

Two new records of vascular plants for the flora of Iran

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Abstract. In this paper, *Crambe edentula* (*Brassicaceae*) and *Crinitaria grimmii* (*Asteraceae*) are reported as new noteworthy records for the vascular flora of Iran. Diagnostic morphological characters, taxonomic remarks, conservation status and a distribution map are provided.

Key words: *Asteraceae*, *Brassicaceae*, *Crambe*, *Crinitaria*, Iran, Khorassan, new records

Introduction

Zarrin-Kuh Protected Area (ZPA) is one of the most extraordinary protected areas located in the Razavi Khorassan Province (NE Iran). It runs along the border between Turkmenistan and Iran in the central part of Kopet-Dagh. Kopet-Dagh is a mountain between Iran and Turkmenistan which comprises numerous plant species and is known for its unique flora. The flora and vegetation of the Kopet-Dagh mountain have been intensively studied both in Iran and Turkmenistan. However, comprehensive studies devoted to the entire area are still lacking. ZPA is delimited from the surrounding areas by its geographical isolation and no botanical recording has been ever done there (Memariani & al. 2016). During the extensive field trips to the mountainous areas of ZPA, two rare and interesting species belonging to the genera *Crambe* (*Brassicaceae*) and *Crinitaria* (*Asteraceae*) were collected. In this article, these two taxa are reported as new records for the vascular flora of Iran. Furthermore, the findings in this research reconfirm the occurrence of *Crinitaria* Cass. and increase the number of species of *Crambe* L. to four in Iran.

Material and methods

The records presented in this paper result from the field work for the PhD project of the first author in 2015 in the Zarrin-Kuh Protected Area (NE Iran). The herbarium specimens were collected for further taxonomic study both during flowering and fruiting periods. The vegetative and reproductive characteristics of specimens were studied by a stereomicroscope. The specimens were compared with the records in *Flora Iranica* (Grierson & Rechinger 1982) and *Flora of the USSR* (Shishkin 1959; Czerniakowskaya 1939). The materials recorded here are deposited in the herbaria of FUMH (Herbarium of the Ferdowsi University of Mashhad) and GUH (Herbarium of the University of Guilan). Main threats and the conservation status of these rare taxa are presented in this study, with recommendations for subsequent measures. The scientific and authors' names of the plant species in this article were checked according to The Plant List (<http://www.theplantlist.org>) and The International Plant Names Index (<http://www.ipni.org>).

Results and discussion

Brassicaceae

Crambe edentula Fisch. & C.A.Mey. ex Korsh.

(Figs. 1 & 3)

Iran, Razavi Khorassan Province, NW Dargaz, on northern slopes of Zarrin-Kuh Mt., 37°35'56"N, 58°55'34"E, 940–960 m a.s.l., 18 June 2015, coll. M.S. Amiri 45559 (FUMH).

Description

Perennial; root thin, woody; stems several, 45–70 cm high, glabrous, ribbed, branching, leafy below, nearly leafless above; leaf blades ovate, somewhat rhomboid, 4–8 cm long, 3–6 cm wide, slightly cuneate at base, petioles (2–2.5 cm long) rigid-hairy, particularly beneath and along the veins and margin, angularly dentate or subentire; upper cauline leaves linear – subulate, small. Inflorescence loose, branching, branches elongated; sepals oblong, up to 3 mm long, glabrous; petals white,

4–5 mm long, oblong-ovate, tapering at base, the upper 2.5–3 mm wide; all filaments edentate, the longer slightly dilated at both sides; fruiting pedicels 3–7 mm long, erect; gynophore very short but distinct (1–1.5 mm long), elliptic, firm, smooth, glaucous.

Flowering time: May–June; fruiting: July.

Taxonomic and phytogeographical remarks

The genus *Crambe* L. (*Brassicaceae*) is an Old World genus with approximately 40 species worldwide. It is the only large (>10 species) monophyletic genus of the tribe *Brassicaceae* (Francisco-Ortega & al. 1999). This genus was categorized into three taxonomic sections, namely: *Leptocrambe*, *Dendrocrambe* and *Crambe* (Prina 2009). It is distributed between four major centers of species diversity. These major geographical regions include: Macaronesia, Mediterranean, East Africa, and Euro-siberia – Southwest Asia (Francisco-Ortega & al. 1999). The Macaronesian species are subsrubs and, as a rule, have small fruits with the pericarp adhering to the seed, whereas the Eastern species are hemicryptophytes, with



Fig. 1. Photograph of voucher herbarium specimen of *Crambe edentula*.



