

## DISTRIBUTION OF THE GENUS *FERULA* L. IN THE FLORA OF UZBEKISTAN

1F. Djumaniyozova, 2I.U. Mukumov, 3T.Kh. Mukimov, 1K.T. Ismoilov

1Samarkand Medical Institute, Department of Medical Biology and Genetics, Assistant, 2Samarkand State University, Department of Botany, Associate Professor, 3Scientific-Research Institute "Oriental Medicine", Samarkand

**ABSTRACT.** The article presents materials on the distribution area of *Ferula* species in Uzbekistan. The materials were obtained as a result of field research, herbarium materials were collected, and the chemical composition of various species was determined. The economic characteristics of the *ferula* species are given.

**Keywords:** *ferula*, forage, food, honey, medicinal plants, field research, herbarium materials, chemical composition

### INTRODUCTION

Genus *Ferula* L. – belongs to the tribe Peucedaneae Dumort. subfamilies Apioideae Drude, family Apiaceae Lindl. (Umbelliferae Juss). It has about 180-185 species, distributed almost exclusively in the area of the Ancient Mediterranean. The maximum number of species in Central Asia is 105 species [1].

*Ferula* L. is perennial herbaceous plants, geophyte. Most of them, according to the rhythm of seasonal development, belong to the group of ephemeroids, perennials with a short annual period of growth and development and a long period of rest, falling at an unfavorable time of the year. Underground organ *Ferula* L. the stem root and the root of the storage type.

In the genus there are giants, as well as *F. gigantea* (2-2.5 m) and dwarfs - *F. nuda* (25-30 cm).

The name *Ferula* L. proposed by [2] was later adopted by C. Linnaeus [3] and under this name the genus entered the scientific botanical nomenclature. In the 18th century, there was a slow accumulation of material on this genus, and botanists described new species, sometimes not from nature, but from plants grown in botanical gardens [4].

Great contribution to the study of the genus *Ferula* L. contributed by E. Regel (1878, 1882), B.A. Fedchenko (1902), B.M. Kozo-Polyansky (1914, 1915, 1922, 1924), M. P. Petrov (1933), L.A. Utkin (1938), I.A. Zakharyants (1943), I. T. Vasilchenko (1941), E.P. Korovin (1939, 1947), R.V. Kamelin (1970), M.S. Baitenov (1970, 1975), M.G. Pimenov (1974, 1979, 1980, 1983), H.A. Nishanbayeva (1972), S. Melibayev (1985), I.U. Mukumov [13], as well as scientists from Iran, Afghanistan, Turkey, and China. [5, 7]



Figure 1. Grazing in the mountain



Figure 2. Grazing in the plain

The genus *Ferula* L. is subdivided in the monograph of E. P. Korovin (1947) into 6 subgenera *Scorodosma* Merwia, *Narthex*, *Euferula*, *Peucedanoides* and *Dorematoides*. Within the subgenera, sections and groups are distinguished, which are based on the morphological features of the leaf and fruit.

Korovin [6,7] distinguished two biological groups of the genus *Ferula*: monocarpics and polycarpics. Monocarpics are one of the original, rarely found among herbaceous plants, life forms. Monocarpics include all species of ferula of the subgenus *Narthex*, *Merwia*, the only species of the subgenus *Scorodosma* – *Ferula foetida*, some species of the subgenus *Ferula* L., the remaining species of the genus-polycarpics.

Alexandrov, Pervukhina, [8]; Kiryalov, Budkevich, [9]; Kozo – Polyansky, [10], [12], were devoted to the study of the anatomical structure of fruits, and the authors focused on the character of the mechanical tissue of the pericarp, the so-called "Hypendocarp", as an important feature in phylogenetic relations.

Pimenov et al. [11] carried out the classification of domestic species of the genus *Ferula* using the methods of cluster analysis and analysis of the main components on the basis of a wide set of features (33 features), which made it possible, in contrast to the system of E. P. Korovin [5], to group the species into small natural sections, refusing to allocate large subgenera. The classification we have adopted in this paper mostly corresponds to the data of M. G. Pimenov et al. [11], but it takes into account studies on the phytochemistry and carpology of *Ferula* L.

