

## **Cousinia sect. Argenteae (Asteraceae, Cardueae), a new section including a new species from NE Iran**

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## *Cousinia* sect. *Argenteae* (Asteraceae, Cardueae), a new section including a new species from NE Iran

### Abstract

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*Jurinea pungens* has long been known by its tough, linear and entire leaves ending in a rigid spine, which make it distinct from any other species of the genus. It is shown that material collected c. 70 km SW of the putative type locality of *J. pungens* belongs to a similar species new to science. Results obtained from molecular studies supported by morphological and palynological data show that these two species do not belong to *Jurinea* but form a group within *Cousinia* subg. *Cousinia*. *J. pungens* is therefore transferred to *Cousinia* and renamed *C. argentea* as the name *C. pungens* is in use for a different species. The closely related species new to science is described as *C. kadereitii* and illustrated. Since the two species do not fit into any of the existing sections of *Cousinia*, *C.* sect. *Argenteae* is described as a new section to accommodate them. A distribution map for the two species is provided.

Additional key words: *Compositae*, *Cousinia* subg. *Cousinia*, *Jurinea*, taxonomy

### Introduction

*Jurinea* Cass. (of the monophyletic “*Jurinea-Saussurea* group”) and *Cousinia* Cass. (of the monophyletic “*Arctium-Cousinia* group”) belong to the subtribe *Carduinae* (Cass.) Dumort. of the apparently monophyletic tribe *Cardueae* Cass. (Asteraceae = *Compositae*; Garcia-Jacas & al. 2002; Susanna & Garcia-Jacas 2006; Susanna & al. 2006). Phylogenetic analyses of ITS, *trnL-trnF* and *matK* sequences revealed that the “*Jurinea-Saussurea* group” and the “*Arctium-Cousinia* group” (*Arctium-Cousinia* complex) are sister groups and closely related to each other (Susanna & al. 2006).

The *Arctium-Cousinia* complex can be distinguished from the related groups by a combination of three key characters: (1) twisted scales of the receptacle, (2) achenes always with a streaky surface, very often winged and without nectary, and (3) a pappus of free, deciduous bristles (Susanna & al. 2003). Within the *Arctium-Cousinia* com-

plex, and in disagreement with their morphology, the usually spiny *Cousinia* s.str. (the “Cousinioid group” = *Cousinia* subg. *Cousinia*) can be segregated from the “Arctioid group” (including *Arctium*, “*Cousinia*-like” *Hypacanthium*, *Schmalhausenia* and the *Cousinia* subgenera *Hypacanthodes* and *Cynaroides*) by molecular, chromosome and pollen characters (Susanna & al. 2003; Susanna & Garcia-Jacas 2006; López-Vinyallonga & al. 2009). Within the *Arctium-Cousinia* complex, the spiny pollen and possibly also the long stigmata of the basal arctioid clade are also present in *Jurinea* and *Saussurea* (Punt & Hoen 2009). The smooth pollen and the short stigmata of the cousinioid clade (*Cousinia* s.str.) therefore appear to be apomorphic and *Cousinia* s.str. seems to be a derived group (López-Vinyallonga & al. 2009).

*Jurinea pungens* Boiss. with its unique entire, pungent leaves (Fig. 2 under *Cousinia argentea*; Boissier

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1875; Rechinger & Wagenitz 1979) was described based on incomplete type material collected by Jenisch from an unknown locality in NE Iran. Searching for *Cousinia* in late May 2002, some immature plants with unopened capitula were collected by the first author in a locality c. 70 km SE of Robat-Sefid (Fig. 1). The material was initially identified as *J. pungens* based on its distinctive vegetative characters and included in the molecular analysis along with other *Cousinia* species. Surprisingly it grouped with other *Cousinia* species constituting *Cousinia* s.str. or the cousinoid clade (Mehregan & Kadereit 2009: 47, the species named “*Cousinia* sp. = *Jurinea pungens*”), but not with other *Jurinea* species (*J. albicaulis* Bunge) present in the analysis as outgroup.

In this paper we clarify the taxonomic position of *Jurinea pungens* based on additional collections and the study of more taxonomically relevant aspects.

