

Helichrysum yurterianum (Asteraceae, Inuleae), a new species from NE Anatolia, Turkey

Yusuf Gemici¹, Kit Tan^{2,*}, Hasan Yıldırım¹ & Meliha Gemici¹

¹⁾ Ege University, Faculty of Science, Department of Biology, Bornova-Izmir, Turkey

²⁾ Institute of Biology, University of Copenhagen, Øster Farimagsgade 2D, DK-1353 Copenhagen K, Denmark (*corresponding author's e-mail: kitt@bi.ku.dk)

Received 14 Mar. 2007, revised version received 29 Mar. 2007, accepted 2 Apr. 2007

Gemici, Y., Tan, K., Yıldırım, H. & Gemici, M. 2008: *Helichrysum yurterianum* (Asteraceae, Inuleae), a new species from NE Anatolia, Turkey. — *Ann. Bot. Fennici* 45: 223–228.

Helichrysum yurterianum Y. Gemici, Kit Tan, H. Yıldırım & M. Gemici (Asteraceae, Inuleae) is described and illustrated. It is a serpentine endemic restricted to the province of Erzincan in NE Anatolia, Turkey. Its affinities are with *H. arenarium* and *H. noeanum*, which both have a wider distribution. Anatomical and ecophysiological data for the new taxon are provided.

Key words: Asteraceae (Compositae), *Helichrysum*, new species, taxonomy

The Otlukbeli Mountains lie in the northeast of Anatolia, bordering the provinces of Erzincan and Gümüşhane in square B7 (grid system proposed by Davis 1965). The range stretches from west to east, enclosing in a crescent the plains to the north of Erzincan. Kelkit Valley is at the southernmost part. The massif includes the peaks of Karadağ (3030 m), Akdağ (2710 m), Spikör Dağı (2600 m), Keşişdağları (3537 m), Çiçekli Dağı (3200 m) and Mürüt Dağı (3056 m). Peridotite, an ultrabasic rock, is the main substrate. Neritic limestone occurs in the north, and in the eastern and southernmost part, gypsum (evaporitic sedimentary rock), klastic and carbonated rock are present as local outcrops.

Phytogeographically, the Otlukbeli Mountains can be considered as delimiting the Irano-Turanian Region from the eastern part of the Euxine province of the Euro-Siberian Region. They are linked to the High Caucasus via the mountain chains of East Anatolia. The range

is also situated on the “Anatolian Diagonal”, a theoretical line running from the Taurus Mountains in southern Turkey to the northeast. This line is considered one of the most important centres of endemism and a hotspot of biodiversity. On the slopes facing Kelkit Valley and along the River Euphrates, forests of *Pinus sylvestris* and *Populus tremula* develop. In these forests many Euro-Siberian and Euxine elements can be found. Some of those familiar in northern climes include *Acer hyrcanum* subsp. *hyrcanum*, *Cephalaria gigantea*, *Epilobium montanum*, *Euonymus latifolius* subsp. *latifolius*, *Filipendula ulmaria*, *Lapsana communis* subsp. *grandiflora*, *Mulgedium quercinum*, *Polygonatum orientale*, *Salix pentandroides*, *Sempervivum armenum* var. *armenum*, *Sorbus aucuparia*, *Tussilago farfara*, *Vaccinium arctostaphylos* and *Viburnum lantana*. *Quercus macranthera* subsp. *sypsiensis*, *Q. pubescens* and *Juniperus communis* subsp. *nana* occur in the unstructured forest. The exist-

ence of *Juniperus communis* subsp. *nana* at 2500–2700 m on the southern slopes of the Otlukbeli Mountains is an indication that forests of *Pinus sylvestris* are also present.

The Baku–Tbilisi–Ceyhan (BTC) Crude Oil Pipeline runs past and through the Otlukbeli Mountains. A project was set up in Ankara in 1998 to monitor the environmental impact of the pipeline once laid. One of the authors (Y.G.) participated in this investigation. During a five-year period he collected more than 5000 plant samples including several *Helichrysums* from the Otlukbeli Mountains. Many of the specimens were determined as belonging to the fairly widespread and polymorphic species *H. arenarium*, but one sample differed and is described here as a new species. With the inclusion of this species there are now 20 species of *Helichrysum* in Turkey and a total of 25 taxa, approximately half of which are endemic. Several species occur along the Anatolian Diagonal.

***Helichrysum yurterianum* Y. Gemici, Kit Tan, H. Yıldırım & M. Gemici, sp. nova** (Fig. 1)

Helichryso noeano et H. arenario affinis sed ab illa species foliis minoribus, phyllariis erectis, planis, colore stramineo usque pallido differt, ab altera species indumento griseo tomentosolanato, capituli dimensione et forma atque synflorescentia 3–5-capitulata diagnoscutur.

