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DISTRIBUTION OF FERULA FOETIDA (BUNGE) REGEL IN CENTRAL ASIA

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Annotatsiya. Adabiyotlar tahlili va yirik gerbariy fondlari (TASH, LE, MW, MANG, P) hamda online axborot saytlari (GBIF, iNaturalist, Plantarium) yordamida to’plangan tur haqidagi gerbariy va fotosuratlarga taalluqli 472 ta ma’lumotlar yillar kesimida tahlil qilindi, samarali kollektorlar aniqlandi, yirik gerbariy bazalari tadqiq etildi. Ilk bor Markaziy Osiyoda ushbu turni tarqalish xaritasi va mamlakatlar kesimida ma’lumotlari aks etgan konspekti keltirildi.

Kalit so’zlar: Ferula foetida, gerbariy, kollektor, geografik tarqalish.

Аннотация. На основе анализа литературы, крупных гербарных фондов (TASH, LE, MW, MANG, P) и онлайн-информационных сайтов (GBIF, iNaturalist, Plantarium) было проанализировано 472 гербарных образцов и фотографических данных о видах по годам, выявлены эффективные коллекторы, исследованы крупные гербарные базы. Впервые представлена карта распространения этого вида в Центральной Азии и конспект с данными по странам.

Ключевые слова: Ferula foetida, гербарий, коллектор, географическое распространение.

Abstract. The analysis of literature, large herbarium collections (TASH, LE, MW, MANG, P), and online information resources (GBIF, iNaturalist, Plantarium) was conducted to examine 472 herbarium specimens and photographic records of the species. The data were analyzed by year, effective collectors were identified, and major herbarium databases were investigated. For the first time, a distribution map of this species in Central Asia and a synopsis of its occurrence data by country are presented.

Keywords: Ferula foetida, herbarium, collector, geographical distribution.

Introduction. The Central Asia is considered one of the hotspot centers for the Apiaceae family. According to the latest data, the flora of Central Asia includes more than 459 species from the Apiaceae family, of which over 204 species and 16 genera are regional endemics (Pimenov, 2020). Ferula (Ferula L.) is one of the largest genera within the Apiaceae family, covering vast areas from the Mediterranean and North and East Africa to Central Siberia, the Himalayas, and East Asia, comprising over 227 species (POWO, 2024). The highest taxonomic diversity of the genus is mainly concentrated in the Irano-Turanian region, with Central Asia being a leading area with nearly 100 species (Pimenov, 2020). Most species of this genus are widely used as valuable medicinal plants. Among medicinal plants belonging to the Apiaceae family, species of this genus attract significant interest. In the flora of Uzbekistan, 47 species of the genus are distributed (Sennikov, 2023), among which Ferula tadshikorum, F. sumbul, F. foetida, F. varia, and F. tenuisecta are of high economic importance and valuable medicinal plants (https://planta-medica.uz/). The increasing demand for raw materials from these species in Uzbekistan is reflected in requests from resource users over the past three years. Specifically, the average annual demand for Ferula tadshikorum raw material is 110.0 tons, F. foetida – 150.0 tons, F. tenuisecta – 25.0 tons, and F. varia – 11.0 tons. Notably, these figures have increased by an average of 40% in recent years. Furthermore, this study aligns with the implementation of the tasks set in several governmental resolutions of Uzbekistan, including: Presidential Resolution PQ-4670 (April 10, 2020) on "Measures for the conservation, cultivation, processing, and rational use of wild medicinal plants." Presidential Resolution PQ-4901 (November 26, 2020) on "Measures to expand scientific research on the cultivation, processing, and seed production of medicinal plants." While preparing this article, we set the following objectives: a) A critical analysis of available data from herbarium collections and online databases. b) Mapping the spatial distribution of the species based on geo-referenced data. c) Creating a geographic distribution synopsis at the national level.

Materials and methods. To visualize the geo-referenced herbarium specimens available in the database on a grid-based map, ArcGIS v10.6.1 was used. The SDMtoolbox v10.9 was employed to integrate species diversity indices and collection density indicators into Microsoft Excel. To ensure the integration of the grid-based map with mobile applications (Tracklia, Google Earth), shape files were converted into KML and KMZ formats using ArcGIS v10.6.1. JASP v14 was used for statistical analyses. The database was compiled using herbarium collections from TASH, MW, and LE, materials uploaded to the GBIF portal (E, STU, K, K, UCB, P, MANG), as well as data from online platforms (plantarium.ru, iNaturalist) and herbarium specimens collected during field research.