Species of the genus *Ferula* L. they are promising essential oils, forage, food, honey-bearing and medicinal plants. It is a rich source of biologically active substances, essential oils, coumarins, sesquiterpene lactones, esters and other natural compounds. Plants of this genus have long attracted the attention of various researchers – botanists, chemists, pharmacologists.

Types of ferula can be used in other areas of the national economy. Many species of ferula are among the most important forage plants, especially in deserts and semi-deserts, some are used as hay plants. Forage plants include: *F. foetida*, *F. varia*, *F. kuhistanica*, *F. karatavica*, *F. tenuisecta*, etc.



Figure 3. *Ferula foetida*



Figure 4. *Ferula kuhistanica*

Among the representatives of the genus *Ferula* L., growing in Uzbekistan, of particular interest are mountain species *F. tenuisecta*, *F. kuhistanica*, *F. tadshikorum* and desert-*F. foetida* and *F. varia*. The latter are also good forage plants and are used in the creation of artificial agrophytocoenoses in order to enrich the feed base of animal husbandry in Southwestern Kyzylkum.



Figure 5. *Ferula akitschkensi*



Figure 6. *Ferula karatavica*

Many species of *Ferula* L., containing a significant amount of resins, can be used in the soap, paint, textile and paper industries. Fruits of *Ferula* L. they contain protein and protein substances and are used as a fat feed for poultry, as well as in the treatment of hemochotosis in animals.

It should be noted that numerous species of *Ferula* L. they are used in agriculture as forage plants. They are readily eaten by cattle and sheep, and both grass and seeds are used. When the seeds of *F. foetida* are added to the diet of cattle, milk yield increases.

Plants of the genus *Ferula* L. that occupy an important place in the formation of the vegetation cover of Uzbekistan. Important edificators of landscape significance include *F. kuhistanica*, *F. foetida*, *F. tenuisecta*, and others [14].

#### PURPOSE OF THE STUDY

The aim of the work was to study the features of biology and ecology, growth and development of different types of ferula in different ecological conditions of growth. Development of scientific and practical bases for adaptive use of agroecological resources, including optimization of flora composition, assessment of biological diversity and identification of the resource potential of natural vegetation.

## MATERIALS AND RESEARCH METHODS

During the research, the following methods were used: The description of vegetation, taking into account its floral composition, was carried out according to the Drude method, which is generally accepted in geobotany. The range was specified on the basis of literature data and surveys of distribution areas within the regions of Uzbekistan. Age-related changes in plants according to the method of T.A. Rabotnov [15]. The phenology was carried out according to the method of I.N. Beideman [16]. The plant species was specified according to S.K. Cherepanov [17, 19] and Plant Determinants of Central Asia (vol. I-X, 1968-1993) [18].

## RESULTS AND DISCUSSION

As a result of field research in 2010-2018, on the territory of Uzbekistan, it was surveyed where herbarium materials were collected. The processing of this material was carried out, as well as the analysis of literary sources.

**Table 1**

**The chemical composition of the species of the genus *Ferula* L.**

№	Types of <i>Ferula</i>	* Plant organ	Carbohydrates	Essential oil	Coumarins	Flavonoids	Sesquiterpene lactones	Steroids	Terpenoids	Phenols	Fatty oil	Fatty acids
1	<i>F. diversivittata</i>	T	+	+	+	+	-	-	-	-	-	-
		R	-	-	+	-	+	+	-	-	-	-
		S	-	-	+	-	+	-	-	-	-	-
		F	-	+	+	-	-	-	-	-	-	-
2	<i>F. gigantea</i>	R	-	-	+	-	+	-	-	-	-	-
		S	-	+	+	-	-	-	-	-	-	-
3	<i>F. foetidissima</i>	R	-	+	+	-	-	-	-	-	-	-
		F	-	+	+	-	-	-	-	-	-	-
4	<i>F. kuhistanica</i>	R	-	+	-	-	-	-	+	-	-	-
		T	-	+	-	-	-	-	-	-	-	-
		L	-	+	-	-	-	-	-	-	-	-
		I	-	+	-	-	-	-	-	-	-	-
		S	-	+	-	-	-	-	-	-	-	-
		F	-	+	+	-	-	-	-	-	-	-

