

## Taxonomic notes on *Centaurea persica* (Asteraceae, Cardueae-Centaureinae)

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### Abstract

A taxonomic review of *Centaurea persica* BOISS. was performed. Three varieties are recognized and one of them is reported here as a new record for Iran: *C. persica* var. *multijuga* BORNH. Three lectotypes are designated and one lectotype from previous lectotypifications is rejected. The recognized taxa, the relevant synonyms, type details, examined specimen lists, full descriptions and a taxonomic key to the varieties of this species are provided. In addition, the geographic distributions of all varieties are presented and mapped. Finally, images of the type specimens of all taxa and photos of the taxa in their natural habitats and related fields are provided.

**Kew Words:** *Centaurea persica*, identification key, lectotypifications, new record, taxonomy

### Introduction

*Centaurea* L. s.l. is one of the largest genera in the family Asteraceae (BREMER 1994, SUSANNA & GARCIA-JACAS 2007). It is considered as a taxonomically artificial taxon. In the course of recent studies it was split into several natural genera, namely *Centaurea* s.str., *Cyanus* MILL., *Psephellus* CASS. and *Rhaponticoides* VAILL. (WAGENITZ & HELLWIG 2000, GREUTER 2003, HELLWIG 2004).

The genus *Acrocentron* was described by CASSINI (1826) to include species with large capitula and spiny, long, decurrent appendages. Subsequently, CANDOLLE (1838) reduced this genus to a section under *Centaurea*, a position followed by subsequent authors (BOISSIER 1875, WAGENITZ 1975, 1980, 2006, 2019, FONT et al. 2002, 2009, GARCIA-JACAS et al. 2006). *Centaurea* sect. *Acrocentron* is the largest section of the genus and comprises ca. 100 species that are distributed mainly in the Mediterranean region (FONT et al. 2009). Among other characters, this section is well defined by the “*Centaurea scabiosa*” pollen type (WAGENITZ 1955).

This article follows previous studies conducted on *Centaurea* sect. *Acrocentron* (GARCIA-JACAS & SUSANNA 1993, GARCIA-JACAS 1998, FONT et al. 2002, 2009, KAYA & VURAL 2007, KÜLTÜR 2010, RAHIMINEJAD et al. 2010, CONTI et al. 2011, LÓPEZ et al. 2012, RANJBAR & NEGARESH 2013a, 2013b, RANJBAR et al. 2014, BONA 2015, FERRER-GALLEGÓ et al. 2016, NEGARESH 2018, 2019, NOVAKOVIĆ et al. 2018) and aims at increasing the knowledge about taxonomy and geographical distribution of a common species of the section *Acrocentron* namely *C. persica* BOISS.

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## Material and methods

Plants were collected from different regions within the distribution area of *Centaurea persica* during several excursions in Iran, both in the flowering and fruiting phases, between 2011 and 2020. The voucher specimens from field work are deposited at BASU and KHAU. Additional material has been examined and consulted from the following herbaria: B, BM, C, E, FI, G, GOET, HLK, HSB, HUI, IRAN, JE, K, MICH, MO, P, PR, SAV, TARI, TMRC, US, W and WU (all herbarium codes according to THIERS 2022). All vegetative and floral parts were measured in a dry state and some parts were observed and measured under a stereo microscope. Morphological characters such as life form, length and indumentum of stems, shape, size and indumentum of leaves, shape and color of appendages, length of spine and cilia, color and length of florets, size of achenes, length of pappus etc., were studied in each taxon. In addition, the designation of the lectotypes is based on the consultation of the original material and the respective protologues. The guidelines of Arts. 9.1 and 40.2 of the Shenzhen Code (TURLAND et al. 2018) have been followed while designating the lectotypes.

## Results and Discussion

*Centaurea persica* BOISS., Diagn. Pl. Orient. ser. 1, 6: 132 (1845); – Figs. 1 and 2.

≡ *Colymbada persica* (BOISS.) HOLUB, Folia Geobot. Phytotax. 7: 316 (1972).

Type: Iran, in faucibus alpis Kuh-Daëna (Kuh-e Dinar), 16.7.1842, K.G.T. Kotschy 664 [holotype: G-BOIS (G00759951!: two sheets comprising one specimen); isotypes: BM (BM000906220!), E (E00394672!), FI (FI006610!), G (G00223054!: two sheets comprising one specimen), G-DC (G00223055!), GOET (GOET001301!), K (K000794235!), MO (MO-149548!), P (P00703809!), P (P00703810!), P (P00703811!), W (0056838!), W (1889-0020390!)].