Results

Taxonomic status: Ferula sect. *Scorodosma* (Bunge) Boiss. Fl. Orient. 2: 983 (1872). — *Scorodosma* Bunge, Delect. Sem. Horti Dorpat: 3 (1846). — *Ferula* subgen. *Scorodosma* (Bunge) Drude in Engler & Prantl, Pflanzenreich 3(8): 230 (1898).

Type: *Ferula foetida* (Bunge) Regel.

Ferula foetida (Bunge) Regel — **Ферула вонючая** — **Sassiq kovrak**

https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:842277-1

https://www.ipni.org/n/842277-1

in Acta Horti Petropolit. 5(2): 592 (1878); Пименов в Опр. раст. Ср. Аз. 7: 290 (1983); Пименов, Клюйков, Зонт. Кирг.: 176 (2002); Пименов in Turczaninowia 23(4): 169 (2020). — *Scorodosma foetida* Bunge, Delect. Sem. Horti Dorpat.: [3] (1846).

Type: Узбекистан. In deserto aralensi specimen unicum florens, et pauca semina collegit b. Lehmann [Im der Lehmsteppe zwischen Tschakyr-Ata und Nasarbai-Kuduk], 12.04.1842, Lehmann 549 (лектотип LE!, выбран Пименовым в Бот. журн. 101(10): 1232 (2016); изолектотип P [P02272144, P02272145]).

— *Ferula assa-foetida* auct. non L.: Boiss., Fl. Orient. 2: 994 (1872); Korovin, Gen. Ferula Monogr. Ill.: 21 (1947); Коровин во Фл. СССР 17: 73 (1951); Коровин во Фл. Узбекистана 4: 409 (1959).

Botanical description. A monocarpic perennial plant with a garlic odor, reaching a height of 100–180 cm. The roots are vertical, with an entire caudex densely covered by fibrous remnants of withered leaf petioles. The stem is single, thick, round in cross-section, 4–5 cm in diameter, glabrous, and branched in the upper part. The leaves are soft and wither early; the upper surface is usually glabrous, while the lower surface is covered with soft hairs. Basal leaves have short, thick petioles. The leaf blades are up to 50–60 cm long and 40–50 cm wide, broadly triangular, and divided into secondary triangular segments. The basal primary segments on petioles are 4–5 cm long. The ultimate leaf lobes are 3–15 cm long and 0.7–5 cm wide, elongated, lanceolate, narrowly lanceolate, or almost linear, tapering into petioles, with entire or serrated-cut margins and rounded tips. Stem leaves are elliptical, papery, soft, downward-curved, and hairy, with sheaths; the uppermost leaves are reduced in both petioles and blades. The central umbels are 9–20 cm in diameter, nearly spherical, with 12–22 rays, almost sessile. The rays are nearly equal in length, up to 5 cm. Lateral umbels are 4–15 cm in diameter, on long peduncles, grouped in clusters of 3–7 beneath the central umbel. The umbels lack involucral bracts and bracteoles. The umbellets are hairy, 3 cm in diameter during flowering, containing 12–15 flowers, and 4–5 cm in diameter during fruiting. The pedicels are short, 3 mm long, thickened, and spaced apart. The calyx teeth are indistinct. The petals are pale yellow, 2–3.5 mm long, oval, broad, and glabrous. The stylopodium is cup-shaped, with styles 1.3 mm long, curved backward onto the mericarp. The fruits are large, 15–26 mm long and 10–14 mm wide, obovate, oval, or nearly round, either hairy or glabrous. 2n = 22 (Figure 1).

Phenology. Flowering III–VI; Fruiting V–VI.

Ecology: Occurs in sandy, loess, and loess-gravel foothill plains, ancient lake terraces, stabilized sands, gravelly deposits, and sandy soils under mixed rock formations. It grows in flat and foothill deserts, occasionally in loess, fine soil, fine soil-stony, and variegated mountain slopes, at elevations below 800 meters. The species often dominates large areas [1,2].

