

A new *Campanula* (Campanulaceae) from east Anatolia, Turkey

Ali Kandemir

A. Kandemir (akandemir@gmail.com), Dept of Science Education, Erzincan, Faculty of Erzincan Education, TR-24030, Erzincan Univ., Turkey.

Campanula demirsoyi A. Kandemir (Campanulaceae) is described and illustrated from a localised area of Erzincan province. It is closely allied to *C. hedgei* Davis and *C. coriacea* Davis. Diagnostic morphological characters are discussed and compared with those of related taxa.

The genus *Campanula* L. comprises ca 300 species widely distributed in temperate areas of the Northern Hemisphere. It includes annual and perennial plants (Saez and Aldasoro 2003). Two-thirds of all *Campanula* grow in the Mediterranean, the Black Sea region and west and central Asia. It extends as far north as the Eurasian–Arctic regions and Japan, as well as in North America, where 22 indigenous taxa have been recorded. Some species are found in eastern Africa and in the southern Sahara mountains as far as Morocco. The perennial species occupy either regions of very large geographical distribution, or are confined in restricted ranges as an important element (Contandriopoulos 1984).

The genus *Campanula* as represented in Turkey is divided into six subgenera: *Campanula*, *Megalocalyx*, *Roucela*, *Brachycodonia*, *Sicyodon* and *Rapunculus* (Damboldt 1976). Some plant samples belonging to subgenus *Campanula* were collected from the Munzur Mountains (B7 Erzincan–Turkey) during the flowering period by the author. The range of the Munzur mountains is one of the centres for endemic plants, located on the Anatolian diagonal and many endemic *Campanula* species grow in this interesting area (Davis 1962, Huber-Horath 1963, Ekim and Güner 1986, 2000, Yıldırım 1995). The samples were compared to many specimens of supposedly related species in the Edinburgh Herbarium (E). The studies showed that the new samples were representatives of a new species related to *C. hedgei* P. H. Davis and *C. coriacea* P. H. Davis.

Campanula demirsoyi Kandemir sp. nov. (Fig. 1)

C. hedgei P. H. Davis et *C. coriacea* P. H. Davis affinis, sed a *C. hedgei* caule infra pubescenti vel retrorsum

hirsuto, supra glabro (non omnino pubescenti vel retrorsum-hirsuto), calyce glabro, dentibus costatis (non hispidulo dentibus costatis), corolla cylindraceo-campanulata, 10–13 × 5–7 mm, glabra (non anguste cylindraceo-campanulata, 13–20 × 10–12 mm extus et interdum intus pubescenti) distincta; a C. coriacea caule infra pubescenti vel infra retrorsum hirsuto, supra glabro (non omnino pilis crispatis tecto), calycis dentibus costatis (non ecostatis), corolla cylindraceo-campanulata, 10–13 × 5–7 mm, glabra (non late infundibulari-campanulata, 9–12 × 8–12 mm, extus hispida), stylo incluso (non exserto) differt.

Type: Turkey. B7 Erzincan: Munzur mountains, along Mercan river, 1968 m, limestone crevices 39°31'N, 39°35'E', 04.VII.2005, A. Kandemir 6992 (Holotype: GAZI, Isotype: ANK).

Perennial; stems 1–6 from a woody caudex, branched, ascending to erect, firm, 18–35 cm, pubescent or retrorse-hirsute below (hairs ca 0.4 mm) glabrous above, cauline leaves firm, obovate to oblanceolate with narrowly winged petiole, 1–6 × 0.5–1 cm, strigose, obscurely dentate to irregularly serrate; upper cauline leaves similar, sessile or shortly pedicellate, attenuate at base. Flowers erect, sessile to shortly pedicellate (ca 0.5 mm), axillary in a lax spicate or terminal inflorescence, solitary with floral leaves; bracts shorter than calyx, hispid at least at apex. Ovary shortly obconical, glabrous, 2.5 mm. Calyx glabrous, lobes lanceolate 3–5 mm, thickened on the midrib and along the edges, with retrorsely strigose margins, at least near the apex, appendages between the adjacent lobes, small, ca 0.5 mm. Corolla deep blue, cylindrical to campanulate, 10–13 mm long, 5–7 mm wide, divided to 1/4, glabrous, lobes 3–4 mm, ovate, triangular. Stamen 1.5–2.5 mm; filiform part of filament 0.5–0.9 mm; base oblong–elliptic, 1–1.3 × 1.4–1.5 mm, ciliate at base. Anthers 4–5 mm, shorter than

