

## A NEW SPECIES OF *FERULA* (*UMBELLIFERAE*) FROM SOUTHERN IRAN

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A new species of *Ferula* (*Umbelliferae*), *Ferula hezarlalehzarica* Y.Ajani, from the Hezar and Lalehzar mountains (Kerman province) in the south of Iran, is described and illustrated. From field and herbarium studies it appears that the species is found only in Kerman province. Details of its morphology and mericarp anatomy are discussed and compared with its closest relatives, *Ferula hindukushensis* Kitam. and *F. koso-poljanskyi* Korovin. The new species differs from these mainly in leaf, umbel and mericarp characters. An alteration to the *Ferula* key in *Flora Iranica* is given.

*Keywords.* *Ferula*, fruit anatomy, Iran, new species, *Umbelliferae*/Apiaceae.

### INTRODUCTION

*Umbelliferae* Juss. (*Apiaceae* Lindl.) is one of the largest plant families in Iran (Jalili & Jamzad, 1999), along with families such as *Boraginaceae*, *Compositae* and *Labiatae*. Iran is one of the centres of diversity for this family in Southwest Asia and also worldwide (Pimenov & Leonov, 2004; Valiejo-Roman *et al.*, 2006).

The family includes some large genera such as *Ferula* L. and *Heracleum* L. Species of *Ferula* are distributed mainly in Southwest and Central Asia but also occur as far east as North India and in the Mediterranean basin. Currently, c.30 species are found in Iran and, of these, half are endemic to the country (Chamberlain & Rechinger, 1987). Traditionally *Ferula* spp., with common Persian names like Koma, Anghuze and Baridje, have been used medicinally by local people. *Ferula assafoetida* L. and *F. gumosa* Boiss. are particularly commonly used. The latter is one of the major non-petroleum export products of Iran (Mozaffarian, 2006).

In early March 2007, while studying the specimens in the IRAN herbarium, the first author noted that a flowering specimen was misidentified on the original label as *Ferula ovina* (Boiss.) Boiss. and also on a later determination label as *F. badghysi* Korovin (Kerman province, Baft, Kuh-e Lalehzar to Gholle Shah, 3000–3800 m, 30 v 1974, *Mousavi & Tehrani* 33749). Using the key in *Flora Iranica* (Chamberlain & Rechinger, 1987) the specimen keys out as *Ferula hindukushensis* Kitam. *Ferula hindukushensis* is also frequently confused with *F. koso-poljanskyi* Korovin