Analysis and results

Analysis of herbarium specimens: The analysis of the collection dynamics of herbarium specimens showed that the highest collection intensity occurred between 1921 and 1940. This period coincides with the peak of botanical research in Central Asia and the publication of national floras. Due to the development of the information age and the emergence of digital online platforms, the distribution data of species in the 21st century are being uploaded to information websites such as iNaturalist, plantarium.ru, and GBIF (Global Biodiversity Information Facility). Georeferenced data collected from 61 records between 2001 and 2024 confirm this trend.

During the analysis of herbarium specimens, it was determined that the largest collections, in terms of the number of stored specimens and records, are held in the TASH, MANG, MW, P, LE, and UCB herbarium repositories. In terms of the number of collectors, the leading repositories are TASH, MW, P, and LE (Table 1).

Figure 1. Distribution of Ferula foetida in Nurota BGR A. Basal leaves B. General inflorescence C. Umbel D. Umbellule (Photo by Baxtiyor Karimov, 16.04.2024)

Among the most productive collectors of this species, the herbarium specimens stored in the MANG herbarium fund, collected by Ishmuratova M.Y. and Kopbayeva G.B., can be noted. Additionally, the herbarium specimens collected by Pimenov and colleagues (Pimenova M.E.,

Vasileva M.G., Baranova Y.V., Klyuykov E.V., Boryayev K.I., Tomkovich T.B., Qurbonov A.R.) hold leading positions in the number of records compared to other collectors (Table 2).

Table 1.

Analysis of herbarium collections storing specimens of the species

	Existing herbarium databases and digital information sites	Number of herbarium	Number of	Number of collectors	Collection years
1	The National Herbarium of Uzbekistan (TASH)	182	97	58	1911-2017
2	Herbarium fund of the Mangyshlak experimental botanical garden (MANG)	103	8	2	2016-2020
3	Plantarium: Plants and Lichens of Russia and Adjacent Countries: An Open Online Atlas and Plant Identification Guide	100	42	19	1985-2023
4	Lomonosov Moscow State University (MW)	35	22	14	1924-2015
5	P Herbarium - MNHN - Museum national d'Histoire naturelle	16	8	6	1842-1926
6	Herbarium of Higher Plants of the V. L. Komarov Institute of Botany of the Russian Academy of Sciences (LE)	14	13	16	1882-1971
7	UCB University of California at Berkeley	12	1	2	1900
8	iNaturalist Research-grade Observations	4	4	1	2022-2024
9	E Herbarium - Royal Botanic Garden Edinburgh	2	2	2	1924-2018
10	K Royal Botanic Gardens, Kew	2	1	1	1924
11	S Department of Botany - Swedish Museum of Natural History	1	1	1	1924
12	STU Staatliches Museum für Naturkunde Stuttgart	1	1	1	1900

Table 2.

Collectors who have effectively collected herbarium specimens

	Full name	Number herbarium mens	Num of ls	Collection	Available database
1	Ishmuratova M.Y., ayeva G.B.	103	8	2016-2020	MANG
2	Tarasevich V.	25	5	1936	TASH

3	Pimenov va boshq.	23	16	1971-2015	TASH, MW
4	Vvedenskiy A.	13	6	1923-1953	TASH
5	Bornmyuller	13	1	1900	UCB, P
6	Sovetkina, Poljakova	11	2	1918-1924	TASH, MW, K, S, P,
7	Abolin R.I.	11	2	1926	TASH
8	Gomolitskiy P.	8	3	1927-1941	TASH, MW
9	Demurina E.	8	3	1932-1937	TASH
10	Korovin E.P.	7	1	1914	TASH
11	Linchevskiy I.	7	3	1928-1930	TASH
12	Sintenis Paul	7	2	1900	STU, UCB, P
13	Beshko N.Y.	6	2	2011-2017	TASH
14	Paziy V.	6	2	1945	TASH
15	Mokeeva E.A.	6	3	1914-1924	TASH
16	Dimo N.A., Sprigin I.I., a I.A.	6	3	1911-1916	TASH
17	Nabiyev M.M.	5	3	1952-1967	TASH
Online platforms					
18	Davkayev Evgeniy	29	7	2010-2013	Plantarium
19	Beshko N.Y.	14	9	2011-2021	Plantarium
20	Gaziyev Alim	6	4	1985-2008	Plantarium

When analyzing the collection of herbarium specimens over 20-year periods, the years 1901–1980 were found to be dominant. This can be explained by the publication periods of the former Soviet Union (USSR) Central Asian plant identification guides and local floras.

