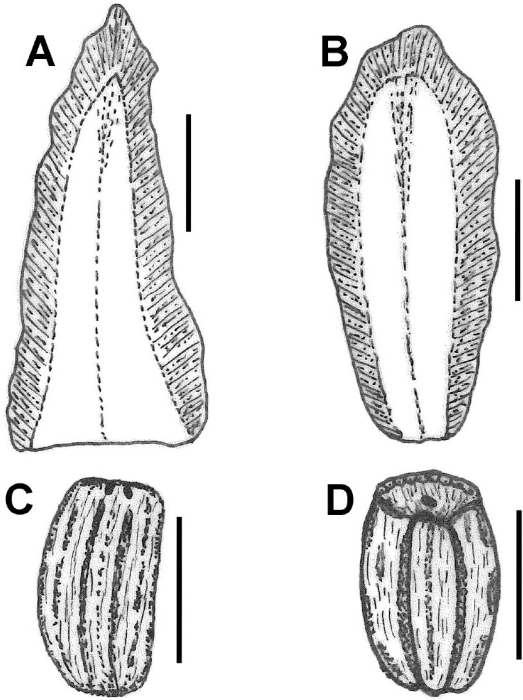


Fig. 2. *Tripleurospermum insularum* (from the holotype). — **A:** Outer involucral bract. — **B:** Inner involucral bract. — **C:** Achene from dorsal side. — **D:** Achene from ventral side. Scale bars 1 mm.

absent. Chromosome number: $2n = 2x = 18$ (in holotype). Flowering and fruiting in April–May.

Tripleurospermum insularum is known only from the type locality in Turkey, and is isolated both geographically and ecologically from the other Turkish *Tripleurospermum* taxa. It grows in open places and on rocky slopes at an altitude of 30 m a.s.l. The dominant type of vegetation in the area is phrygana. *Tripleurospermum insularum* shares its habitat with plants such as *Sarcopote-*

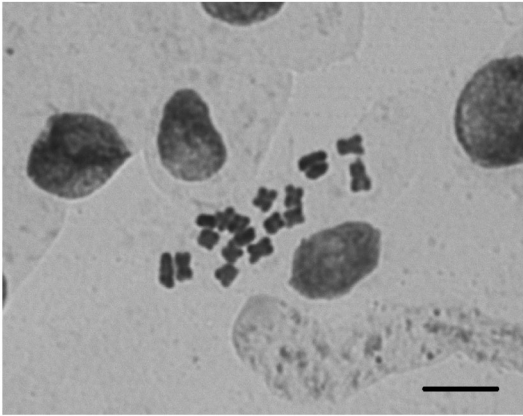


Fig. 3. Somatic metaphase chromosomes of *Tripleurospermum insularum*. Scale bar 10 μ m.

rium spinosum, *Crepis sancta*, *Matricaria chamomilla* var. *recutita*, *Medicago lupulina*, *Allium neapolitanum*, *Poa pratensis*, *Echium plantagineum*, *Leontodon tuberosus*, and *Myosotis* sp.

The population of *T. insularum* in the type locality seems to be small and scattered. It should therefore be regarded as belonging to the Critically Endangered CR (criterion B2ab) category (IUCN 2001) because of its local distribution and small population size.

Tripleurospermum insularum is quite different from the other *Tripleurospermum* taxa in Turkey. However, it resembles most *T. auriculatum*, which is not represented in the Turkish flora, but differs in terms of its weak habit, presence of ray florets, and ecoronate achenes. A more detailed comparison of these species is given in Table 1.

Tripleurospermum insularum has $x = 9$, the most common basic number in the tribe

Table 1. Comparison of the diagnostic characters of *Tripleurospermum insularum* and *T. auriculatum*.