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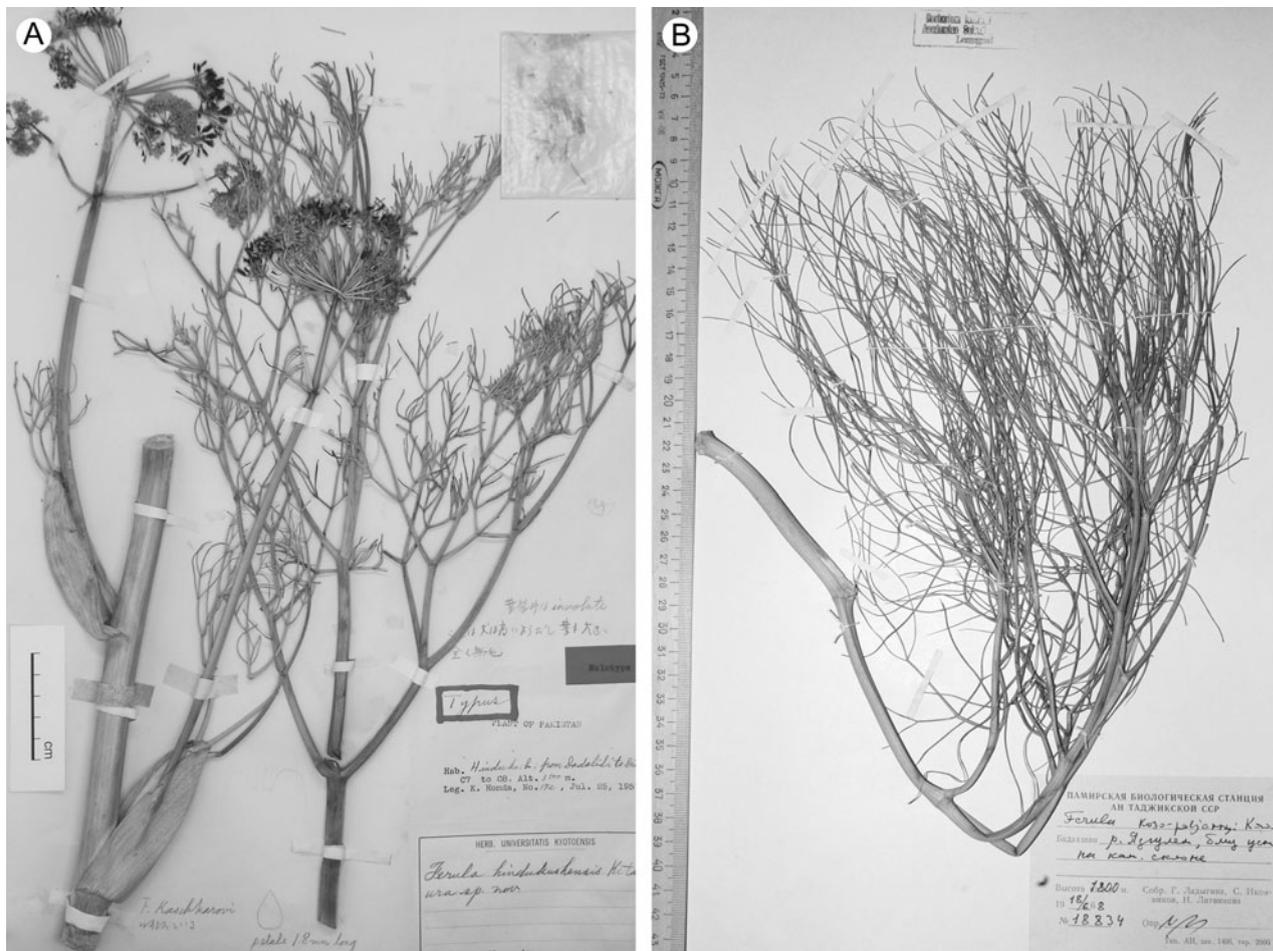


FIG. 1. A, *Ferula hindukushensis* Kitam. (Honda 172, holo KYO). B, *Ferula koso-poljanskyi* Korovin (*Ladygina, Ikonnikov & Litvinova* 18834, LE).

(Chamberlain & Rechinger, 1987). As the identification of this specimen still seemed unsatisfactory the first author visited the collection locality on 26 vi 2007 to collect new material to compare with *Ferula hindukushensis* and *F. koso-poljanskyi*.

#### MATERIALS AND METHODS

Schischkin (1951) and Korovin (1947) report *Ferula koso-poljanskyi* from Central Asia (Kyrgyzstan, Tajikistan and the border area between Afghanistan and Tajikistan). *Ferula hindukushensis* is reported from Afghanistan and Pakistan (Chamberlain & Rechinger, 1987). As access to these areas was impossible for us we used images of specimens to compare with our new species (Fig. 1A–B).

Fruit anatomy was studied by free-hand sectioning of mature and dried fruit samples which had been boiled in water for 3–5 seconds. They were then stained with Carmine, for cellulose in the phloem, and diluted methyl green, for lignified cells in the xylem. Permanent slides as vouchers were prepared by dehydrating and mounting on microscopic slides in Canada balsam (Chamberlain, 1930). The sectioned samples were studied under a stereo-microscope (Fig. 2). The vouchers are deposited in the Central Herbarium of Medicinal Plants (ACECR), Karaj, Iran.