= *Centaurea persica* var. *peraspera* BORNHM., Beih. Bot. Centralbl. 28, 2: 261 (1911).

Type: Iran, Kuh Wafs, 10.6.1905, Th. Strauss s.n. [lectotype designated here: B (B 10 0088263!); isolectotypes: B (B10 0088264!), JE (JE00015915!), JE (JE00015916!)].

Perennial plant, with thickened rootstock, (25–) 30–50 (–90) cm tall; remains of stems and leaf bases of the previous year present. Stems 2 to 8, erect to ascending, branched from median to upper parts, up to 5 mm in diam. at the base, basal part ± loosely covered with pilose-articulate hairs, remaining part sparsely covered with pilose-articulate hairs to subglabrous, sometimes the whole stem glabrous. Leaves firm, usually divided, below sparsely covered with short pilose-articulate hairs especially on veins and midrib, above subglabrous, margins scabrous. Basal and lower cauline leaves petiolate, 15–20 (–35) cm long, lyrate, segments in 2–4 (–7) pairs; terminal segments much larger, rhombic or lanceolate, entire or remotely dentate, acuminate at apex; lateral segments lanceolate or linear-lanceolate, 5–8 (–15) mm wide, acute at apex, smooth or denticulate at margins. Median cauline leaves sessile, 4–12 cm long, lyrate, segments in 1–2 (–4) pairs; terminal segments larger, lanceolate or lanceolate-oblong, entire or remotely dentate, acute or acuminate at apex; lateral segments linear or linear-lanceolate; sometimes only lobate. Upper cauline leaves increasingly smaller, few, sessile, undivided or lobed near base, smooth at margins, acuminate or mucronate at apex. Capitula solitary at the end



Fig. 1. Holotype of *Centaurea persica* Boiss. var. *persica* [G-BOIS (G00759951)]. Photo provided by Conservatoire et Jardin botaniques de la Ville de Genève.



Fig. 2. *Centaurea persica* var. *persica*: (A) close up of a capitulum; (B) habit and habitat; (C) basal leaves with pilose indumentum. Scale bars A = 1 cm; B = 3 cm; C = 2 cm. Voucher: Negaresh 500 [KHAU].

of branches, peduncles up to 10 cm long. Involucre oblong or subglobose, convex at base, 20–25 (–27) × 16–23 mm. Phyllaries multiseriate, coriaceous, green, glabrous. Outer phyllaries ovate, 5–7 × 6–8 mm; median phyllaries broadly oblong, 8–13 × 6–8 mm; inner phyllaries oblong, 15–20 × 5–8 mm, with hyaline margins. Appendages medium-sized, concealing the phyllaries only partially, ciliate, usually straw-coloured, rarely brown to purplish that is more intensive in the central part, triangular, 4–5 mm wide at base (cilia excluded), strongly decurrent, the outer and inner ones rather abruptly constricted into a spreading spine, the innermost rounded and spineless, the median ones 10–20 (–27) mm long; cilia whitish, numerous, 8–12 on each side, (3–) 4–5 (–6) mm long; spines straight, sometimes slightly curved, straw-coloured, 6–15 (–20) mm long, longer than the adjacent cilia. Flowers pink or purple; central florets hermaphrodite, 28–30 mm long, with 5 equal and acute corolla lobes, with deeply orange nerves, tube yellow; anther tube equaling the corolla, apical appendages acute; stigma deeply purple, longer than the corolla (up to 3 mm), symmetrically bifid, ca. 0.2 mm long, pubescent; peripheral floret sterile, corolla 4-lobed, lobes narrowly lanceolate, not radiant. Achenes oblong, 5–7 mm long, 2–2.5 mm wide, whitish, appressed white hairy; hilum lateral, 0.8–1 mm long. Pappus persistent, multiseriate, scabrous, whitish, (5–) 7–9 mm long, bristles of inner rows much shorter than others, ca. 2 mm long.