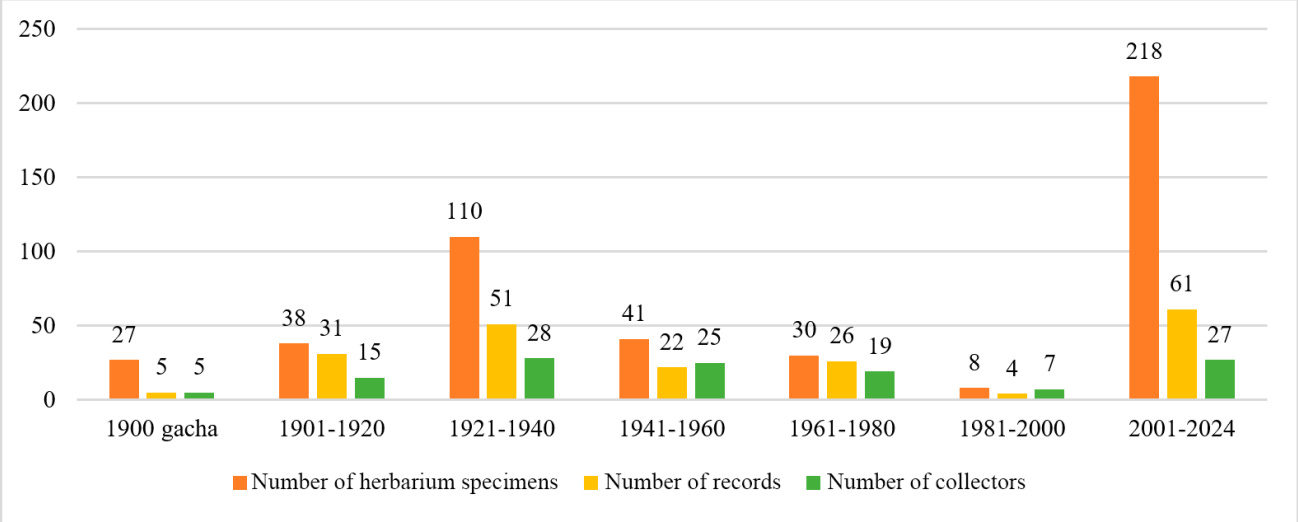

Figure 2. Dynamics of herbarium specimen collection

A total of 472 herbarium specimens were collected from herbarium collections and digitized information websites. Among them, 2 specimens (0.42%) lacked label information, 6

specimens (1.27%) were missing the collection year, 16 specimens (3.38%) had no collection month, 26 specimens (5.5%) lacked the collection day, and 12 specimens (2.54%) did not have collector information. Due to these issues and other influencing factors, georeferencing could not be performed for 11 specimens (2.33%). As a result, a distribution map of the species across Central Asia was developed. It was determined that the primary distribution area of this species is the Turan Province, with Uzbekistan being the region where the highest number of herbarium specimens were collected (Figure 3).

Geographical distribution overview of herbarium specimens and digitized photographic materials by country in Central Asia