### Material and methods

In addition to the molecular analysis performed and described by Mehregan & Kadereit (2009), which included ITS sequences obtained from the silica-gel dried leaves of material collected c. 70 km SE of Robat-Sefid (c. 30 km S of Fariman; Fig. 1), morphological and palynological examinations of herbarium material (cited below) were carried out. Pollen grains were studied using light microscopy. Mature achenes were obtained from capitula of the previous year which remained in the tufts. Herbarium abbreviations follow Thiers (2008+).

### Results, discussion and conclusion

Examination of herbarium material of *Jurinea pungens* collected near Robat-Sefid and of material collected S of Fariman, c. 70 km SE from Robat-Sefid, revealed that the plants in the two localities differ from each other mainly in features of the synflorescence and capitula, but they are conspicuously similar regarding their habit (cushion-like tufts) and leaf morphology (Fig. 2-3, Table 1). The plants from the new locality (S of Fariman) apparently represent a new species.

Results obtained from the molecular analysis of species from the “*Arctium-Cousinia*” group along with a *Jurinea* species as outgroup (Mehregan & Kadereit 2009) showed that the new species falls into the cousinoid

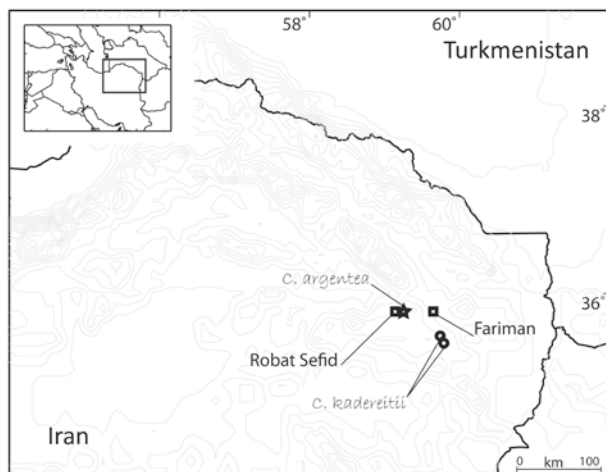


Fig. 1. Distribution of *Cousinia argentea* (asterisk) and *C. kadereitii* (circles). Each symbol indicates the locality of a single collection or several collections made at the same or nearby localities.

clade (*Cousinia* s.str. = *Cousinia* subg. *Cousinia*). This placement is highly supported by floral and pollen morphology. Both species have the sweeping hairs scattered on the styler branches (Fig. 2, B, I), instead of forming a ring on the thickening just below the styler branches as in the arctioid group and *Jurinea* spp. The pollen grains are oblong and smooth as typical for *Cousinia* s.str., instead of being relatively spherical and spiny as in the “*Jurinea-Saussurea*” and the arctioid group.

Both species (the new species plus what had been called “*Jurinea pungens*”) represent a combination of characters different from the rest of *Cousinia*. This concerns the cushion-like habit, the unique linear, usually entire, tough and pungent leaves and the corymbose synflorescences (Fig. 2–3). Therefore, we here describe a new section to accommodate the two species. The new section may be related with *C.* sect. *Platyacanthae* from NE and E Iran with similar synflorescences. *C.* sect. *Platyacanthae*, however, can be distinguished from the new section by its larger capitula with usually appendiculate phyllaries (Rechinger 1972, 1979; Mehregan 2009). In the new section the leaves seem to be entire, whereas usually sinuate-lobate to more incised in *C.* sect. *Platyacanthae*. In some plants, however, leaves with few lateral teeth can be observed (Fig. 2E), a phenomenon presumably indicating a trend from incised to entire leaves in the section.

Table 1. Comparison of some differential characters between *Cousinia argentea* and *C. kadereitii*.

Characters	<i>C. argentea</i>	<i>C. kadereitii</i>
Substrate	gypsum soil	loamy soil
Length of emerged part of flowering stem compared to lower part included in the tuft	more than 1.5 times	shorter to equal
Base of involucre	short-conical	round
Size of involucre [mm]	c. 15 × 8–10	16–23 × (8–)10–13
Apex of middle phyllaries	mucronulate	attenuate