#### RESULTS AND DISCUSSION

After careful examination it was concluded that the material belonged to a new and undescribed species close to *Ferula hindukushensis* and *F. koso-poljanskyi*. The new species is described here.

#### ***Ferula hezarlalehzarica* Y.Ajani, sp. nov. Figs 2–4.**

Folia basalia 4–5 pinnata; segmenta ultima filiformia; vagina superior non inflata. Vittae dorsales in valleculis (1–)2–3(–4); commissurales 10–11. – Type: Iran, Kerman province, South of Kerman, Rayen, Kuh-e Hezar, near to Dodaran village, 29°23'20.7"N, 57°23'20.6"E, 2489 m, 26 vi 2007, Y. Ajani & H. Ghasemi Far 43 (holo TUH; iso ACECR, FUMH, IRAN, TARI, TEH, TUH).

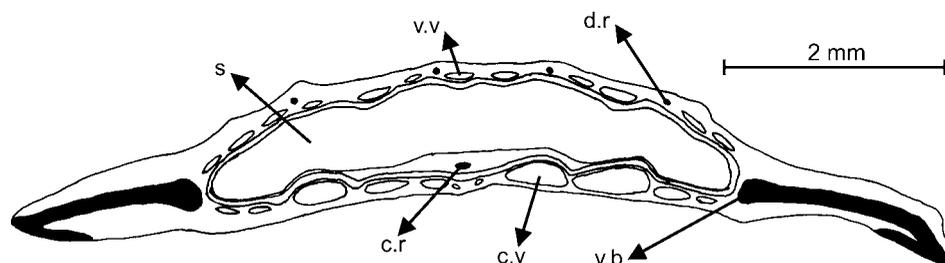


FIG. 2. Fruit anatomy of *Ferula hezarlalehzarica* Y.Ajani. Abbreviations (following Kljuykov *et al.*, 2004): c.r, commissural rib; c.v, commissural vittae; d.r, dorsal rib; s, endosperm; v.b, vascular bundle; v.v, vallecular vittae.