Kazakhstan: Chu Ili mountain, unknown data, *Titov, Ioffe* (TASH); unknown place, 1886, *Capus* (P); Kempir-Darbata, 3.05.1914, *Mokeeva* (TASH); Syrdarya, Aris, 2.05.191, *Sovetkina* (TASH); Golodnaya step, st. Cherneva, *unknown collector 2053* (TASH); Alekseyevka, Golodnaya step, *Mokeeva* (TASH); Chimkent, Darbat, 29.05.1923, *Simonova 243* (TASH); Chimkent, Kempir-Darbat, 3.05.1924 *Mokeeva* (TASH); river Chu, Khan-tau, 2.07.1926, *Abolin 368* (TASH); Syr-darya, 28.04.1926, *unknown collector* (P); Aris, st. Kara-Kungir, 21.09.1936, *Gomolitskiy 600* (TASH); Chulak-Kurgan, 6.05.1939, *Pavlov 176* (MW); Chu-Iliyskie mountain, Almalisay, 6.05.1951, *Pavlov 61* (MW); st. Vrevskaya, 21.05.1953, *Vvedenskiy 1302* (TASH); Golodnaya step, krepost Akcha, 23.04.1959, *Maylun, Akjigitova 21* (TASH); Keless, 15.04.1962, *Tayjanov* (TASH); Chimkent, Mansurotasay, 28.04.1975, *Pimenov, Pimenova, Baranova, Klyuykov 88* (MW); Chimkent, st. Montaytash, 24.05.1976, *Pimenov, Klyuykov, Baranova, Vasilyeva 147* (MW); Chu-Ili mountain, Khan-tau, 27.04.1977, *Pimenov, Baranova, Klyuykov 93* (MW); Chimkent, Darmina, 20.04.1978, *Baranova 3* (TASH); Chimkent, Burunskiy rayon, 29.04.1981, *Baranova* (MW); Mangistau, Mammezkazgan, 4.05.2008, *Gorbunov* (plantarium); Kyzylkum, 3.05.2010, *Davkaev* (plantarium); Kizilorda, Baykonur, 25.04.2011, *Prigorov* (plantarium); South Kazakhstan, Dostik, 30.05.2012, *Davkayev* (plantarium); Mangiustau, Karinjarik, 14.04.2013, *Gorbunov* (plantarium); South Kazakhstan, Aris, 3.05.2013, *Davkayev* (plantarium); Kyzylkum, 5.05.2013, *Davkayev* (plantarium); Mangiustau, Tuesu, 6.05.2015, *Komarov* (plantarium); Mangiustau, Tuesu, 7.04.2016, *Ishmuratova, Kopbayeva* (MANG); Mangiustau, Tuesu, 9.05.2016, *Ishmuratova, Kopbayeva* (MANG); Mangiustau, Tinibay, 5.09.2016, *Ishmuratova, Kopbayeva* (MANG); Karatau, Kizilkol, 8.05.2017, *Kolbinsev* (plantarium); Mangiustau, Tuesu, 18.04.2018, *Ishmuratova, Kopbayeva* (MANG); Karatau, Kizilkul, 22.04.2018, *Epiktetov* (plantarium); Mangiustau, Jarma, 7.05.2018, *Ishmuratova, Kopbayeva* (MANG); Kizilorda, Karmakshin, 7.12.2018, *Shakula* (plantarium); Karatau, Kizilkul, 6.05.2019, *Kolbinsev* (plantarium); Kazakhstan, Atrius obl, 8.05.2019, *unknown collector* (MANG); Mangiustau, Tuesu, 29.05.2020, *Ishmuratova, Kopbayeva* (MANG); Turkestan, Koksaray, 22.04.2021, *Belousov* (plantarium); Mangiustau, Beyneuskiy, Sarga, 8.06.2022, *Novikova* (plantarium); Kyzylkum, 14.03.2023, *Shakula* (plantarium); Kyzylkum, 29.03.2023, *Shakula* (plantarium).

Kyrgyzstan: Karavan, Jiydasay, 19.05.1952, *Nabiyev* (TASH); Karavan, Jiydasay, 6.06.1952, *Nabiyev* (TASH); between, Osh and Nookat, near the Uchbay, 16.07.1981, *Pimenov, Baranova, Vasilyeva, Klyuykov, Tomkovich 376* (MW); Ala-buka, 11.09.2022, *Kushnerova* (plantarium).

Tajikistan: Kafirnihan, village Tashkent, 3.06.1930, *Granitov 301* (TASH); Kabadiyon, 1932, *Demurina* (TASH); Leninabad, Shumtau, 20.07.1974, *Pimenov, Baranova, Klyuykov 503* (MW); Khodja-Kaziyan, 12.05.1975, *Pimenov, Klyuykov, Boyayev, Baranova, Vasilyeva 619* (MW); Tadjikistan, reserve of Tigraya balka, 17.04.2011, *Davkayev* (plantarium); Sogd, Akchopa, 28.05.2015, *Pimenov, Kurbanov 51* (MW); Poimazor, 30.09.2018, *unknown collector* (E).