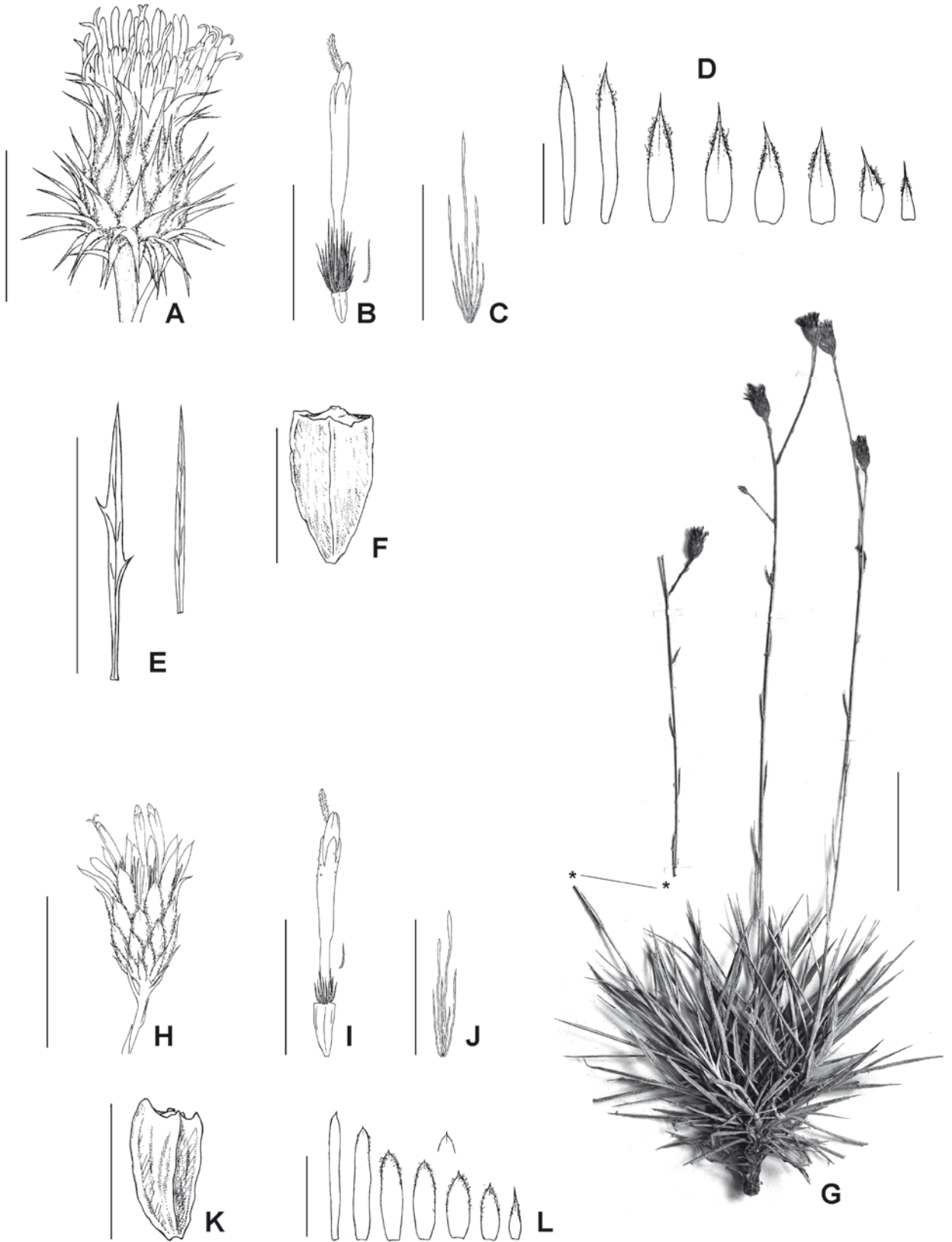


Fig. 2. A-F: *Cousinia kadereitii* (Assadi & Mehregan 91946): capitulum (A); flower (B); receptacular bristles (C); phyllaries (D); two different forms of leaves (E); achene (F). – G-L: *Cousinia argentea* (Wendelbo & Foroughi 18886): whole plant (G); capitulum (H); flower (I); receptacular bristles (J); achene (K); phyllaries (L). – Scale bars: A-H = 20 mm; B-D, I, J + L = 10 mm; E + G = 5 cm; F + K = 5 mm. – Illustration by I. Mehregan.