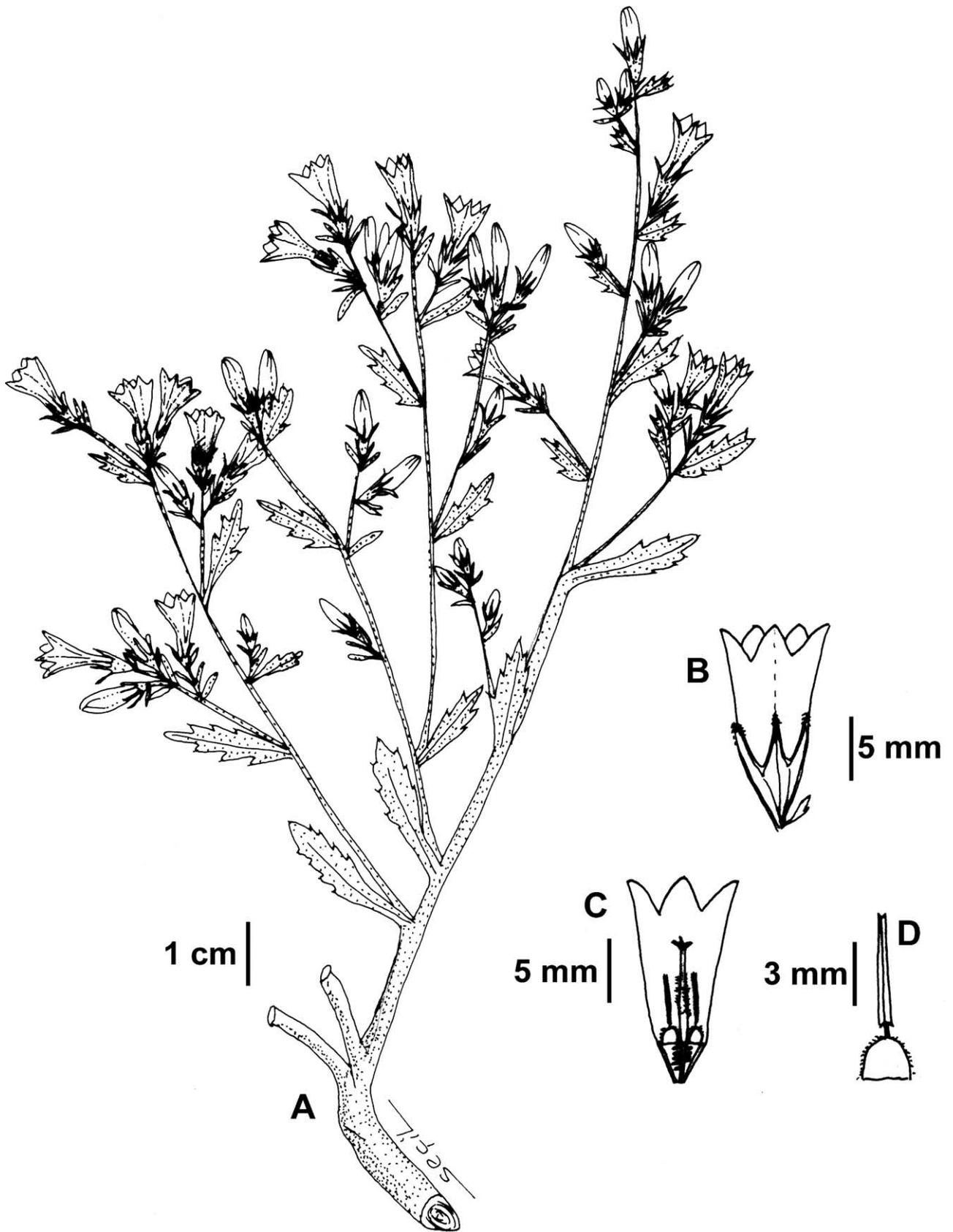


Fig. 1. *Campanula demirsoyi*. (A) habit (holotype), (B) flower, (C) dissection of a flower, (D) stamen and details of stamen base.

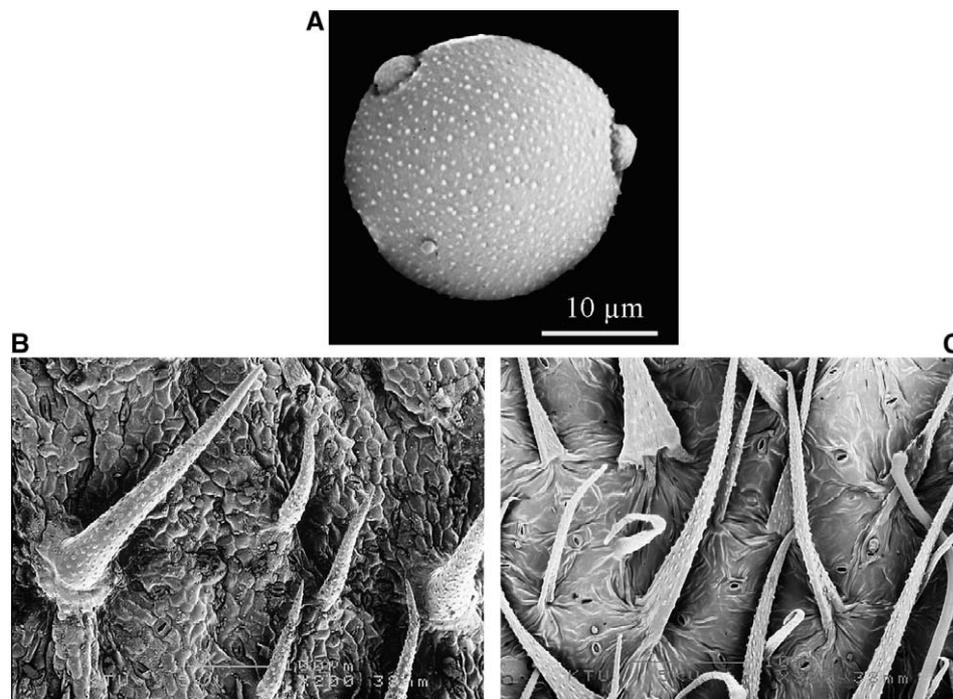


Fig. 2. Scanning electron micrographs. (A) pollen of *C. demirsoyi* (3000 ×), (B) leaf surface of *C. demirsoyi* (300 ×), (C) leaf surface of *C. hedgei* (300 ×).

style; pollen grain monad, shape sphaeroidal, equatorial outline circular, 3-porate, ornamentation microechinate–microreticulate, 20–24 µm in diameter. Styles 5.2–9 mm, hairy below, glabrous above. Stigma 3, short, included. Capsule unknown.

Ecology and conservation status

The plant grows in limestone crevices at 1968 m altitude with *C. hedgei*. The specimens were collected from the Munzur mountains. *Campanula demirsoyi* is an endemic species and probably restricted to this area. However, the IUCN category of the new species is considered to be data deficient (DD) for the time being according to the IUCN

red list categories (Pullin 2004). In order to suggest another IUCN category, more investigations are needed to clearly determine the distribution, population size and threats.

