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

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Abstract


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 stinky surface, very often winged and without nectary, and (3) a pappus of free, deciduous bristles (Susanna & al. 2006). Within the Arctium-Cousinia complex, and in disagreement with their morphology, the usually spiny Cousinia s.str. (the “Cousinioid group” = Cousinia subg. Cousinia) can be segregated from the “Arcticoid 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 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 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 stylar branches (Fig. 2, B, I), instead of forming a ring on the thickening just below the stylar 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 *Cousinia* s.str. or the cousinioid clade (Mehregan & Kadereit 2009). In the new section the leaves seem to be entire, whereas usu-ally sinuate-lobate to more incised in *Cousinia* s.str. = *Cousinia* subg. *Cousinia*.

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

<table>
<thead>
<tr>
<th>Characters</th>
<th><em>C. argentea</em></th>
<th><em>C. kadereitii</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Substrate</td>
<td>gypsum soil</td>
<td>loamy soil</td>
</tr>
<tr>
<td>Length of emerged part of flowering stem compared to lower part included in the tuft</td>
<td>more than 1.5 times</td>
<td>shorter to equal</td>
</tr>
<tr>
<td>Base of involucre</td>
<td>short-conical</td>
<td>round</td>
</tr>
<tr>
<td>Size of involucre [mm]</td>
<td>c. 15 × 8–10</td>
<td>16–23 × (8–)10–13</td>
</tr>
<tr>
<td>Apex of middle phyllaries</td>
<td>mucronulate</td>
<td>attenuate</td>
</tr>
</tbody>
</table>
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; folis numerosis, parvis, lineari-ariaibus, saepe simplicibus, pungentibus; capitulis 1–3 (−4); floribus 15–30; antherarum tubo glabro, purpurascenti; involucrui phylladis exappendiculatis; achaenia 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. **C. argentea** Mehregan & Assadi, nom. nov.

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


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 khorasanica* 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 corymbose 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 wing-angled, oblong-obpyramidal, 4–5.5 mm long, 2.5–3 mm wide (Fig. 2K). Pappus 2.3–3 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, I.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 Zhafar, 4.7.2009. 2300 m, As-sadi & Mehregan 91946 (TARI; isotypes B, IRAN).

Suffruticosa-caespitosa, argentea. Caespites usque ad 1 m diametro. Caules floriferi numerosi, erecti vel erecto-ascendentes, simplices vel corymbose-furcati, 2–3 (−4)cephali. Folia rigidissima, saepe linearia, simplicia, in spinam rigidam excurrentia. Capitula solitaria, pedunculata, ovata vel oblonga, basi rotundata; involucrum 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-angulata, oblongo-obpyramidalata.

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-
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 ascending; 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-oblipyramidal.

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. (MIG; identified as “Jurinea pungens” in Mehregan & Kadereit 2009); same locality, 2150 m, 12.8.1993, Mozaffarian 72272 (TARI); same locality, 7.8.1985, Moharchi & Zangooee 13475 (Masshad University Herbarium); same locality, 2200 m, 29.8.2000, Moharchi 33167 (Masshad University Herbarium).

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