TYPE: Turkey B7. Gümüşhane/Erzincan: Otlukbeli Mountains, east-facing slope with 10% declivity, above radar station on way to Karadağ, mountain steppe and meadow overlying peridotite, 2000–2500 m, 20.VII.2001 Y. Gemici 11241 (holotype EGE!; isotype herb. Kit!).

ETYMOLOGY: The species is named after the late Erol Yurteri, father of Coşkun Yurteri, a close friend and colleague of two of the authors (Y. & M. Gemici).

Densely tufted, mat-forming, greyish-white lanate, eglandular perennial. Flowering stems flexuous, 4–7 cm, arising from stout, much-branched woody caudices. Basal leaves simple, entire, petiolate, spatulate-ob lanceolate, (3–)8–16(–25) × 1–6 mm; cauline leaves alternate, sessile, linear to linear-lanceolate, (5–)9–15(–20) × 0.8–2 mm, not adpressed to stem. Sterile shoots

with prominently swollen leaf-bases; shoot leaves closely imbricate; inner surface of coriaceous base brown, 5–7-veined, glabrous; outer surface densely grey-felted to weakly lanate. Inflorescence unbranched. Capitula homogamous, discoid, hemispherical, 5–8 mm diam., 3–5 in moderately lax terminal corymbs. Phyllaries scarious, scarcely spreading, regularly imbricate, flat, 5–6-seriate; middle ones straw-coloured to pale yellow, obtuse-rounded; inner ones lemon-yellow; outermost phyllaries ovate, 3–4.2 × 1.8–2.1 mm; innermost phyllaries spatulate to linear, with hyaline margin, 4–4.5 × 0.8–2 mm. Receptacle flat. Flowers 32–44, all hermaphrodite. Corolla tubular, five-lobed, pale yellow, 2.3–3.2 mm; lobes 0.2–0.3 mm, glandular. Anthers ecalcarate, 1.7–1.9 mm, with short simple tails and obtuse apical appendages. Style bifid, 2.5–3 mm; style branches 0.7–0.8 mm. Achenes obcylindrical, 0.8–1 × 0.4–0.6 mm, pale brown, densely verrucose, glandular; pappus scabrid, ca. 3 mm long, dirty white. Flowering and fruiting late June to August.

HABITAT ECOLOGY: Mountain steppe and meadows in subalpine zone, on ultrabasic igneous rock.

DISTRIBUTION: So far known only from a locality with an area of less than 10 km² in the Otlukbeli Mountains in NE Anatolia (Fig. 2). Considered rare; however, no evidence exists that it is threatened or critically endangered (IUCN 2001).

Related to *Helichrysum noeanum* and *H. arenarium*, differing from the former by the smaller leaves and scarcely spreading, flat, pale-coloured phyllaries, and from the latter by its greyish-white felted indumentum, capitulum size and shape and fewer-flowered corymbs. *Helichrysum chionophilum*, another species in the same complex differs in having sterile shoots not swollen at the base. Swollen leaf-bases as developed in *H. yurterianum*, *H. noeanum* and *H. arenarium* help to protect the young vegetative buds from severe heat or cold.

The morphological differences between the three species are presented in Table 1.

Helichrysum yurterianum is an obligate serpentinophyte, and is thus edaphically isolated from *H. noeanum* and *H. arenarium*, which thrive on dry calcareous or siliceous soils.