Discussion

Campanula demirsoyi A. Kandemir belongs to the section *Rupestres* Boiss.) Charadze of the subgenus *Campanula* (Damboldt 1978). It is very distinct from other species in the section. However, some of its features are similar to *C. hedgei* and *C. coriacea*.

Campanula demirsoyi and *C. hedgei* are sympatric in the Munzur mountains (Fig. 2) and *C. demirsoyi* is closer to *C. hedgei* than to *C. coriacea*. *Campanula hedgei* has

Table 1. Diagnostic characteristics of *Campanula demirsoyi* and *C. hedgei*.

| <i>Campanula demirsoyi</i> | <i>Campanula hedgei</i> |
|--|---|
| Stem pubescent or retrorse-hirsute below (hairs ca 0.3 mm), glabrous above, 5–22 cm | Stem pubescent or retrorse-hirsute throughout (hairs ca 0.5 mm), 18–35 cm |
| Epidermal cell of irregular shape (tetragonal to isodiametric), with straight anticlinal walls, smooth periclinal walls and multicellular trichomes showing a big micropapillate secondary sculpture | Epidermal cell shape not distinct and several unicellular trichomes with small micropapillate secondary sculpture |
| Stem leaves obovate or oblanceolate | Stem leaves broadly ovate or orbicular |
| Calyx glabrous, teeth thick at margins | Calyx pubescent to hispidulous, teeth not thick |
| Corolla cylindrical to campanulate, 10–13 × 5–7 mm, glabrous | Corolla narrowly cylindrical–campanulate, 13–20 × 10–12 mm, pubescent outside, glabrous or hairy inside |
| Ovary glabrous, midrib thick | Ovary pubescent hispidulous, midrib not thick |
| Anther 4–5 mm | Anther 4.5–6 mm |
| Filiform part of filament linear, base oblong–elliptic | Filiform part of filament lanceolate, base oblong |

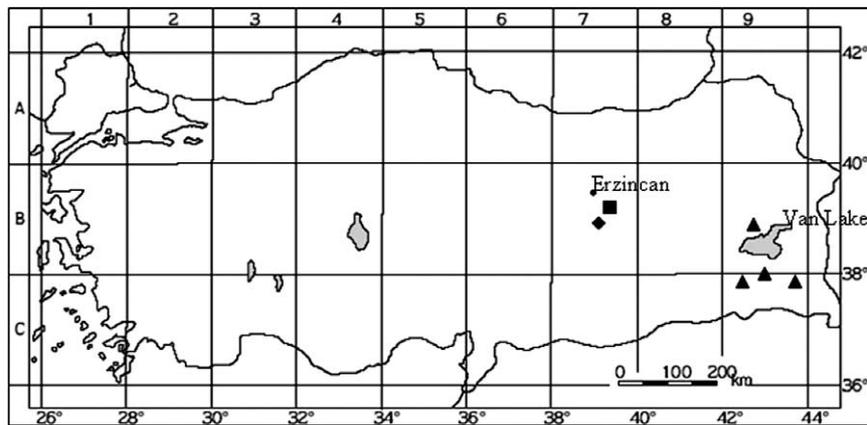


Fig. 3. The distribution of *Campanula demirsoyi* A. Kandemir sp. nov. (■), *C. hedgei* Davis (◆) and *C. coriacea* Davis (▲) in Turkey.