Turkmenistan: Nephton, 4.05.1900, *Bornmyuller 265a* (STU, P, UCB); Caspia, 4.05.1900, *Sintensis 265b* (UCB, P); Islim-Cheshme, 17.04.1914, *Korovin* (TASH); Eroylanduz, 22.04.1914, *Korovin 249a, 816* (TASH); st. Kelif, 15.04.1927, *Gomolitskiy 7, 92* (TASH, MW); st. Kelif, 25.03.1928, *Vvedenskiy* (TASH); oz. Eroylanduz, 6.10.1930, *Linchevskiy 1156, 1666* (TASH); Gurji, 23.05.1938, *Nechelva* (TASH); Eroylanduz, 7.06.1978, *Pimenov, Klyuykov, Baranova, Vasilyeva 310* (MW); Krasnavodsk, kolodtsa Khudayberdi, 30.07.1978, *Pimenov, Klyuykov 142* (MW); Karakum, 25.09.2014, *Pavlenko* (plantarium).

Uzbekistan: Tschakyr-Ata and Nasarbai-Kuduk, 12.04.1942, *Lehmann* (P); between Syrdarya and Mirzarabod, 18.05.1882, *Regel* (LE); st. Khilkavo-Shabskiy, 1.04.1911, *Dimo, Sprigin, Shulga 3, 290, 831* (LE, TASH); Sultan-uiz-dag, 5.04.1913, *Popov 536* (LE); 14.04.1913, *Teplov 3* (TASH); 28.04.1913, Bukhara, kol. Baltibay, *Teplov 197* (TASH); Bukhara, Kara-bulan, *Staxanov* (TASH); Khodjikent, Golodnaya step, *Bugodoskiy 239* (LE); Samarqand, Zolotoy Orda, 7.04.1915, *Fedtschenko* (LE); oz. Tuzkan, 11.04.1915, *Spiridonov 71* (LE); Akkurgan, 10.05.1915, *Spiridinov 97* (LE); Golodnaya step, Ulken-Salik, 31.03.1916, *Popov* (TASH); Bukhara, Kul-mazar, 31.03.1916, *Androsov* (TASH); Nayzang-Zulb, 8.04.1916, *Kultiasov 216* (TASH); Khilkavo, 21.04.1916, *Androsov 113* (LE); Golodnaya step, Ulken-Salik, 31.07.1916, *Dimo* (TASH); Mirza-chul, 14.05.1923, *Vvedenskiy 1224, 1225, 1226, 1227* (TASH); desert Mirza-chul, 24.04.1924, *Sovetkina, Poljakova* (TASH, K, S, P, E, K); Jizzakh, Pistali-mazar, 24.05.1925, *Spiridinov 152* (LE); Shirabad, Alaman-tepe, 23.05.1927, *Vvedenskiy* (TASH); Shirabad, Bozrabat, 13.06.1927, *Popov*, *Vvedenksiy 274* (TASH); Kashkadarya, Bek-budi, Kunya-Fazil, 27.05.1928, *Linchevskiy 413, 414* (TASH); Kashkadarya, Bek-budi, between kol. Jelau and Kallik, 27.05.1928, *Linchevskiy 491* (TASH); Jizzakh, Zernotres, 15.05.1930, *Koshurnikova 88* (TASH); Kyzyl-kum, kol. Karakalpak, 28.05.1932, *Poretskiy* (LE); Kyzyl-kum, 1.08.1932, *Knorring 113* (MW); Konemix, Uzun-kuduk, 25.04.1933, *Zooveterinary expedition* (TASH); Mubarak, Saray-Sahaba, 18.04.1934, *Valkov 311* (MW); Mubarek, st. Staniabad, 1934, *Shviryaeva* (MW); Sultan-uiz-Dag, 13.05.1934, *Arsenyeva 97* (MW); Ashir-xan-kuduk, 14.07.1934, *Demurina 272* (TASH); Konimex, Ayak-Agirtma, 2.05.1936, *Tarasevich 32, 35, 129, 132, 141, 142* (TASH); Kyzyl-kum, Ayak-Agirtma, 5.05.1936, *Tolbina 194* (TASH); Kyzylkum, kol. Bukanay, 6.05.1936,