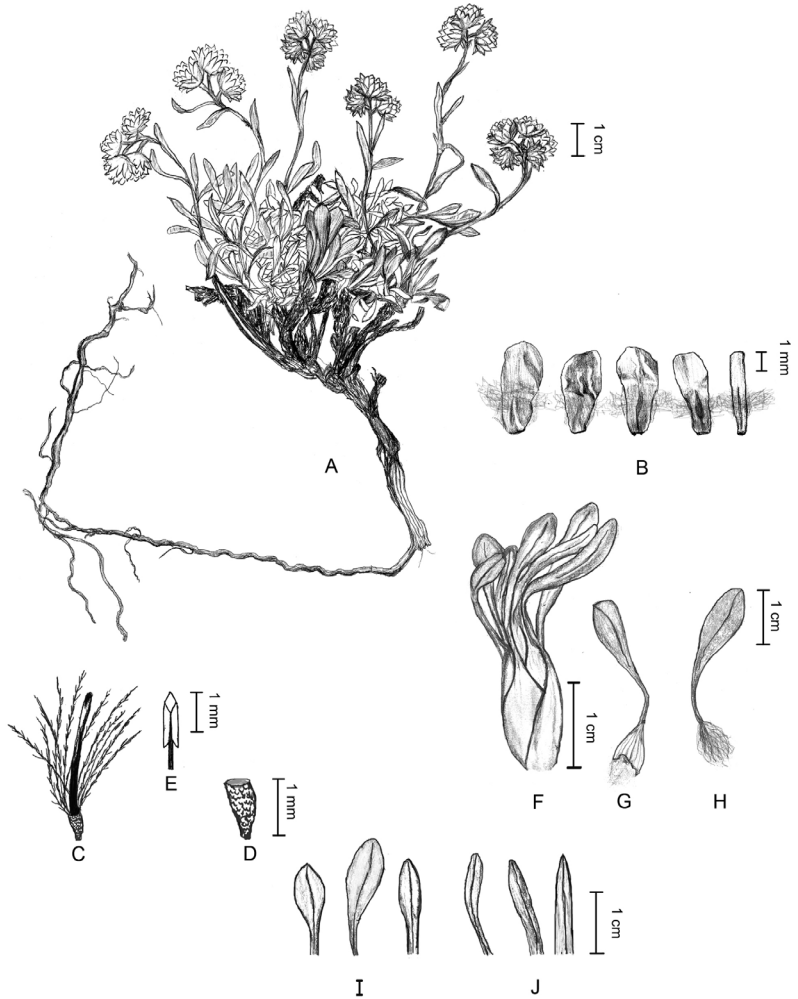


Fig. 1. *Helichrysum yurterianum* (from holotype). — **A:** Habit. — **B:** Phyllaries. — **C:** Flower. — **D:** Achene. — **E:** Anther. — **F–H:** Cauline leaves of sterile shoot. — **G:** Inner surface. — **H:** Outer surface. — **I:** Basal leaves. — **J:** Cauline leaves.

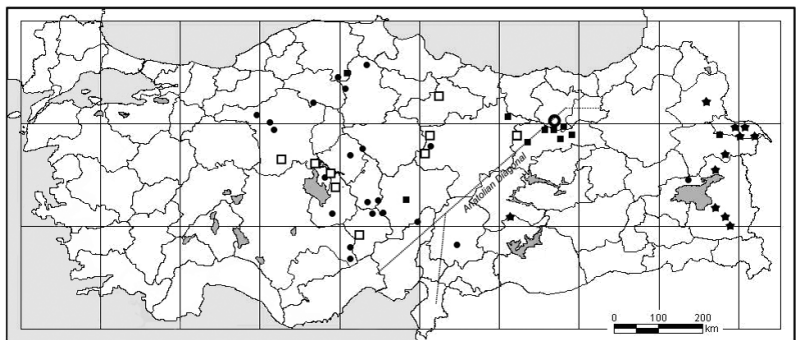


Fig. 2. Distribution of ○ *Helichrysum yurterianum*, □ *H. noeanum*, ★ *H. arenarium* subsp. *rubicundum*, ● *H. arenarium* subsp. *aucheri*, and ■ *H. arenarium* subsp. *erzincanicum*.

Numerous Turkish endemics were identified during the course of the investigation. It is expected that the number will increase after final identification of all collected samples. As the research was financially supported by

the “Baku–Tbilisi–Ceyhan Crude Oil Pipeline Project”, the fieldwork has concentrated on the area adjacent to the pipeline route. The following endemics were listed by Anon. (2003) and Gemici *et al.* (2004): *Acantholimon calvertii*, *A.*

hypochaerum, *Alchemilla erzincanensis*, *Alyssum paphlagonicum*, *A. peltarioides*, *A. stylare*, *Anchonium elichrysofolium* subsp. *glandulosum*, *Arenaria acerosa*, *A. armeniaca*, *A. pseudacantholimon*, *Astragalus barba-jovis* var. *candicans*, *A. compactus*, *A. condensatus*, *A. densifolius* subsp. *amasiensis*, *A. plumosus* subsp. *krugianus*, *Asperula glomerata* var. *filiformis*, *Campanula hedgei*, *C. ptarmicifolia* var. *ptarmicifolia*, *Centaurea armena*, *C. lanigera*, *C. sessilis*, *Cochlearia aucheri*, *C. sempervivum*, *Cousinia eriocephala*, *Crepis armena*, *C. dioritica*, *Digitalis lamarekii*, *Ferulago pauciradiata*, *F. platycarpa*, *Festuca anatolica* subsp. *borealis*, *Fritillaria armena*, *Hedysarum erythroleucum*, *H. nitidum*, *Helichrysum arenarium* subsp. *erzincanicum*, *Hypericum scabroides*, *Iris kerneriana*, *I. galatica*, *Isatis candolleana*, *I. undulata*, *Jurinea brevicaulis*, *Minuartia erythrosepala* subsp. *erythrosepala*, *Onobrychis araxina*, *Origanum acutidens*, *Papaver trinifolium*, *Rosa pisidica*, *Quercus macranthera* subsp. *sypirensis*, *Salvia rosifolia*, *Silene azirensis*, *S. dianthoides*, *S. pungens*, *Thymus leucotrichus*, *T. sipyleus* subsp. *sipyleus* and *Verbascum armenum* var. *tempeskyanum*.

