

## *Ferula parva* Freyn & Bornm. (Apiaceae): A Contribution to an Enigmatic Species from Turkey

Mehmet SAĞIROĞLU\*, Hayri DUMAN

Gazi University, Faculty of Science and Literature, Department of Biology, 06500 Teknikokullar, Ankara - TURKEY

Received: 30.09.2005

Accepted: 02.06.2006

**Abstract:** *Ferula parva* Freyn & Bornm. was first collected from Central Anatolia (Turkey B5 Kayseri-Yozgat in declivibus apricis inter Kayseri et Yozgat, 1890) by Bornmüller. No specimens belonging to this species have been collected since the type and Andrasovszky specimens. When the *Flora of Turkey* was being prepared, Dr. H. Peşmen considered this species imperfectly known; therefore, it was not included in the keys. In the present paper, diagnostic morphological characters are discussed. In addition, its ecology, conservation status, SEM photographs of the surface of mericarps, and chromosome numbers are presented.

**Key Words:** Taxonomy, Umbelliferae, Anatolia, Chromosome number

### Türkiye'den bilmece gibi bir tür olan *Ferula parva*'ya katkılar

**Özet:** *Ferula parva* Freyn & Bornm. ilk olarak Kayseri ve Yozgat çevresinden Bornmüller tarafından 1890 yılında toplandı. Tip ve Andrasovszky örneğinden sonra bu türe ait günümüze kadar hiç örnek toplanamadı. Türkiye ve Doğu Ege Adaları Florası hazırlanırken, Dr. Hasan Peşmen tarafından bu tür iyi bilinmeyen türler arasına kondu ve tür ayırım anahtarında yer almadı. Bu makalede *F. parva*'nın morfolojik karakterleri tartışıldı. İlave olarak ekolojisi, tehlike kategorisi, kromozom sayısı ve meyve yüzeyi SEM fotoğrafları da verildi.

**Anahtar Sözcükler:** Taksonomi, Umbelliferae, Anadolu, Kromozom sayısı

### Introduction

Samples belonging to *Ferula parva* Freyn & Bornm. were collected in June 1890 by Bornmüller for the first time during one of his botanical trips in Anatolia (Peşmen, 1972). It was published by Freyn & Bornm. in Öst. Bot. Zeitschr in 1892. After that, some specimens of the same species were collected by Andrasovszky from C2 Karaman in 1911. These specimens were also identified by Bornmüller as *F. parva*. It has not been collected since then. When the *Flora of Turkey* was being prepared by H. Peşmen (1972), he considered this species imperfectly known; therefore, it was not included in the keys. The specimens collected by Bornmüller were lacking basal leaves and fruits and, although the specimens were not adequate for description, the authors distinguished this species easily from *F. rigidula* DC. with its shorter stem,

fewer-rayed umbels and shorter leaf lobes. A comprehensive revisional study on Turkish *Ferula* were conducted by the authors of this paper since 2000, and a large number of new specimens have been collected from all over Turkey. Some interesting specimens were collected from C2 Karaman and B5 Kırşehir vicinity by the authors in August 2000. These specimens looked like *F. parva* at first glance as they had small and thin stems, ovate sheaths and a few rays. During subsequent visits, adequate flowering and fruiting materials were collected. After a detailed examination of the account of *Ferula* in the *Flora of Turkey* (Peşmen, 1972) and Peşmen's PhD thesis (Peşmen, 1974), it was clear that the specimens were quite different from the other Turkish *Ferula* species. The specimens were also cross-checked with the *Ferula* accounts from others Floras, such as *Flora Iranica*

\*E-mail: m\_sagiroglui@yahoo.com

(Chamberlain & Rechinger, 1987a, 1987b), *Flora Palaestina* Zohary (1966a, 1966b), *Flora Syria* (Mouterde 1986a, 1986b), *Flora Europaea* (Cannon, 1968), *Flora of the USSR* (Korovin, 1951), and *Flora of Cyprus* (Meikle, 1977). They were also compared with materials at GAZI, ANK, HUB herbaria and the type

specimens and Androsovszky specimens in B herbarium, confirming that our specimens were representatives of *F. parva* (Figure 1). A map showing the distribution of both *F. parva* and a related species, *F. rigidula*, is provided (Figure 2).