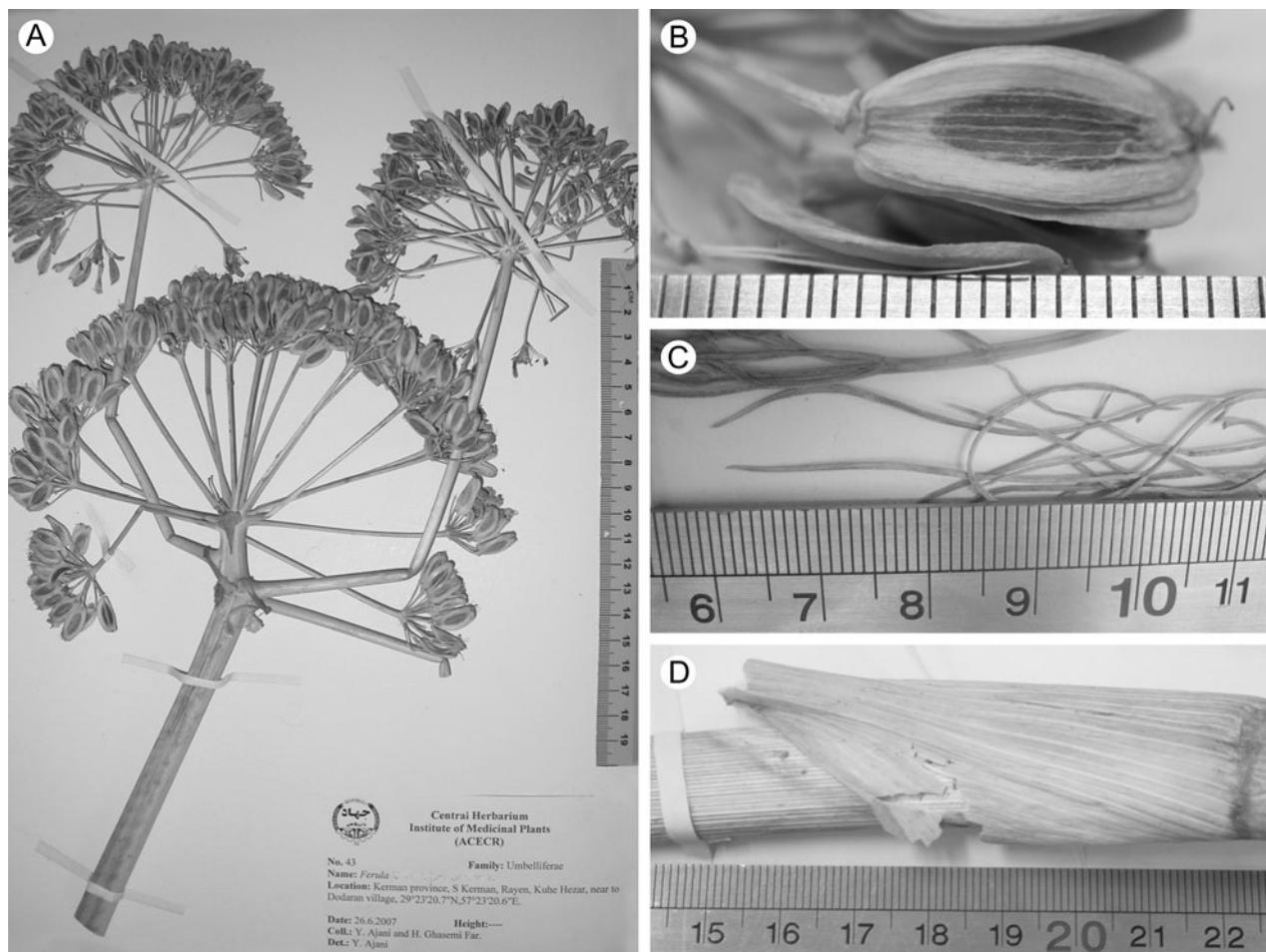


FIG. 3. *Ferula hezarlalehzarica*. A, herbarium specimen; B, mature fruit; C, terminal leaf segments; D, sheath of stem leaf.



FIG. 4. Distribution map of *Ferula hezarlalezarica*.

Perennial herb. *Stem* up to 2 m tall, diameter at base 2–2.5 cm, yellow when in fruit. *Leaves* glabrous; basal leaves elliptic, 4–5 pinnate, green, blade 35–40 × 20–26 cm, sheath 9–10 cm long, petiole 8 cm long; upper leaves up to 36 cm long, sheath 8–9 cm long, not swollen, with prominent ribs on abaxial surface, petiole 4–5 cm long; terminal leaf segment filiform, 4.5–6.5 × 0.5 mm, entire at margin. *Bract* and bracteole filiform, glabrous or both deciduous. *Central hermaphrodite umbel* with 1–2 cm peduncle; rays (20–)25–30, (3.5–)4.5–6.5(–7.5) mm long, 1.5–2 mm in diameter, glabrous. *Lateral hermaphrodite umbel* with 0.5 cm peduncle; rays 20–23, 2.5–3.5 mm long, 1 mm in diameter, glabrous. *Calyx* inconspicuous or very small; petals elliptic, 2.5 × 1.5 mm, acute. *Fruit* elliptic or elliptic-oblong, 14–15.5 × 6–8.5 mm, c.1 mm thick, wing 2–2.5 mm wide, glabrous, smelling resinous, ribs on mericarp filiform (Fig. 3).

Fruit anatomy: dorsal ribs 3–4, elliptic; vallecular vittae (1–)2–3(–4), unequal, elliptic; commissural vittae 10–11, unequal, elliptic or circular; wing without appendix at base of commissural surface, lignified cells extend to end of wing with deviation towards commissural surface (Fig. 2).