A comprehensive list of all plant species in the area is under preparation by one of the authors (Y.G.). The vegetation of the Otlukbeli Mountains is mainly mountain steppe and subalpine meadow. Cushion-forming shrubs with an average height of ca. 15–20 cm such as *Ono-*

brychis cornuta, *Astragalus microcephalus*, *A. compactus* and *A. barba-jovis* var. *candicans* are dominant in the steppe, providing 40% of the ground cover. *Festuca anatolica* subsp. *borealis* is the main species in the subalpine meadows, where annuals and herbaceous perennials comprise 30% of the plant cover. Other closely associated endemics are *Alyssum paphlagonicum*, *A. stylare*, *Ferulago pauciradiata* and *F. platycarpa*. Among the non-endemics, *Acantholimon acerosum*, *Artemisia absinthium*, *Bromus tomentellus*, *Centaurea pseudoscabiosa* and *Leucanthemum vulgare* were significant.

ANATOMY AND ECOPHYSIOLOGY: The three species of *Helichrysum* examined have sterile shoots with swollen leaf-bases. The swollen portion is comprised of numerous imbricate leaf sheaths and stipules which, together with dense hairs, provide a protective cover for the young bud (Fig. 3). The plant survives continental climatic extremes of heat or cold by developing this response. Flowering shoots are produced from April to September, a more favourable growing season. According to Akman (1999) the greater part of East Anatolia including the province of Erzincan is classified as with a “Semi-Arid Mediterranean Bioclimate”, which, interestingly enough, also includes the Irano–Turanian region. The Erzincan climate is quite extreme as compared with the Mediterranean one. Consideration the much higher altitudes at which the new taxon appears (2000–2500 m), we can conclude

Table 1. Morphological differences of *Helichrysum yurterianum*, *H. noeanum* and *H. arenarium*.

Characters	<i>H. yurterianum</i>	<i>H. noeanum</i>	<i>H. arenarium</i>
Habit	densely tufted	laxly tufted	laxly tufted
Indumentum	grey-felted	densely grey-felted	greyish-adpressed-tomentose
Flowering stems	4–7 cm, flexuous	(4–)8–17 cm, flexuous	9–46 cm, erect-ascending
Basal leaves	oblancoolate-spathulate, 7–16 mm long	oblancoolate-spathulate, 20–70 mm long	linear-oblancoolate to spatulate, 7–60 mm long
Capitula			
shape	hemispherical	hemispherical	subglobose
diam.	5–8 mm	6–9 mm	4–9 mm
no. in corymb	3–5	3–12	numerous
Phyllaries	flat, scarcely spreading, stramineous to pale yellow	concave, strongly cucullate, spreading, lemon-yellow	flat (cucullate in subsp. <i>rubicundum</i>), scarcely spreading, yellow or apricot-coloured
Altitudinal range	2000–2500 m	900–1500 m	250–3200 m
Substrate	peridotite (a form of serpentine)	limestone	limestone or silicate

it grows in rather harsh, semi-arid and cold conditions.

The main rock substrate is peridotite, which is rich in the mineral olivine. In contrast to other ultrabasic ophiolitic rocks peridotite has a low percentage of SiO_2 , but is high in magnesium, aluminium, iron, cobalt and chromium. It is poor in plant nutritional elements. Peridotite metamorphoses to serpentine and is taxonomically, ecologically and phytogeographically important for demonstrating plant distribution patterns. A serpentine flora differs greatly from one established on limestone or other siliceous substrate. Though poor in total number of species, it is often rich in edaphic endemics.