Nomenclatural notes: BOISSIER (1845) in the protologue of *Centaurea persica* cited “in faucibus alpis Kuh-Daëna, D. 16. Jul. 1842, Kotschy 664”. WAGENITZ (2006) lectotyped the name based on Kotschy 664 at G-BOIS. Pertaining to the type specification provided in the protologue, I realized that two sheets of Kotschy 664 are found at G-BOIS. My study showed that the two sheets deposited at the herbarium G-BOIS are really belonging to one specimen. Therefore, the lectotypification by WAGENITZ (2006) should be rejected; since there is only one specimen of Kotschy 664 at the herbarium G-BOIS, it must be recognized as the holotype (Art. 9.1, TURLAND et al. 2018).

Taxonomic and distribution remarks: *Centaurea persica* is widely distributed in southwestern to western parts of Iran, northern part of Iraq and southeastern part of Turkey (Fig. 3). It is an Irano-Turanian element, and grows on rocky slopes, fallow fields, mountainsides, in ravines and pastures, mid to high montane zone, at elevations of 1500–3000 m (Figs. 2B, 5A and 7A).

WAGENITZ (1980, 2006), recognized two varieties in *Centaurea persica*, namely: var. *persica* and var. *multijuga*. According to him, var. *multijuga* differs from the former by plants being totally glabrous (vs. sparsely or loosely pilose-articulate to subglabrous), stems up to 90 cm tall (vs. scarcely more than 60 cm tall), basal leaves up to 35 cm long (vs. up to 20 cm long), and spines slightly curved (vs. straight).

*Centaurea persica* var. *subinermis* was described by BORNMÜLLER (1911) based on specimens with appendages of phyllaries lacking a spine (sometimes with spine up to 2 mm long), relative to specimens of var. *persica* with 10–20 (–27) mm long terminal spines (Figs. 2A and 5B). In Flora Iranica, var. *subinermis* was included within the synonymy of *C. persica* by WAGENITZ (1980). In their account, RAHIMINEJAD et al. (2010), considering morphological data, revived this variety. My observations on the specimens in different herbaria and during field excursions show that var. *subinermis* consistently reveals differences from var. *persica*. Therefore, RAHIMINEJAD et al.’s treatment is followed here.

BORNMÜLLER (1911) described var. *peraspera* with cauline leaves abaxially densely covered with short pilose hairs in the type specimen. My extensive examination of herbarium sheets of *C. persica* deposited in different herbaria as well as detailed field study confirms the presence of the above diagnostic characters. So, WAGENITZ's treatment is followed here and a lectotype for this taxon is chosen here too.

Finally, *C. persica* can be treated as including three varieties.

### Key to the varieties of *Centaurea persica*

- 1 Plant totally glabrous; stems up to 90 cm tall; basal leaves up to 35 cm long; spines slightly curved ..... *C. persica* var. *multijuga*
- 1\* Plant sparsely or loosely pilose-articulate to subglabrous; stems scarcely more than 60 cm tall; basal leaves up to 20 cm long; spines straight ..... 2
- 2 Appendages of phyllaries lacking a spine, or sometimes with a spine up to 2 mm long ..... *C. persica* var. *subinermis*
- 2\* Appendages of phyllaries with a 10–20 (–27) mm long terminal spine ..... *C. persica* var. *persica*

### *Centaurea persica* var. *persica*

Taxonomic and distribution remarks: *Centaurea persica* var. *persica* generally occurs in SW to W Iran, N Iraq and SE Turkey (Fig. 3). Its distribution is wider in comparison to the other varieties. The main distribution range of this variety is in Iran (Fig. 3).