Klimovskaya 174 (TASH); Kyzylkum, kol. Bukanay, 20.06.1936, *Klimovskaya 667* (TASH); Kyzylkum, Sorbatir, 1.07.1936, *Tarasevich 875 — 884* (TASH); Karnabchul, Shurcha, 27.07.1936, *Arxiriyev 364* (TASH); Kyzylkum, 25.10.1936, *unknown collector* (TASH); Gazgan, 14.07.1937, *Mironov 3* (TASH); Koytash, Majrem, 28.07.1937, *Demurina 799* (TASH); Shurchi, Akkapchigay, 15.05.1940, *Klima 41* (TASH); Ustyurt, 10.06.1940, *Granitov 101* (TASH); Termiz, Xashmak, 23.06.1941, *Gomolitskiy 333* (TASH); Ustyurt, kol. Jingeldi, *Pyatayeva 109, 225* (TASH); Xovost, st. Ursataevka, 4.04.1945, *Paziy 45* (TASH); Ustyurt, Shakhpat, 27.08.1945, *Arifxanova 111* (TASH); Ustyurt, Shordja, 13.11.1945, *Granitov, Arifxonova 460* (TASH); Shafirkan, 23.05.1948, *Rodin, Arkadiyev* (LE); Taxtakupir, 2.06.1949, *Damashevich 8* (TASH); Samarkand, Kizilcha, 27.04.1954, *Sedov* (TASH); Bukhara, Olot, Kurkuduk, 29.04.1956, *Momotov 592* (TASH); Jizzakh, 24.04.1957, *Adilov 39* (TASH); Jizzakh, st. Ursataevka, 24.04.1957, *Butkov, Maylun 91* (TASH); Golodnaya step, Kurgan-tube, 24.04.1957, *Butkov, Maylun 91* (TASH); village Gum, 14.05.1958, *Li, Zakirov 562, 563, 565* (TASH); Jizzakh, 19.07.1960, *Sagatov, Abdukhamidov, Khodjimatov* (LE, TASH); Kyzylkum, Bayrakkum, 16.05.1963, *Sukervanik 160* (TASH); Kyzylkum, kol. Kizilkuduq, 2.06.1967, *Nabiyev, Adilov, Kazakbayev, Nishanov 9* (TASH); Kyzylkum, Bukantau, 27.04.1968, *Kolamazorova* (TASH); Shirabad, between Sayrob and Shurab, 22.05.1971, *Pimenov* (MW); 15.06.1971, Nuratau, Sintob, 15.06.1971, *Bochansev, Kamelin 451* (LE); Bukhara, 15.06.1973, *Pimenov, Baranova 157* (MW); Tomdi, kolodt. Karaman, 16.04.1975, *Djavliyev, Vahidov, Li* (TASH); Kyzylkum, Fazilbek-kuduk, 27.04.1975, *Pimenov, Pimenova, Baranova, Klyuykov 82* (MW); Kyzylkum, between Zarafshan and Uchkuduk, 28.04.1975, *Pimenov, Pimenova, Baranova, Klyuykov 136* (MW); Kugitang, near the Chilanzar, 29.05.1975, *Baranova, Klyuykov 703* (MW); Nuratau, 4.04.1981, *Safraliyeva* (TASH); Kashkadarya, Sundukli, 7.04.1985, *Gaziyev* (plantarium); Kyzylkum, Kuljuktau, 22.05.2004, *Matvafayeva 29* (TASH); Kyzylkum, Taskuduk, 5.05.2008, *Gaziyev* (plantarium); Karakalpakistan, Beruniy, 12.05.2009, *Kapranov* (plantarium); Sultan-uiz-Dag, 12.05.2009, *Esemuratova 76* (TASH); Nukus, Orolbolga, 14.06.2010, *Abdiniyazova* (TASH); Nuratau, 26.03.2011, *Davkaev* (plantarium); Bukhara, Jeyran ecocenter, 3.04.2011, *Davkayev* (plantarium); Kashdakarya, Pomuk, 5.04.2011, *Gaziyev* (plantarium); Kashkadarya, Sundukli, 7.04.2011, *Gaziyev* (plantarium); Nuratau, Majremsay, 2.05.2011, *Beshko* (plantarium); Nuratau, Majremsay, 5.05.2011, *Beshko* (TASH); Kyzylkum, Kuljuktau, 10.04.2014, *Beshko* (plantarium); Nuratau, 13.04.2014, *Beshko* (plantarium); Kyzylkum, Kuljuktau, 15.04.2014, *Beshko* (plantarium); Sundukli, 6.04.2015, *Beshko* (plantarium); lake Aydarkul, 15.04.2015, *Beshko* (plantarium); Nuratau, Majremsay, 20.05.2015, *Beshko* (plantarium); Aydarkul, 15.04.2017, *Beshko* (plantarium); Nuratau, Majremsay, 20.05.2017, *Beshko* (TASH); Kyzylkum, between Khiva and Bukhara, 26.04.2018, *Chulanova* (plantarium); Nuratau, Majremsay, 18.04.2019, *Beshko* (plantarium); Farish, Uzunkuduq, 26.03.2019, *Beshko* (plantarium); Pistalitau, 25.04.2020, *Beshko* (plantarium); Bukhara, Kyzylkum, 26.03.2021, *Mardanov* (plantarium); Kyzylkum, Ayakagirtma, 9.04.2021, *Beshko* (plantarium); Jizzakh, 5.04.2022, *Odilbek* (iNaturalist); Navoiy, 8.04.2022, *Odilbek*