retorse-hirsute stems, broadly ovate or orbicular cauline leaves, hispidulous ovary, corolla pubescent outside and hairy inside. Triangular filiform part of the filament is different from *C. demirsoyi* which has stem pubescent or retrorse-hirsute below, almost glabrous above, leaves ovate or oblanceolate, ovary and corolla glabrous, distinctly thickened and edge of calyx teeth and midrib of calyx linear filiform part of filament (Table 1). According to the flora of Turkey, the corolla of *C. hedgei* is glabrous inside (Damboldt 1978). The corolla is hairy inside in most examined specimens belonging to *C. hedgei*. In addition, other morphological characteristics like leaf surfaces were compared by scanning electron microscopy (SEM). The epidermal cells are irregular in shape (tetragonal to isodiametric) and has straight anticlinal walls, smooth periclinal walls and multicellular trichomes showing a big micropapillate secondary sculpture in *C. demirsoyi*. The epidermal cell shape is not distinct and has several unicellular trichomes with small micropapillate secondary sculpture in *C. hedgei* (Fig. 2).

Campanula coriacea is the other species that closely resembles *C. demirsoyi*. It inhabits the Van lake area far from the Munzur mountains (Fig. 3). *Campanula coriacea* is less similar to the species described here than it is to *C. hedgei*. So, a more detailed comparison was not performed between *C. coriacea* and *C. demirsoyi*. However, some floral differences were noted and are emphasized here. *C. coriacea* has a broadly campanulate corolla, divided into halves, the lobes are barbate inside, the tube is hispid outside and the style is exerted whereas *C. demirsoyi* has narrowly cylindrical to campanulate corolla, divided to $\frac{1}{4}$, glabrous with the style included.

The range of the Munzur mountains is one of the centres for endemic plants in Turkey and is located on the Anatolian diagonal (Ekim et al. 2000). The concept of the diagonal was first proposed by P. H. Davis (Davis 1971). Thirty-three percent of the species growing in Turkey are found along the diagonal, and five percent are more or less restricted to it (Ekim and Güner 1986). Seventeen *Campanula* taxa grow in the Munzur mountains, eight of which are endemic, and five endemic species grow in this area only (Damboldt 1978, Yıldırım 1995). The range of the Munzur mountains is an important area for the diversity of the genus *Campanula*.

Etymology

The new species was named in honour of Prof. Dr Ali Demirsoy (Biology Dept, Sci. Fac. of Hacettepe Univ. in Turkey).

Examined specimens of related species

Campanula coriacea; Turkey. B9 Bitlis: Adilcevaz, in limestone crevices, 1900 m, 25 Aug 1954, Davis & O. Polunin, D. 24608, Holotype, Inter cilicio-kurdicum, 1859 (syn *C. radula*) (E), Turkey. Van: South foothills of Artos Dağı, West of Van, Çatak road, 2000 m, 8 May 1986, J. C. Archibald 8315 (E), Turkey. Van: Başkale, İspiriz Dağı, 2600 m, 31 Jul 1954, Davis & O. Polunin, D.23622 (E), Turkey. Van: 28 Jul 1954, Davis & O. Polunin, D.23273 (E), Turkey. Van: River Valley, West of Yukari Narlica to Bahçesaray, 2200 m, 5 Aug 1986, J. C. Archibald 8010 (E), Turkey. Van: old town of Van, 1800 m, 1 Sep 1956, McNeill 721 (E), Turkey. Van: Gevaş, 1800 m, 13 Jul 1954, Davis & O. Polunin, D. 22671 (E), Turkey. Van: Havasor-Hoşhap, 30 Jul 1954, Davis & O. Polunin, D 23312 (E). ***C. hedgei* Davis**: Turkey. Tunceli, Munzur Dağı above Ovacik, 2400 m, 18 Jul 1957, Davis & Hedge D. 31358 Holotype (E), Turkey. Tunceli, Munzur Dağı above Ovacik, 2400 m, 19 Jul 1957, Davis & Hedge D. 31315 (E), Turkey. B7 Erzincan: Keşiş Dağı, above Cimin, 2700–2900 m, 27 Jul 1957, Davis & Hedge D. 31634, Turkey. B7 Erzincan: Keşiş Dağları prov. Çamlık 39° 45'N, 39° 44'E, 2440 m, 15 Jul 2004, Kandemir 6449 (EEFH).

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