Additional specimens seen: **Iran.** Lurestan province: Dowroud, 10 km after Natural Resource Office, 1600–1700 m, 18.6.2011, Negaresh & Ranjbar 26993 (BASU!, KHAU!: three sheets); Dowroud, Oshtrankuh protected area, mountains between Saravand and Gahar river, 2300–2500 m, Negaresh & Asadbegy 226 (HSB!, KHAU!); Aligudarz, 3 km from trifurcate toward Ab Sefid waterfall, 2150–2200 m, 30.5.2015, Negaresh & Asadbegy 496 (KHAU!); Negaresh & Asadbegy 497 (KHAU!); Negaresh & Asadbegy 498 (KHAU!); Aligudarz toward Daran, Gandomieh, 28.6.2019, Parishani 409 (KHAU!); Brojerd, Strauss s.n. (JE!); 100 km SW of Khorramabad, 1800 m, Koeie 821 (C!); Saravand, 20 km SE of Dowroud, 2000–2200 m, Rechinger 48104 (E!, W!); Tang-e Sayad protected region, M. Pir Kuh, 32 km east Shahr Kord, substr. calc., 2400–2700 m, Rechinger 47181 (W!); Aligudarz, Abgarmak, 1950 m, 2.7.1994, Karimi & Fardad 108 (HLK!); Karimi & Fardad 3586 (HLK!); Gahar, 2400 m, 4.6.1941, Koelz 18036 (MICH!). Chaharmahal and Bakhtiari province: Chelgard, Negaresh & Ranjbar 28441 (BASU!, KHAU!); 1890, Sawyer 13019B (E!); Bakhtiari Mountains, near the village of Oregon, 1981–2591 m, 8–12.7.1949, Douglas s.n. (US!); Darasana, 1800 m, 6.6.1941, Koelz 18084 (MICH!, US!). Isfahan province: Semirrom toward Vanak village, Emamzadeh Zeid ebne Ali, 2500–2600 m, 14.7.2015, Negaresh 499 (KHAU!); Negaresh 500 (KHAU!). Kohgiluyeh va Bowyer Ahmad province: in gram. mt. Sawers, Nur et Eschker, 1868, Haussknecht s.n. (G!: two sheets, W!); old road of Chitab to Damchenar, after Gandomkesh village, 29.5.2010, Moazzeni & Pirani 4575 (TMRC!: four sheets); Kuh-e Dinar, supra Sisakht, 2400–3400 m, Soják 6267 (PR!); Soják 6277 (PR!). Hamedan province: M. Karaghan prope Hamedan, Strauss s.n. (JE!); Nahavand, 15.7.1895, Strauss s.n. (JE!). Markazi Province: Khomeyn, Strauss s.n. (JE!); Kuh-e Sefid Khaneh, Strauss s.n. (JE!); Latetar, Strauss s.n. (JE!). **Iraq.** Arbil province: Algurd, Guest 2849 (K!); Gillett 9532 (K!); Lalan- Arl Gird Dagh, 1600 m, 23.8.1948, Gillett 12465 (K!, US!); between Karokh Mt. and Dargala, Rawi et al. 27732 (K!); Siewaka, at the foot of mt. Karokh, Kass & Noori 27562 (K!). **Turkey.** Bitlis: Totuan, Karz Da above Sapur village, calcareous western slope, mixed forest, 20.8.1972, Pesman 3274 (E!). C10 Hakkari: Gevar Ovasi, 2–3 km from Yükseskova, 1950 m, 1.7.1966, Davis 45762 (E!); Cilo Da., at Sua, 2100 m, 10.8.1954, Davis 24226B (E!); in radicebus montium Halakur-Dar ad septentr. ab oppido Geziret-ibn-Omar, 1500 m, 26.7.1910, Nábělek 3667 (SAV!: two sheets).

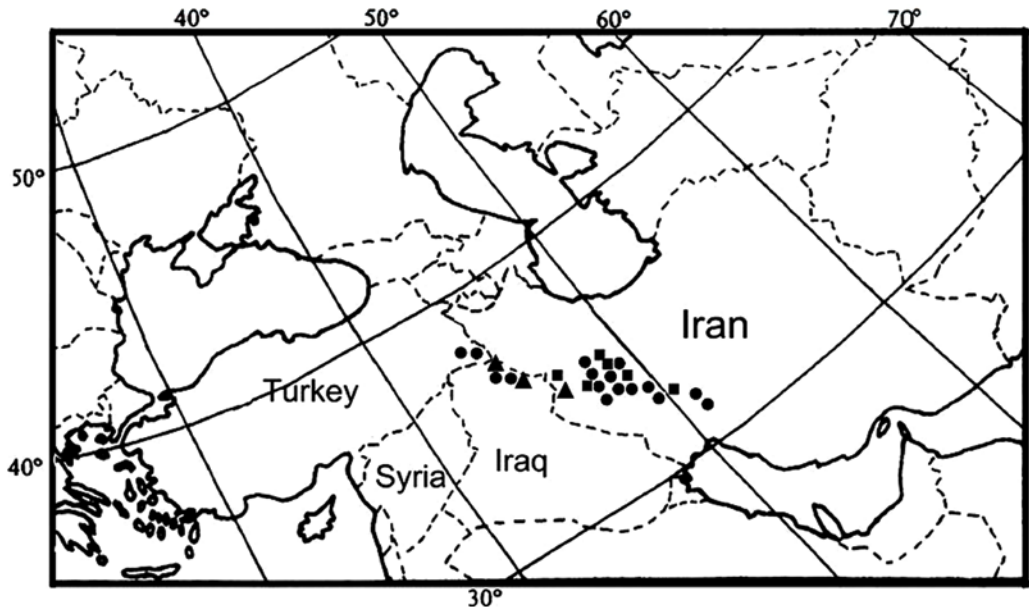


Fig. 3. Distribution of *Centaurea persica* var. *persica* (circles), *C. persica* var. *subinermis* (squares) and *C. persica* var. *multijuga* (triangles).