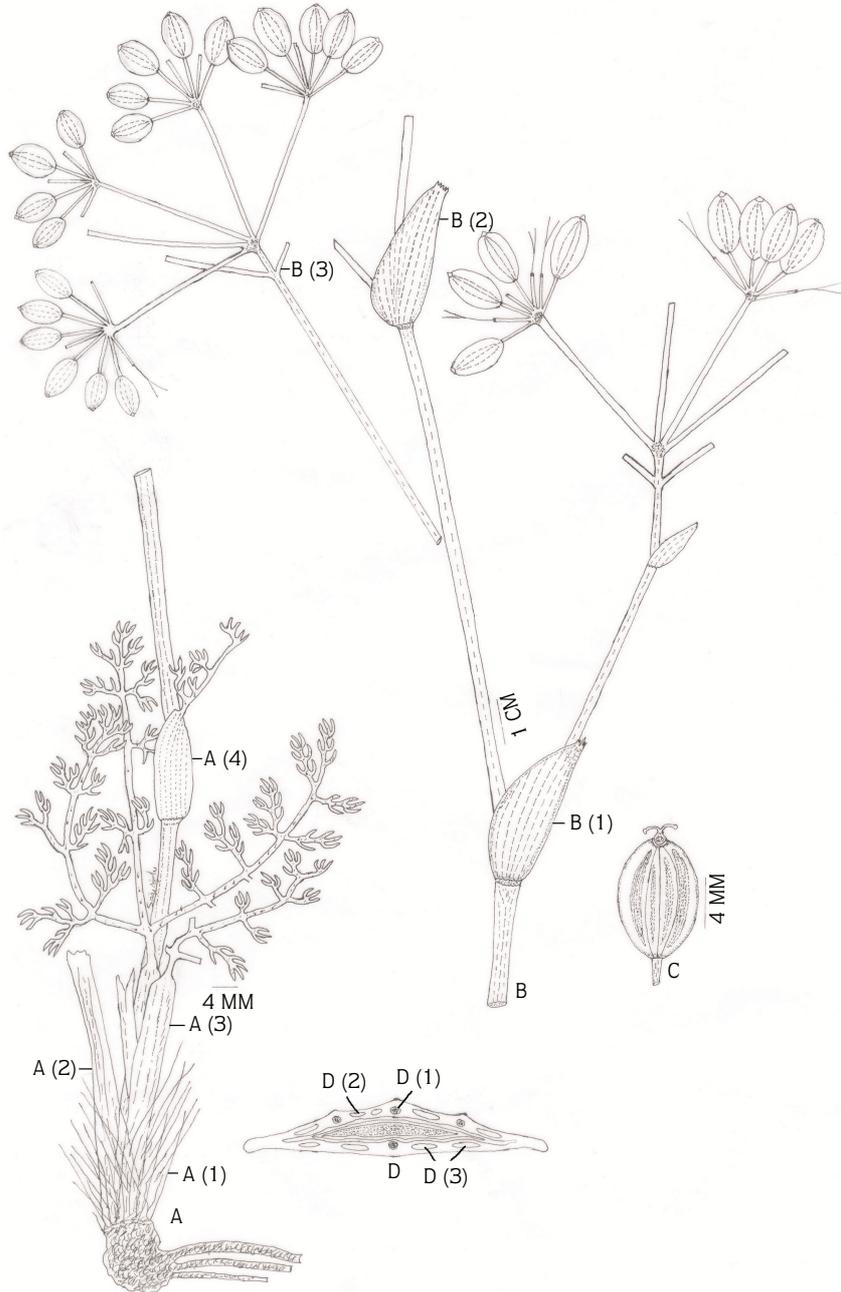


Figure 1. *Ferula parva* Freyn & Bornm. A: Lower part of plant, A (1): fibrous collar, A(2): ancient stem, A(3): basal leaves, A(4): lower sheath. B: Middle and upper part of plant, B(1): middle sheath, B(2): upper sheath, B(3): upper of plant. C: Dorsal surface of mericarp. D: Mericarp cross-section, D(1): vascular bundle, D(2): dorsal vittae, D(3): commissural vittae, (M.Sağiroğlu 1812, GAZI).