Fig. 2. Photograph of voucher herbarium specimen of *Crinitaria grimmii*.

larger fruits and normally the pericarp does not adhere to the seed (Prina 1998). This genus has an immense area of distribution spreading from the Macaronesian archipelagoes to the West China and North India, and from the Arctic Polar Circle on the Scandinavian Peninsula to a latitude of 5° southwards in the North Tanzania. It is represented in the Macaronesian, Euro-Siberian, Mediterranean, Sindico-Saharan, Irano-Turkish, and Sudan-Zambezian (Ethiopia and Tanzania) regions (Leppik & White 1975). Three taxa of *Crambe* L. have been recorded earlier from Iran, namely: *Crambe hispanica* L., *Crambe cordifolia* subsp. *kotschyana* (Boiss.) Jafri and *Crambe orientalis* L. The number of *Crambe* species in Iran now amounts to four after the addition of *C. edentula*. All *Crambe* species which occur in Iran, except *C. hispanica* (sect. *Leptocrambe*), belong to section *Crambe*, according to Prina's (2009) classification. The closest species to *C. edentula* is *Crambe orientalis*, but it differs in its leathery basal leaves and edentate stamen filaments. Other differences are shown in Table 1. Furthermore, the ITS phylogeny has shown that *C. edentula* does not fall within the "Orientalis" group (Francisco-Ortega & al. 1999).

Distribution and conservation status

So far *Crambe edentula* was reported as an endemic species from the western part of Turkmenistan (Czerniakowskaya 1939). Now, its distribution extends to NE Iran. This species is very rare in Iran and is known only from one locality. Different factors pose great threats to the small remnants of *C. edentula* in the area. Particularly, its habitat has recently been greatly affected by road construction and intensive sheep grazing. Considering the restricted distribution of the species and low number of specimens in the area, it is urgently recommended for its habitat to be legally protected by the Iranian government. A fencing out of the area and cultivation in botanical gardens is very necessary.

Habitat and ecology

This newly recorded species grows at 940–960 m a.s.l., on the northern slopes of Zarrin-Kuh Protected Area in

the central part of Kopet-Dagh Mt. It was found on red gypsiferous marl soils, along with *Sclerorhachis platyrachis* (Boiss.) Podlech ex Rech.f., *Onosma khorassanica* Attar & Joharchi, *Ruta obtusifolia* Ledeb. ex Eichw., *Cephalorhizum turcomanicum* Popov, *Delphinium turkmenum* Lipsky, *Seseli staurophyllum* Rech.f., *Stipa caucasica* Schmalh., and *Aeluropus littoralis* (Gouan) Parl.

Asteraceae

Crinitaria grimmii (Regel & Schmalh.) Grierson

(Figs. 2 & 3)

Iran, Razavi Khorassan Province, NW Dargaz, on northern slopes of Zarrin-Kuh Mt., 37°35'55"N, 58°55'39"E, 910–930 m a.s.l., 12 Aug 2015, coll. M.S. Amiri 45657 (FUMH).

Description

Perennial. Stems branching, 25–35 cm high, subsulcate, sparsely dotted with fine shining yellowish glands and sparse multicellular hairs. Leaves linear-oblongate, lower leaves (1–2 cm long) longer than the internodes or equal to them, but upper leaves (20–50 mm long) shorter of the internodes, with a distinct lucid thin nerve beneath, smooth-edged lamina, sparingly pubescent, longer sparse sinuate hairs at margin and also on stems, dotted with shining glands. Peduncles of unequal length with 3–8 heads, almost straight,