***Centaurea persica* var. *subinermis*** BORNM., Beih. Bot. Centralbl. 28, 2: 261 (1911); – Figs. 4 and 5.

Type: Iran, Hamedan, in montibus Wafs, 10.6.1905, Th. Strauss s.n. [lectotype designated here: B (B10 0088261!); isolectotype: JE (JE00015928!)]; – further syntypes: Iran, Markazi, in planitie ad Sultanabad, 14.6.1904, Th. Strauss s.n. [B (B10 0088262!); JE (JE00015929!)]; Iran, in fauce Girdu, 3.7.1892, Th. Strauss s.n. [JE (JE00015930!)].

Nomenclatural notes: Three syntypes (“in montibus Wafs, Strauss s.n.”, “in planitie ad Sultanabad, Strauss s.n.” and “in fauce Girdu, Strauss s.n.”) were cited by BORNMÜLLER (1911) in the protologue of *C. persica* var. *subinermis*, now deposited at B and JE herbaria. The sheet “in montibus Wafs, Strauss s.n.” preserved at B is here selected as lectotype because the specimen has leaves, well developed phyllaries and capitula.

Taxonomic and distribution remarks: *Centaurea persica* var. *subinermis* is endemic to Chaharmahal and Bakhtiari, Kurdistan, Lorestan, Isfahan and Markazi provinces, SW to W Iran (Fig. 3). It is distinguished from the other varieties by having appendages of phyllaries lacking a spine, or sometimes with a spine up to 2 mm long.

Additional specimens seen: **Iran.** Kurdistan province: 10 km from Sanandaj toward Marivan, 1600–1700 m, 28.5.2014, Negaresh & Kamalnejad 503 (KHAU!); Negaresh & Kamalnejad 504 (KHAU!); Negaresh & Kamalnejad 505 (KHAU!). Lorestan province: Dowroud, mountains between Saravand and Gahar river, 2300–2500 m, 17.8.1982, Mozaffarian & Sardabi 42375 (TARI!). Isfahan province: Khansar, Golestankuh, 2300–2600 m, 23.6.1998, Mozaffarian & Massoumi 77946 (TARI!). Markazi province: Arak, Rasvand mountains, 2400 m, 23.6.1998, Mozaffarian 72109 (TARI!); Toore, Bessri, Alladagh mountains, 2100–3100 m, 11.7.1985, Mozaffarian 64102 (TARI!); Hesar, Rasvand mountain, 2000–2300 m, 18.7.1984, Mozaffarian 48370 (TARI!); Goolpaygan, Hende, 2200–2800 m, 27.6.1969, Iranshahr 8244 (IRAN!). Chaharmahal and Bakhtiari province: 39 km from Shahrekord, Sayad pass, in the protected area, 3.6.1974, Iranshahr 8248 (IRAN!).



Fig. 4. Lectotype of *Centaurea persica* var. *subinermis* BORN. [B (B10 0088261)]. Photo provided by Botanischer Garten und Botanisches Museum Berlin-Dahlem, Berlin.