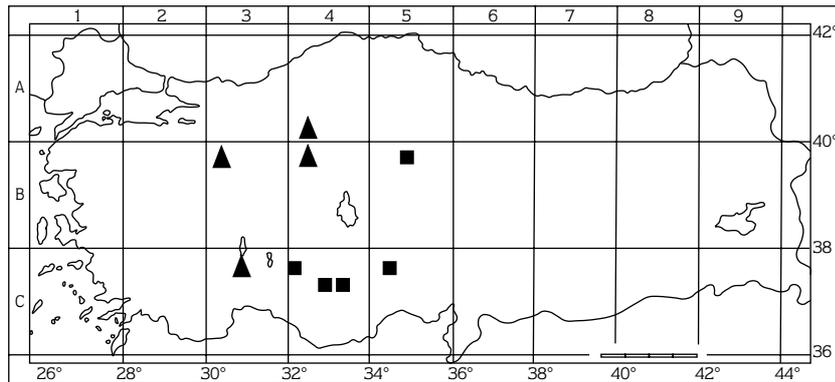


Figure 2. *Ferula parva* Freyn & Bornm. (■), *F. rigidula* DC. (▲).

The results obtained in this study are given in the following order: general description and distribution, habitat and ecology, SEM images showing the micromorphological features of the mericarps' surface (Barthlott, 1998), IUCN Red List Category (IUCN, 2001), chromosome number and discussion of the results. The authors of plant names are given according to Brummitt & Powell (1992).

### Materials and Methods

Samples belonging to *F. parva* were collected from 5 different localities. Each locality was visited at least twice during the flowering and fruiting periods of the plant, and the population state of the species in these localities was determined.

In the chromosome study, mature mericarps were washed with water and kept in a freezing compartment for 7-15 days. They taken out of the freezing compartment, placed in petri dishes and kept in a refrigerator. They were left to sprout at + 4 °C for 15-30 days. With the examinations conducted on the preparations of root tips, chromosomes of the cells in the metaphase stage were counted and photographed.

Mericarps representing the general fruit structure were selected from the samples with fruits. Appropriate mericarps belonging to *F. rigidula*, the closest species to *F. parva*, were placed on prepared stubs; surface photographs of the mericarps were taken with a JSM 5600 SEM. Voucher specimens, collected during the flowering and fruiting periods, are deposited in GAZI herbarium.

### Results

*Ferula parva* Freyn & Bornm. in öst. Bot. Zeitschr. 42: 121 (1892).

**Type:** Turkey B5 Kayseri-Yozgat in declivibus apricis inter Kayseri et Yozgat, 1400 m, 23 vi 1890, Bornmüller 2213! Photo GAZI.

Perennial, polycarpic herbs. Rootstock oblong, 0.7-1.5 cm diam.; fibrous collar dense, 1-3 cm. Stem 20-50 (-80) cm, terete, weakly sulcate, glabrous, 1-3 (-5) mm diam. at the base. Basal leaves triangular-ovate in outline, 8-18 (-25) x 4-8(-10) cm; petioles 1-5 cm long, sparsely scabrid; lamina 3-4-pinnate; ultimate segments linear-lanceolate, (0.3-) 0.5-2 (-3) x 0.3-1 mm, sometimes involute, scabrid, acute to acuminate. All sheaths amplexicaul, coriaceous, sometimes violaceous, weakly sulcate, glabrous; lower sheaths cylindrical, 1-4 x 0.4-1 cm, weakly inflated, lamina reduced, 1-2-pinnate, sparsely scabrid, sometimes absent; middle and upper sheaths ovate, 1.5-5 x 0.5-2.5 cm, broadly inflated, lamina usually absent, Inflorescence very lax paniculate-corymbose, lateral branches short, central umbels 0.5-5 cm or sessile, lateral umbels usually 1-2, up to 10 cm, usually sterile, bract-like sheath present or absent at the base of lateral umbel; rays (2-) 3-6 (-8), 1-3 (-4) cm in fruiting time, ± equal, lax; umbellules 6-12-flowered, fruiting pedicels 5-10 (-12) mm. Bracteoles 2-4, ovate-lanceolate, 1-2 mm, glabrous, caducous. Sepals obsolete. Petals yellow, 1.5 mm, glabrous, deflexed. Mericarps elliptic-oblong, rarely obovate, 6-12 x 4-7 mm, light brown when ripe; dorsal ridges filiform, lateral wings 0.5-1 mm wide; stylopodium conical-terete; style usually persistent; stigma capitate; dorsal vittae 1-2 per vallecule, commissural vittae 2-6.