***Cousinia* sect. *Argenteae* Mehregan & Assadi, sect. nov.**Type: *C. argentea* Mehregan & Assadi

Suffruticosae, multicaules; foliis numerosis, parvis, linearibus, saepe simplicibus, pungentibus; capitulis 1–3 (–4); floribus 15–30; antherarum tubo glabro, purpurascenti; involucri phyllis adpressis exappendiculatis; achaeniis alato-costatis, obpyramidatis; receptaculi setis laevibus.

**Key to the species of *Cousinia* sect. *Argenteae***

1. Capitula shortly conical at base; middle phyllaries mucronulate, all phyllaries erect . . . . . 1. *Cousinia argentea*
- Capitula rounded at base; middle phyllaries attenuate; outer phyllaries spreading to recurvate . . . . . 2. *Cousinia kadereitii*

**1. *Cousinia argentea* Mehregan & Assadi, nom. nov.**

≡ *Jurinea pungens* Boiss., Fl. Orient. 3: 569. 1875, emend. Rech. f. in Spec. Nov. Regni Veg. 48: 148. 1940. Holotype: [Iran], “Persia”, *Jenisch s.n.* (LE, n.v., fide Rechinger 1940; isotype: G-BOIS, photo seen!).

*Notes.* — Because of *Cousinia pungens* Juz. (in Trudy Bot. Inst. Akad. Nauk S.S.S.R., Ser. 1, Fl. Sist. Vyssh. Rast. 3: 306, 308. 1937) the epithet of the basionym is not available in *Cousinia* and the new name *C. argentea* is introduced here, according to the ICBN (McNeill & al. 2006).

The description of *Jurinea pungens* was emended by Rechinger (1940) by comparison of the type material from LE (with unopened capitula) with material collected by Rechinger himself from a single locality in NE Iran (in flower but without mature achenes) in the province of Khorassan, near Robat-Sefid (Rechinger 1940: 148–149). Because NE Iran and the neighbouring areas have extensively been visited by botanists and no material of *J. pungens* has been collected from localities other than Robat-Sefid this may most probably be the type locality. The plants grow there on gypsum soil in a small area together with other local endemics such as *Diaphanoptera khorassanica* Rech. f.

*Illustration.* — Fig. 2G–L; Rechinger 1940: t. 36, fig. 1, 2 left.

*Description.* — *Caespitose subshrub* up to 50 cm or more in diameter and up to 60 cm high, with a dense, silvery indumentum. *Stems* numerous, their basal portion woody and branched, covered with leaf remains; sterile branches ending in a subrosette formation of leaves; flowering stems up to 30 cm high, stiff, erect, remotely leafy, simple or corymbosely branched, up to 25 cm emerged from the tuft surface, with 1–2(–3) heads; emerged part of flowering stems (synflorescence) clearly longer than leafy part below. *Leaves* very tough, linear, up to 15 × 0.3 cm, entire, densely silvery-tomentose on both surfaces, some-

times revolute at margins, ending in a tough spine at the apex; stem leaves smaller and narrower upwards. *Heads* solitary, pedunculate, cylindrical to campanulate, short-conical at base. *Involucre* c. 15 mm long, 8–10 mm in diameter; *phyllaries* 40–60, coriaceous, imbricate, ovate to oblong, arachnoid at the margins, yellow-brown at the apex; outer ones green, erect, acuminate, intermediate ones with deep purple tint, 10–12 mm long, 2–3 mm wide, mucronulate, ended in a short spine; inner ones linear. *Reptacular* bristles (erroneously treated by Rechinger 1940 and Rechinger & Wagenitz 1979 as “pappus”) c. 15 mm long, unequal, smooth (Fig. 2J). *Flowers* 12–15 mm long, purple; anther tube smooth, concolorous or rose. *Achenes* narrowly winged-angulate, oblong-obpyramidal, 4–5.5 mm long, 2.5–3 mm wide (Fig. 2K). *Pappus* 2–3 mm long (Fig. 2I).

*Etymology.* — The specific epithet refers to the silvery indumentum.

*Distribution and habitat.* — Endemic to NE Iran, Khorassan (Fig. 1), near Robat-Sefid at altitudes of c. 1500–2000 m, on gypsum soil (not serpentine as stated by Rechinger 1940: 148).