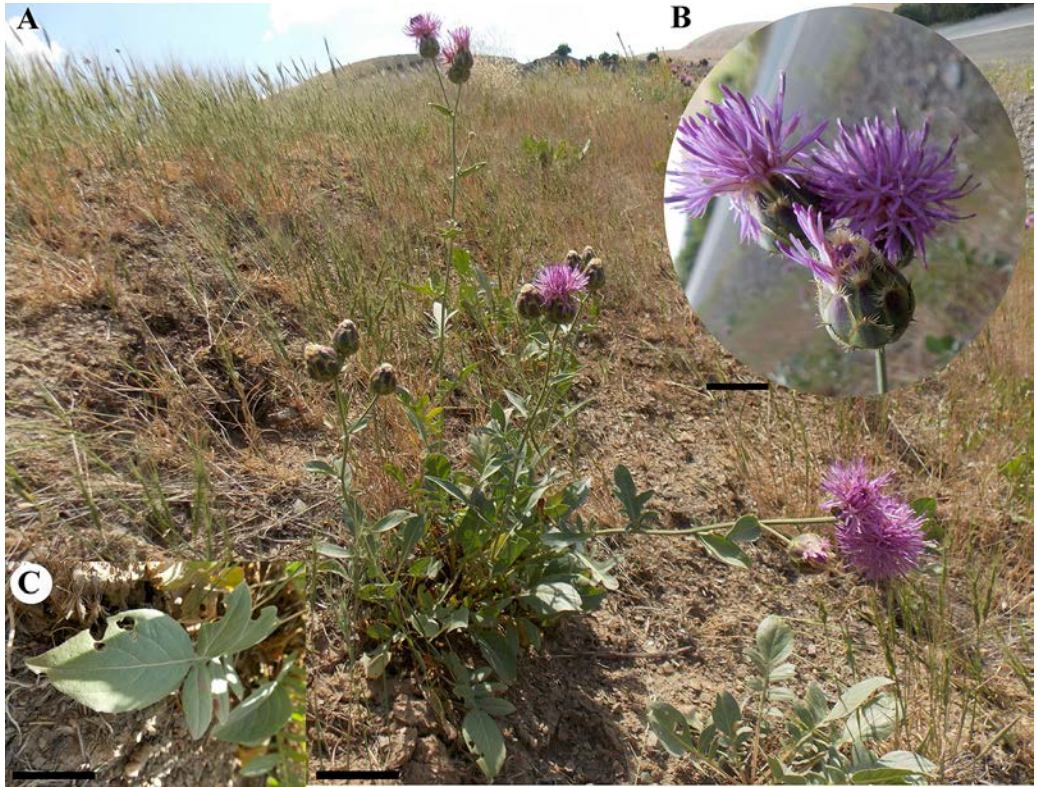


Fig. 5. *Centaurea persica* var. *subinermis*: (A) habit and habitat; (B) close up of capitula; (C) basal leaves with pilose indumentum. Scale bars A = 5 cm; B = 1 cm; C = 2 cm. Voucher: Negaresh & Kamalnejad 505 [KHAU].

*Centaurea persica* var. *multijuga* BORN.M., Beih. Bot. Centralbl. 60B: 211 (1939); – Figs. 6 and 7.

Type: Iraq, Kurdistania: Riwandous (ad fines Pers.) in reg. subsp. monte Handarin, 1300 m, 28.07.1893, J.F.N. Bornmüller 1492 [lectotype designated here: B (B10 0088260!); isolectotypes: B (B10 0088259!): two sheets].

Nomenclatural notes: Three duplicates of the type of *C. persica* var. *multijuga* were found at B herbarium, which had to be treated as syntypes (Art. 40, Note 1, TURLAND et al. 2018). The sheet B10 0088260 is better preserved and more complete than the other specimens and best represents the taxon description given in the protologue, hence it is designated here as the lectotype.

Taxonomic and distribution remarks: *Centaurea persica* var. *multijuga* is cited here as a new record for Iran (Fig. 7). It occurs in W Iran and N Iraq (Fig. 3). *Centaurea persica* var. *multijuga* is distinguished from the other varieties by plants being totally glabrous, stems up to 90 cm tall, basal leaves up to 35 cm long and spines slightly curved.



Fig. 6. Lectotype of *Centaurea persica* var. *multijuga* BORN. [B (B10 0088260)]. Photo provided by Botanischer Garten und Botanisches Museum Berlin-Dahlem, Berlin.



Fig. 7. *Centaurea persica* var. *multijuga*: (A) habit and habitat; (B) close up of a capitulum; (C) basal leaves (glabrous). Scale bars B = 1 cm; C = 8 cm. Voucher: Negaresh & Asadbegy 218 [KHAU].

Additional specimens seen: **Iran**. Kermanshah province: Paveh toward Ravansar, 5 km from trifurcate of Bayangan-Paveh toward Ravansar, 1780–1800 m, 28.5.2015, Negaresh & Asadbegy 218 (KHAU!); Negaresh & Asadbegy 501 (KHAU!); Negaresh & Asadbegy 502 (KHAU!). **Iraq**. Arbil province: above Nawanda, 2000–2600 m, Rechinger 11392 (W!); Qandil range, above Pushtashan, Rechinger 11812 (W!); Handarin, Bornmüller 1486 (JE!, K!).

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