**Flowering time:** July-August.

**Habitat:** Stony rocky places, slopes, 900-1400 m.

**Chromosome number:**  $2n = 22$  (M.Sağiroğlu 1812, Figure 3)



Figure 3. Somatic metaphase chromosome of *F. parva*. Scale bar = 10  $\mu$ m.

#### Specimens examined

-B5 Kırşehir: between Yeşilyurt and Dağ çiftliği, 1400 m, 22.6.1994, Hamzaoğlu 1553 (ADO); *ibid.*, 29.6.2001, M.Sağiroğlu 1733 & Hamzaoğlu (GAZI); *ibid.*, 29.8.2002, M.Sağiroğlu 2241 (GAZI); Kırşehir: Çayağzı town, Höyüktepe, 1320 m, 29.6.2001, M.Sağiroğlu 1723 (GAZI).

-C4 Konya: Karaman-Mut road 6 km, 900 m, 28.05.2001, H.Duman 8573 (GAZI); *ibid.*, 20.06.2001, M.Sağiroğlu 1695 & Akgül (GAZI); *ibid.*, 16.09.2001, M.Sağiroğlu 1812 (GAZI); *ibid.*, 20.7.2002, M.Sağiroğlu 2161-A (GAZI); Konya: Hadim-Beyreli road 13 km, 1200 m, 20.10.2000, H.Duman 8449 & Z.Aytaç (GAZI); *ibid.*, 11.07.2001, M.Sağiroğlu 1775; *ibid.*, 16.09.2001, M.Sağiroğlu 1815 (GAZI); Konya: Hadim-Karaman road 53 km, 1000 m, 20-6.2003, M.Sağiroğlu 2352 (GAZI); Konya: Duada da. nr. Karaman, 14.vii.1911, Androsovszky 547 (B, photo GAZI).

-C5 Konya: Ereğli, Halkapınar-Yayıklı village, 1200 m, 21.9.2002, M.Sağiroğlu 2278(GAZI).

*F. rigidula* DC.

-A4 Ankara: Çubuk dam, 800 m, 14.06.2001, M.Sağiroğlu 2141 (GAZI); Ankara: Çubuk dam, 9.5.1995, M.Coşkun (AEF); Ankara: Hacikadin stream, 940 m, 13.7.1945 B.Kasaplıgil (ANK).

-B3 Kütahya: Dumlupınar, between Arpagediği and Kozluören, stream side, ca. 1350 m, 29.7.1982, T.Ekim 5526 (ESSE).

-B4 Ankara: Haymana-İkizce village, Kabasınan hill, 1300 m, 06.07.2004, BŞ 2290 (GAZI).

-C3 Isparta: Eğridir, Yaka village-Kapız stream, 1700-1500 m, *Pinus nigra* forest, 1.7.1974, H.Peşmen & A.Güner 1641(HUB); Isparta: Eğridir, Anamas-Yakaavşar village, Kovayavuzun yüzü, calcareous rocky, c. 1400 m, 3.6.1974, A.Güner 1426 & H.Peşmen (ANK).

#### Conservation status

*F. parva* is an endemic species restricted to Central Anatolia, known from 5 localities. It grows on stony rocky places and slopes. According to the IUCN Red List Category (2001), this species should be classified as vulnerable (VU), because it is known from 5 localities, the estimated "area of occupancy" is less than 5 km<sup>2</sup> (criterion D2) in each population, although population size is estimated to be fewer than 1000 mature individuals in each locality (criterion D1).