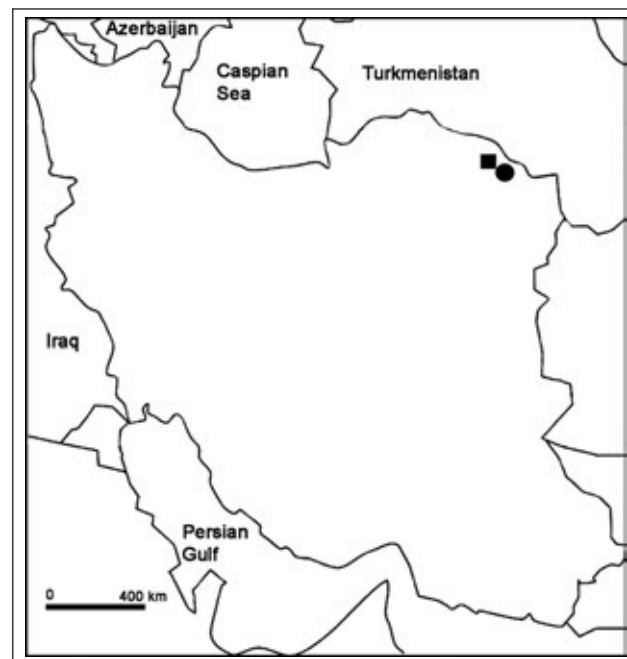


Fig. 3. Distribution of *Crambe edentula* (■) and *Crinitaria grimmii* (●) in Iran.

Table 1. Diagnostic morphological characters useful in separation of *Crambe edentula* and *C. orientalis*.

Character	Taxon	<i>Crambe edentula</i>	<i>Crambe orientalis</i>
Basal leaves		coriaceous	herbaceous
Leaves		irregular dentate	pinnatilobate
Stamen		edenticulate	denticulate

slightly spreading from stem, with fine leaves 2–4 in number. Heads 1.5–2.5 cm long. Involucral bracts usually more than 20–30 in number; outer bracts ovate, acute or acuminate; inner bracts oblong, acute, sparsely pubescent. Florets per head 5–8; achene, oblong, 5–6 mm long and pubescent. Pappus 7–10 mm long, yellowish or white, with some bristly hairs.

Flowering time: July–August; fruiting: September.

General distribution: Afghanistan, Central Asia, Iran and China (Tian Shan).

Taxonomic remarks

Crinitaria Cass. is a member of the subtribe *Asterinae* (Cass.) Dumort. (tribe *Astereae*, family *Asteraceae*). The species of this subtribe are characterized by a high level of morphological plasticity and polyploidy, and a wide distribution range. This subtribe includes 13 genera and about 270 species. However, many open taxonomic questions remain concerning the species diagnosis, generic delimitation, and even the volume of the subtribe itself (Korolyuk & al. 2015; Nesom & Robinson 2007). Despite the numerous studies, genus *Crinitaria* Cass. is still one of the most complex genera of *Asteraceae* that remains unresolved yet (Fiz & al. 2002; Brouillet & al. 2009; Li & al. 2012; Korolyuk & al. 2015). In recent years, some species of this genus have been transferred to other genera. According to the latest changes in The Plant List, *Crinitaria* Cass. comprises 18 scientific plant names of species rank, of which three are accepted species names, including: *Crinitaria pontica* (Lipsky) Czerep., *Crinitaria tatarica* (Less.) Czerep. and *Crinitaria*

grimmii (Regel & Schmalh.) Grierson (<http://www.theplantlist.org>). Hitherto, this genus was represented in Iran by only one species, *C. villosa* (L.) Cass., which is considered doubtful (Mozaffarian 2007). However, *C. villosa* (L.) Cass. has been recognized as a synonym of *Galatella villosa* (L.) Rchb.f. (Korolyuk & al. 2015). Therefore, the occurrence of *Crinitaria* Cass. is reconfirmed and *C. grimmii* (Regel & Schmalh.) Grierson. is considered as the first record of this genus for the vascular flora of Iran.

Distribution and conservation status

Crinitaria grimmii has been reported earlier from Turkmenistan, Afghanistan and Central Asia (Grierson & Rechinger 1982). Therefore, our specimen expands the distribution range of this species to the NE of Iran. Our present knowledge indicates that this taxon occurs in a very limited area (in Iran) and its habitat is threatened by heavy grazing and erosion. Field conservation of a small population of *C. grimmii* is urgently recommended.

Habitat and ecology

This species was found in the same habitat as *Crambe edentula* but at lower altitude ranges (910–930 m), on the northern slopes of that protected area (Fig. 4). The following taxa exist abundantly in its locality: *Acanthophyllum mucronatum* C.A. Mey., *Diarthron antoniniae* (Pobed.) Kit Tan, *Asparagus verticillatus* L., *Valeriana ficariifolia* Boiss., *Zygophyllum atriplicoides* Fisch. & C.A. Mey., and *Lolium subulatum* (Banks & Sol.) Eig.



Fig. 4. Natural habitat of *Crambe edentula* and *Crinitaria grimmii*. They grow on red gypsiferous marl soils on the northern slopes of Zarrin-Kuh Protected Area (Central Kopet-Dagh, NE Iran).

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