According to the classification by Anon. [Soil Survey Staff] (1998) and Altınbaş (2000), the soil in the area belongs to the widespread group "Lithic Xeric Torriorthent". Soil depth is ca. 30 cm and without horizons. The soil is yellowish-brown, compact, with stone, silt and clay, and offers a weak reaction with HCl acid (Table 2). It is medium-structured, capable of water retention and with capillary roots countable per square decimetre (Table 2). The roots of *H. yurterianum* were observed to branch freely in all directions. Ca and Mg values of exchangeable cations are high (Table 2). High Ca and CaCO_3 are features of the soil class "Lithic Xeric Torriorthent" and because the total annual precipitation is rather low, the Ca and carbonate cannot be leached out. The organic content is moderately high (Table 2)



Fig. 3. *Helichrysum yurterianum* (from holotype). Longitudinal section of vegetative bud.

as is also the quantity of humus (loam). The soil is slightly alkaline and poor in P_2O_5 but rich in K_2O (Table 2). Thus with regard to plant nutritional elements the soil is classified as poor, the general characteristic of ophiolite.

SPECIMENS EXAMINED: *Helichrysum noeanum*: Turkey B6 Sivas: 14 km from İmranlı to Zara, roadside, limestone substrate, 1650 m, 13.VII.2002, B. Öztürk EGE 38804. — *Helichrysum arenarium* subsp. *erzincanicum*: B7 Erzincan: Kelkit Valley, 20 km N of Erzincan town, roadsides, 1700 m, 25.VIII.2002, B. Öztürk EGE 38801. — *Heli-*

Table 2. Soil characteristics.

Sand (%)	Silt (%)	Clay (%)	Structure			
25.97	38.08	35.95	clay and loam			
Conductivity dS m^{-1}	Cation exchange capacity ($\text{meq}/100 \text{ g}$)	Exchangeable cations (%)				Boron (ppm)
		Na	K	Ca	Mg	
0.816	31.16	0.51	2.28	73.2	22.5	0.62
Water saturation (%)	Total salt (%)	pH	CaCO_3 (%)	P_2O_5 (kg/da^*)	K_2O (kg/da^*)	Organic content (%)
48 loam ¹	0.082 ²	7.64	12.3	2.9	87.7	2.31

¹ soil structure class as estimated from water saturation content.

² non-saline.

* da = decare = 1000 square metres.

chrysum arenarium subsp. *aucheri*: B2 Kütahya: Emet, Kocakır Tepesi, subalpine meadows overlying limestone, 1700–1900 m, 12.VII.1979, *G. Görk 474 & L. Bekat* (EGE 18236); B4 Ankara: ca. 6 km from Bala to Kaman, gypsum slopes, 1275 m, 7.VII.2003, *B. Öztürk* EGE 38799; B9 Van: Gürpınar, Beşet Dağı, rocky limestone slopes and meadows, 2550–3550 m, 4.VII.1986, *Ö. Seçmen* 3974 (EGE 18621). — *Helichrysum arenarium* subsp. *rubicundum*: B6 Kayseri: left side of Kayseri-Pınarbaşı road, 8th km, 1600 m, 13.VII.2002, *B. Öztürk & V. Jhon* EGE 38809; B9 Van: Gürpınar, vicinity of Umut village, rocky slopes, 2750 m, 25.II.2002, *B. Öztürk* EGE 38784; B9 Van: Muradiye, near waterfall, rocky slopes, 1900 m, 3.VII.1986, *Ö. Seçmen* 3888 (EGE 19678).

Acknowledgements

We thank Beril Sümer for the preparation of Fig. 1 and Prof. Jerzy Zieliński (Kórnik) for kindly translating the Latin diagnosis.

References

- Akman, Y. 1999: *İklim ve biyoiklim*. — Kariyer Printing Co., Ankara.
- Altınbaş, Ü. 2000: *Toprak genetiği ve sınıflamast*. — Ege Univ. Agric. Fac. Publ. 540, Ege University Press, Bornova-Izmir.
- Anon. [Soil Survey Staff] 1998: *Keys to soil taxonomy*. — USDA Natural Resources Conservation Service, ed. 8. Washington, D.C.
- Anon. 2003: *Report on the Baku–Tbilisi–Ceyhan crude oil pipeline project*. — ENVY Corp., Ankara.
- Davis, P. H. (ed.) 1965: *Flora of Turkey and the East Aegean Islands* 1. — Edinburgh Univ. Press, Edinburgh.
- Gemici, Y., Duman, H., Ekim, T. & Alagöz, Z. 2004: *Handbook of threatened and endemic plant species of the BTC pipeline*. — Baku-Tbilisi-Ceyhan (BTC) Co., Ankara.
- IUCN 2001: *IUCN Red List Categories, 51st Council Meeting*. — IUCN Species Survival Commission, Gland.