**Ecology:** This species grows at 650-1100 m, on stony slopes and roadsides with *Sideritis bilgerena* P.H.Davis (endemic), *S. libanotica* subsp. *violescens* P.H.Davis (endemic), *Centaurea isaurica* Hub.-Mor. (end.), *Tanacetum argentea* subsp. *flabellifolium* (Boiss. & Heldr.) Grierson (end.), *Vicia cracca* subsp. *stenophylla* Vel., *Doronicum cacaliifolium* Boiss. & Heldr., *Achillea aleppica* subsp. *zederbaueri* (Heyek) Hub.-Mor. (end.), *Astragalus zederbaueri* Stadlm., *Allium scabrifolium* Boiss. (end.), and *Helianthemum* Adans. sp.

#### Discussion

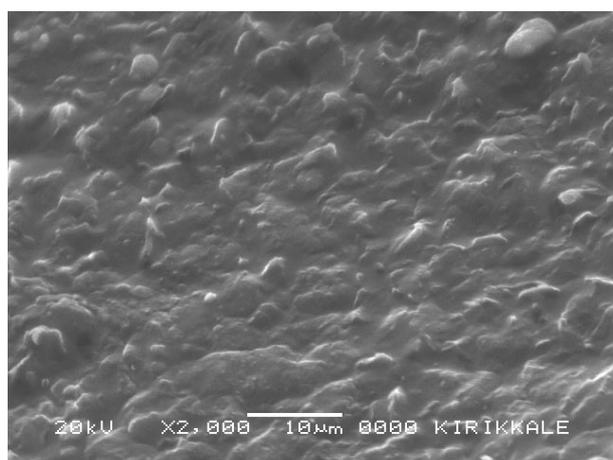
*F. parva* has not been collected since the type and Androsovszky specimens. With this study, problems related to the taxonomy of this species were solved. *F. parva* is a very distinct species, with no obvious allies in Turkey, Iran, USSR, and Europe, due to its smaller and thin stems, smaller and 3-4-pinnate basal leaves, ovate and coriaceous sheaths, lax paniculate-corymbose inflorescence and fewer-rayed umbels. *F. parva* is superficially similar to *F. szowitsiana* DC., *F. communis* L., and *F. tingitana* L., with their 3-4-pinnate basal leaves.

*F. parva* differs from them with its smaller and thin stems, and coriaceous sheaths. In addition, the habit of *F. parva* is similar to that of *F. rigidula*. It differs from *F. rigidula* in having 3-4-pinnate basal leaves and ovate sheaths. A more detailed comparison of the species with related species is given in Table 1. With the examinations conducted on the preparations of root tips, chromosomes of the cells in the metaphase stage were counted and their photographs were taken. *F. parva* has a somatic chromosome number of  $2n = 22$  (Figure 3); the surface

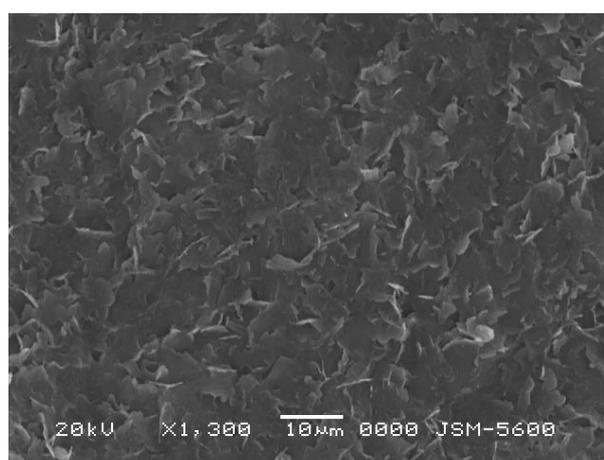
of mericarps has granules (except for dorsal ridges and lateral wings); however, *F. rigidula* has lax scales (Figure 4).