(iNaturalist); Kelif-Sherobod mountains, 9.03.2023, *Karimov* (plantarium); Mirishkor, Pomuq, 25.03.2023, *Tillayev* (plantarium); Sultan-uiz-Dag, 8.04.2023, *Pankratov* (plantarium); Karakalpakistan, Ayaz-Kala, 11.04.2023, *Pankratov* (plantarium); Navoiy, 18.04.2024, *Odilbek* (iNaturalist).

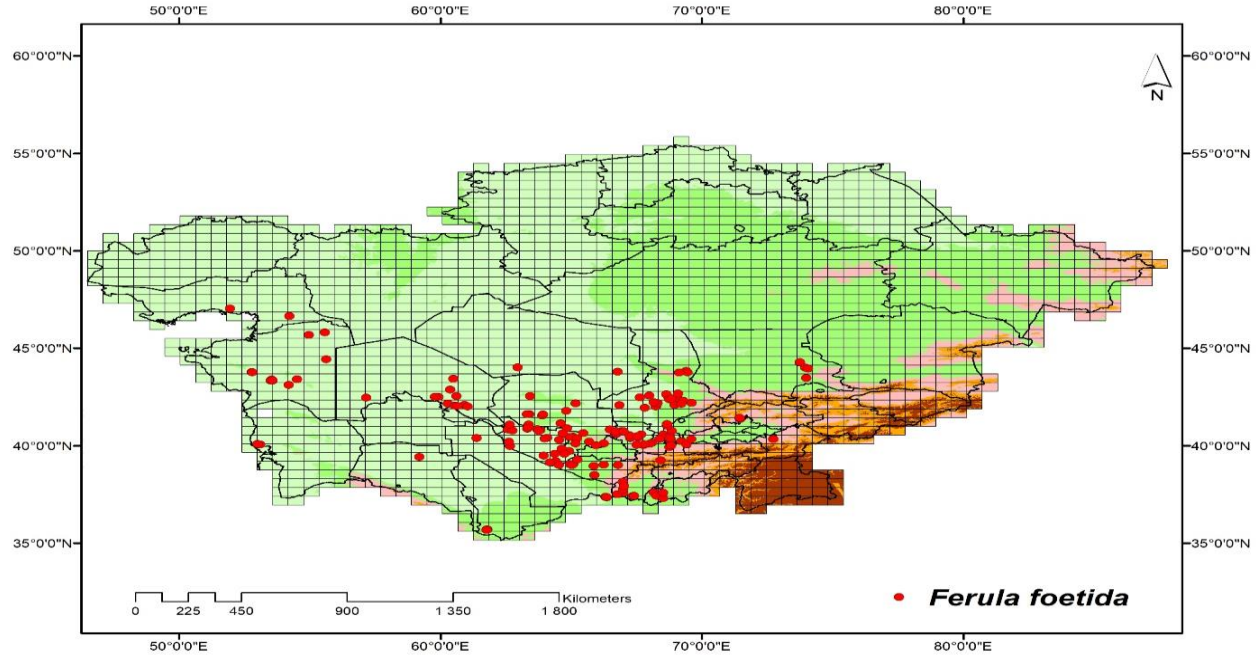

Figure 3. Distribution of Ferula *foetida* in Central Asia

Conclusion. It was determined that this plant, which forms a characteristic cover in certain years, helps stabilize sandy soils, and is used as a medicinal plant, is primarily distributed in Central Uzbekistan, the Kyzylkum Desert, and the Ustyurt Plateau. In Turkmenistan, this species has been included in the Red Book.

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