*Distribution.* Iran: Kerman province (Fig. 4).

*Additional specimen examined.* IRAN. **Kerman province:** South of Kerman, Baft, Kuh-e Lalezar to Gholle Shah, 3000–3800 m, 30 v 1974, *Mousavi & Tehrani* 33749 (IRAN).

The morphological and fruit anatomical differences between *Ferula hezarlalezarica*, *F. hindukushensis* and *F. koso-poljanskyi* are presented in Tables 1 and 2.

TABLE 1. Morphological comparison of *Ferula hezarlalehzarica*, *F. koso-poljanskyi* and *F. hindukushensis*

Character	<i>F. hezarlalehzarica</i>	<i>F. koso-poljanskyi</i> *	<i>F. hindukushensis</i> †
Terminal leaf segment: shape, division, dimensions, density	4–5 pinnate-ternate, 4.5–6.5 × 0.5 mm, crowded	4 pinnate-ternate, up to 6 × 0.5 mm, crowded	5–6 pinnate-ternate, 15–50 × 0.5 mm, not crowded
Upper leaf sheath shape	Not swollen	Not swollen	Swollen
Stem colour	Yellow	Greyish-green	Yellow
Fruit: dimensions (mm)	14–15.5 × 6–8.5	15 × 6–7	14–20 × 6–11
Length of peduncle of central umbel (cm)	1–2	Sessile	Distinctly more than 2

\*Data taken from an image of the specimen in LE and a description in Korovin (1947).

†Data taken from holotype and isotype specimens in KYO and descriptions in *Flora Iranica* (Chamberlain & Rechinger, 1987) and the *Flora of West Pakistan* (Nasir, 1972).

In *Flora Iranica* two other species, *Ferula oopoda* (Boiss. & Buhse) Boiss. and *F. badghysi*, were also regarded as close relatives of *F. hindukushensis* (Chamberlain & Rechinger, 1987). Images and published descriptions of these species have also briefly been studied and they were found to differ from *Ferula hezarlalehzarica* in the diameter of the terminal leaf segment (much wider) and the width of the wings on the mericarps (much narrower).

*Ferula hezarlalehzarica* can be incorporated into the existing *Flora Iranica* key to *Ferula* as follows:

- 23a. Terminal umbel with 20–27 rays, mericarp 14–20 mm long \_\_\_\_\_ \*23  
 23b. Terminal umbel with 6–15 rays, mericarp 8–12 mm long \_\_\_\_ existing couplet 24  
 \*23a. Length of peduncle in central hermaphrodite umbel short, 1–2 cm, leaf segments crowded, sheath of stem leaf not swollen, commissural vittae 10–11 \_\_\_\_\_ *F. hezarlalehzarica*

TABLE 2. Comparison of fruit anatomy between *Ferula hezarlalehzarica* and *F. koso-poljanskyi*

Character	<i>F. hezarlalehzarica</i>	<i>F. koso-poljanskyi</i> *
Number of dorsal ribs	3–4	3
Number of dorsal vittae in valliculae	(1–)2–3(–4)	3
Number of commissural vittae	10–11	6–8
Wing: width (mm), appendix, ribs	2–2.5, without appendix at base, lignified cells extend to tip of wing with deviation towards commissural surface	Not seen, with appendix at base, lignified cells extend to tip of wing with deviation towards dorsal surface

\*Data taken from Korovin (1947).

- \*23b. Length of peduncle in central hermaphrodite umbel distinctly more than 1–2 cm, leaf segments not crowded, sheath of stem leaf swollen, commissural vittae 4–6 \_\_\_\_\_ *F. hindukushensis*

Since the new species is reported only from the adjoining Hezar and Lalehzar mountains of Kerman province it is endemic to Iran (Fig. 4). Conservation of this area is, therefore, vital.

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