#### Acknowledgements

We wish to thank the curator of B herbarium and Dr. Gerald Parolly for their assistance in providing photos of the type specimen, and Dr. Ceyda S. Kılıç for corrections to the English text. This study was supported by Gazi University (Project no: 05/ 2003-62).



(A)



(B)

Figure 4. SEM photographs A: *F. parva* Freyn & Bornm. (M.Sağiroğlu 1812), B: *F. rigidula* DC. (M.Sağiroğlu 2141)

Table 1. Comparison of the diagnostic characters of *Ferula parva* Freyn & Bornm. and *F. rigidula* DC.

Characters	<i>F. Parva</i>	<i>F. rigidula</i>
Base of stem	1-3(-5) mm diam.	(0.4-)8-1.5 mm diam.
Stems	20-50 (-80) cm long	(50-) 70-130 cm long
Basal leaves (in outline)	8-18(-25) x 4-8 (-10)cm	15-55 x 10-35 cm
Lamina of basal leaves	3-4-pinnate	5-6-pinnate
Ultimate segments of leaves	(0.3-) 0.5-2 (-3) mm long	(1-) 2-5 (-8) mm long
Sheaths	ovate, 1.5-5 x 0.5-2.5 cm	cylindric-oblong 3-12 x 1.5-3 (-4) cm
Inflorescence	very lax paniculate-corymbose	paniculate-corymbose
Ray of umbels	2-6(-8) and 1-3(-4) cm long	(4-) 6-15 (-20) and 2-6 cm long
Lateral umbels	sterile	fertile
Lateral wings of mericarps	0.4-0.9 mm wide	1-2 mm wide

## References

- Barthlott W, Neinhuis C, Cutler FD, Meusel I, Theisen I & Wilhelmi H (1998). Classification and terminology of plant epicuticular waxes, *Botanical Journal of the Linnean Society*, 126: 237-260.
- Brummitt RK & Powell CE (1992). *Authors of Plant Names*. Kew: Royal Botanic Gardens: Kew.
- Cannon JFM (1968). *Ferula* L. In: Tutin TG, Heywood VH, Burges NA, Valentine DH, Walters SM & Webb DA, eds. *Flora Europaea*, Vol. 2. 358-359, Cambridge: Cambridge University Press.
- Chamberlain DF & Rechinger KH (1987a). *Ferula* L. In: Rechinger KH, ed. *Flora Iranica* 387-425, Wien.
- Chamberlain DF & Rechinger KH (1987 b). *Ferula* L. In: Rechinger KH, ed. *Flora Iranica* 317-384, Wien.
- IUCN (2001). *IUCN Red List Categories*, Version 3.1. Gland and Cambridge: IUCN Species Survival Commission.
- Korovin EP (1951). *Ferula* L. In: Schischkin BK, ed. *Flora of the USSR*. Vol. XVII (Umbelliflorae): 44-101. Moscow, Leningrad: Akademii Nauk SSSR.
- Meikle RD 1977. *Ferula* L. In: Meikle R.D, ed. *Flora of Cyprus*, Vol. 1, 752-754, Kew: Bentham-Moxon Trust and Royal Botanic Gardens.
- Mouterde SJ (1986a). *Ferula* L. In: El-Machreq D, ed. *Nouvelle Flore du Liban et de la Syrie, Tome II Texte*, 639-643, Beyrouth.
- Mouterde SJ (1986b). *Ferula* L. In: El-Machreq D, ed. *Nouvelle Flore du Liban et de la Syrie, Tome Second, Atlas*, 298-302 Beyrouth.
- Peşmen H (1972). *Ferula* L. In: Davis PH, ed. *Flora of Turkey and the East Aegean Islands*, Vol. 4. 440-453, Edinburgh: Edinburgh University Press.
- Zohary M (1966a). *Ferula* L. In: Zohary M, ed. *Flora Palaestina* (text), 435-439 Jerusalem: Israel Academy of Sciences and Humanities.
- Zohary M (1966b). *Ferula* L. In: Zohary M, ed. *Flora Palaestina* (plate), 629-637 Jerusalem: Israel Academy of Sciences and Humanities.