Character	<i>T. insularum</i>	<i>T. auriculatum</i>
Habitat	phrygana, open places and rocky slopes	steppe and desert; loess and grey desert soils
Habit	slender	\pm robust
Capitulum type	heterogamous, radiate	homogamous, discoid
Involucral bracts	glabrous; outer triangular-acute, margins brownish-black membranous; inner oblong-obtuse, margins brown membranous	glabrous, ovate-oblong, margin membranous, white
Receptacle shape	ovate-conical	ovoid
Achene size (mm)	$1.1\text{--}1.5 \times 0.6\text{--}0.9$	$1.4\text{--}1.9 \times 0.65\text{--}0.95$
Pappus	absent	oblong-obovate, hyaline auricle

Anthemideae and the family Asteraceae (Fedorov 1969, Solbrig 1977, Schweizer & Ehrendorfer 1983, Vallès *et al.* 2005, Inceer & Hayırlıoğlu-Ayaz 2007, Inceer & Hayırlıoğlu-Ayaz 2010). To date, four ploidy levels (2x, 3x, 4x, 5x) in *Tripleurospermum* have been reported by various authors (Hüser 1930, Fedorov 1969, Frey *et al.* 1981, Razaq *et al.* 1994, Dobeš *et al.* 1997, Inceer & Hayırlıoğlu-Ayaz 2010). Diploid and tetraploid levels are more common in the genus than triploid and pentaploid levels. *Tripleurospermum insularum* is diploid with $2n = 18$ chromosomes.

Tripleurospermum and *Matricaria* resemble each other in their morphological characters such as the floral and leaf shape and they also resemble many other Anthemideae genera in their habit. Therefore, they have been confused both taxonomically and nomenclaturally with each other and with other Anthemideae genera (Jeffrey 1979, Xifreda 1985, Kerguélen *et al.* 1987, Bremer & Humphries 1993, Pobedimova 1995, Applequist 2002, Inceer & Hayırlıoğlu-Ayaz 2010). *Tripleurospermum insularum* and *M. chamomilla* var. *recutita* are found in the same habitat and also *T. rosellum* var. *album* is distributed in other parts of Gökçeada. *Tripleurospermum insularum* can be easily distinguished from *M. chamomilla* var. *recutita* by the floral architecture, although they are sympatric on the island. Additionally, the achene morphology of *T. insularum* significantly differs from *M. chamomilla* var. *recutita*. *Tripleurospermum insularum* differs from *T. rosellum* var. *album* in having an annual habit, short ray limbs, and ecoronate achenes. Below is the identification key for these taxa.

1. Plants annual 2
1. Plants perennial *T. rosellum* var. *album*
2. Achenes with five thin ribs *M. chamomilla* var. *recutita*
2. Achenes with three thick ribs *T. insularum*