*Further specimens seen.* — IRAN: KHORASSAN: In montibus serpentinicis inter Meshhed et Turbat-e Haidari, l.d. Robat-Safid, c. 1700 m, 10.–11.7.1937, *Rechinger 1539* (M, W); same locality, 1520 m, 7.5.1975, *Rechinger 51337* (M, W); same locality, N of Robat-e Sefid, 1650 m, 25.9.1975, *Wendelbo & Foroughi 18886* (TARI); same locality, 1700–2000 m, 29.5.1977, *Runemark & Sardabi 23509* (TARI).

**2. *Cousinia kadereitii* Mehregan & Assadi, sp. nov.**

Holotype: Iran, Khorassan, c. 30 km S of Fariman, between Chahar-Takab and Zharf, 4.7.2009, 2300 m, *Assadi & Mehregan 91946* (TARI; isotypes B, IRAN).

Suffruticosa-caespitosa, argentea. Caespites usque ad 1 m diametro. Caules floriferi numerosi, erecti vel erecto-ascendentes, simplices vel corymboso-furcati, 2–3 (–4)-cephali. Folia rigidissima, saepe linearia, simplicia, in spinam rigidam excurrentia. Capitula solitaria, pedunculata, ovata vel oblonga, basi rotundata; involucrium absque spinis 16–23 mm longum, (8–)10–13 mm diametro; phylla coriacea, imbricata, ovata vel lanceolata, in spinas rigidas attenuata, extima patentia vel recurvata, intermedia erecto-patentia, 12–20 mm longa, 2.5–4 mm lata. Flores 20–30; corolla 15–17 mm longa, purpurea; antherarum tubus concoloris. Achaenia c. 6 mm longa, alato-angulate, oblongo-obpyramidata.

*Illustration.* — Fig. 2A–F, 3.

*Description.* — *Caespitose subshrub* up to c. 1 m in diameter and up to 40 cm high, with dense, silvery in-

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Fig. 3. Holotype of *Cousinia kadereitii* (Assadi & Mehregan 91946, TARI). – Scale bar = 5 cm.

dumentum. *Stems* numerous, branched at base, covered with leaf remains at lower parts, erect to ascendent; sterile stems ending in a subrosette formation of leaves; flowering stems 10–30 cm high, densely leafy at base, remotely leafy and simple or corymbosely branched in upper part, up to 15 cm emerged from the tuft surface, with 2–3(–4) heads; emerged part of flowering stems (synflorescence) shorter than or as long as the leafy part below. *Leaves* very tough, linear, up to 11 × 0.5 cm, usually entire, rarely with up to 3 remote spiny teeth on each side, densely silvery-tomentose on both surfaces, ending in a tough spine at the apex; stem leaves smaller and narrower upwards. *Heads* solitary, pedunculate, ovoid to cylindrical, round at base. *Involucre* without spines 16–23 mm long, 8–13 mm in diameter; *phyllaries* 40–70, coriaceous, imbricate, ovate to lanceolate, arachnoid at the margins, yellow-brown at the apex, attenuated into a tough spine; outer ones green, spreading to recurvate; intermediate ones with deep purple tint, 12–20 mm long, 2.5–4 mm wide; inner ones linear. *Receptacular bristles* 14–18 mm long, unequal, smooth. *Flowers* 20–30; corolla 15–17 mm long, purple; anther tube smooth, concolorous. *Achenes* 5–6.5 mm long, winged-angulate, oblong-obpyramidal.

*Eponymy.* — The species is named in honour of Prof. J. W. Kadereit, professor of botany at the Institut für Spezielle Botanik, Johannes Gutenberg-Universität Mainz, Germany.

*Distribution and habitat.* — Endemic to NE Iran, Khorassan (Fig. 1), in the mountains S of Fariman, at altitudes of c. 2100–2300 m on loamy soil, in open areas and rocky slopes, usually with *Astragalus* sp. and *Juniperus excelsa*.

*Further specimens seen.* — IRAN: KHORASSAN: S of Fariman, pass inter Fariman and Zharf, 2200 m, 25.5.2002, *Mehregan s.n.* (MJG; identified as “*Jurinea pungens*” in Mehregan & Kadereit 2009); same locality, 2150 m, 12.8.1993, *Mozaffarian 72272* (TARI); same locality, 7.8.1985, *Joharchi & Zangooei 13475* (Mashhad University Herbarium); same locality, 2200 m, 29.8.2000, *Joharchi 33167* (Mashhad University Herbarium).

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