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References

- Applequist W.L. 2002: A reassessment of the nomenclature of *Matricaria* L. and *Tripleurospermum* Sch. Bip. (Asteraceae). — *Taxon* 51: 757–761.
- Avetisian V.E. & Oganessian M.E. (eds.) 1995: *Flora Armenii*, vol. 9: *Campanulaceae, Asteraceae*. — Koeltz, Havlickuv Brod.
- Bremer K. & Humphries C.J. 1993: Generic monograph of the Asteraceae-Anthemideae. — *Bulletin of the Natural History Museum, London (Bot.)* 23: 71–177.
- Dobeš C., Hahn B. & Morawetz W. 1997: Chromosomenzahlen zur gefäßpflanzen-Flora Österreichs. — *Linzer Biologische Beiträge* 29: 5–43.
- Enayet Hossain A.B.M. 1975: *Tripleurospermum* Schultz Bip. — In: Davis P.H. (ed.), *Flora of Turkey and the East Aegean Islands*, vol. 5: 295–331. Edinburgh University Press, Edinburgh.
- Fedorov A.A. (ed.) 1969: *Chromosome numbers of flowering plants*. — Nauka, Leningrad.
- Frey L., Mizianty M. & Mirek Z. 1981: Chromosome numbers of Polish vascular plants. — *Fragmenta Floristica et Geobotanica* 27: 581–590.
- Himmelreich S., Källersjö M., Eldenäs P. & Oberprieler C. 2008: Phylogeny of southern hemisphere Compositae-Anthemideae based on nrDNA ITS and cpDNA *ndhF* sequence information. — *Plant Systematics and Evolution* 272: 131–153.
- Hüser W. 1930: Untersuchungen über die anatomie und wasserökologie einiger Ostseestrandpflanzen. — *Planta* 11: 485–508.
- Inceer H. & Hayırlıoğlu-Ayaz S. 2007: Chromosome numbers in the tribe Anthemideae (Asteraceae) from Turkey. — *Botanical Journal of the Linnean Society* 153: 203–211.
- Inceer H. & Hayırlıoğlu-Ayaz S. 2008: *Tripleurospermum ziganaense* (Asteraceae, Anthemideae), a new species from north-east Anatolia, Turkey. — *Botanical Journal of the Linnean Society* 158: 696–700.
- Inceer H. & Hayırlıoğlu-Ayaz S. 2010: Chromosome numbers in *Tripleurospermum* Sch. Bip. (Asteraceae) and closely related genera: Relationships between ploidy level and stomatal length. — *Plant Systematics and Evolution* 285: 149–157.
- Inceer H., Bal M., Ceter T. & Pinar N.M. 2012: Fruit structure of 12 Turkish endemic *Tripleurospermum* Sch. Bip. (Asteraceae) taxa and its taxonomic implications. — *Plant Systematics and Evolution* 298: 845–855.
- IUCN Species Survival Commission 2001: *IUCN Red List Categories and Criteria. Approved by the 51st Meeting of the IUCN Council*, ver. 3.1 — IUCN, Gland.
- Jeffrey C. 1979: Note on the lectotypification of the names *Cacalia* L., *Matricaria* L. and *Gnaphalium* L. — *Taxon* 28: 349–351.
- Kay Q.O.N. 1976: *Chamomilla* L. and *Matricaria* L. — In: Tutin T.G., Heywood V.H., Burges N.A., Moore D.M., Walters S.M. & Webb D.A. (eds.), *Flora Europaea*, vol. 4: 165–167. Cambridge University Press, Cambridge.
- Kerguélen M., Bosc C. & Lambinon J. 1987: Données taxo-

- nomiques nomenclaturales et chorologiques pour une révision de la flore de France. — *Lejeunia* 120:1–264.
- Kral M. 1990: *Tripleurospermum anchialense*, a new species of the genus *Tripleurospermum*. — *Preslia* 62: 41–42.
- Mouterde P. 1983: *Nouvelle Flore du Liban et de la Syrie*, tome III. — Dar El-Machreq SARL, Beyrouth.
- Oberprieler C., Vogt R. & Watson L.E. 2007: XVI. Tribe Anthemideae Cass. (1819). — In: Kadereit J.V. & Jeffrey C. (eds.), *The families and genera of vascular plants*, vol. 8: *Flowering plants. Eudicots*: 342–374. Springer, Berlin.
- Pobedimova E.G. 1995: *Tripleurospermum* Sch. Bip. — In: Shiskin B.K. & Bobrov E.G. (eds.), *Flora U.S.S.R.*, vol. XXVI: 181–213. Bishen Singh Mahendra Pal Singh, Dehra Dun, India & Koeltz Scientific Books, Königstein, Germany.
- Podlech D. 1986: *Tripleurospermum* Sch. Bip. — In: Rechinger K. (ed.), *Flora Iranica*, vol. 158: 73–80. Druck- und Verlagsanstalt, Graz.
- Razaq Z.A., Vahidy A.A. & Ali S.I. 1994: Chromosome numbers in Compositae from Pakistan. — *Annals of the Missouri Botanical Garden* 8: 800–808.
- Solbrig O.T. 1977: Chromosomal cytology and evolution in the family Compositae. — In: Heywood V.H., Harborn J.B. & Turner B.L. (eds.), *The biology and the chemistry of the Compositae I*: 269–281. Academic Press, London.
- Schweizer D. & Ehrendorfer F. 1983: Evolution of C-band patterns in Asteraceae-Anthemideae. — *Biologisches Zentralblatt* 102: 637–655.
- Vallès J., Garnatje T., García S., Santz M. & Korobrow A. 2005: Chromosome numbers in the tribes Anthemideae and Inuleae (Asteraceae). — *Botanical Journal of the Linnean Society* 148: 77–85.
- Xifreda C.C. 1985: Sobre el nombre científico correcto de la manzanilla (*Matricaria recutita* L., Asteraceae). — *Darwiniana* 26: 373–375.