distribution of the genus ferula l. in the flora of uzbekistan

5	<i>F.kokanica</i>	R F	- -	- +	+ +	- -	- -	- -	- -	- -	- -	- -
6	<i>F.tuberifera</i>	T	-	-	+	-	-	-	-	-	-	-
7	<i>F.samarkandica</i>	R F	- -	- -	+ +	- +	- -	- -	+ -	- -	- -	- -
8	<i>F.juniperina</i>	R	-	-	-	-	-	-	+	-	-	-
9	<i>F.nevskii</i>	T R	- -	+ +	+ +	+ -	- -	- -	- -	- -	- -	- -
10	<i>F.dubjanskyi</i>	R L F I	+ - - -	- - - -	- - - +	- + + -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
11	<i>F.lithophila</i>	R	-	-	+	-	-	-	-	+	-	-
12	<i>F.renardii</i>		-	-	-	-	-	-	-	-	-	-
13	<i>F.oopoda</i>	T R S L F	- - - - -	+ + + + +	+ + - - -	+ - - - -	- + - - +	- - - - -	- - - - -	- - - - -	- - - - +	- - - - -
14	<i>F.nuda</i>	T	-	-	+	-	-	-	-	-	-	-
15	<i>F.varia</i>	R T L F	+ - - -	+ + + -	+ - - +	- + - -	+ - - -	- - - -	+ - - -	- - - -	- - - -	- - - -
16	<i>F.helenae</i>	T	-	-	-	-	-	-	+	-	-	-
17	<i>F.tadshikorum</i>	R F	- -	+ -	+ +	- -	- -	- -	- -	- -	- -	- -
18	<i>F.foetida</i>	T L F	- - -	+ - +	- - -	+ - -	- - -	- - -	- - -	- - -	- - -	- - -
19	<i>F.szowitsiana</i>	R T F	- - -	+ + -	+ + +	- + -	- - -	- - -	- - -	- - -	- - -	- - -
20	<i>F.ovczinnikovii</i>		-	-	-	-	-	-	-	-	-	-
21	<i>F.Lehmannii</i>	T	-	+	+	-	-	-	-	-	-	-
22	<i>F.Litwinowiana</i>	T R F	- - -	+ - -	- - +	- - -	- + -	- - -	- - -	- - -	- - -	- - -
23	<i>F.Lipskyi</i>	R	-	-	+	-	-	-	-	-	-	-
24	<i>F.fedschenkoana</i>	T	-	-	-	-	-	-	+	-	-	-
25	<i>F.prangifolia</i>	T	-	-	-	-	-	-	+	-	-	-
26	<i>F.tschimganica</i>	R F	- -	+ -	- +	- -	- -	- -	- +	- -	- +	- -

27	<i>F.ovina</i>	R T F	- - -	+ + +	+ - +	- - -	- - -	- - -	+ - -	- - -	- - +	- - -
28	<i>F.kyzylkumica</i>		-	-	-	-	-	-	-	-	-	-
29	<i>F. dshizakensis</i>	T	-	-	-	-	-	-	+	-	-	-
30	<i>F. pallid</i>	R	-	-	+	-	-	-	+	-	-	-
31	<i>F. tenuisecta</i>	R F	- +	+ -	- +	- -	- -	- +	+ +	- -	- -	- -
32	<i>F. angreni</i>	R F	- -	- -	- -	- -	- -	- -	+ +	- -	- -	- -
33	<i>F.ugamica</i>	R	-	-	-	-	-	-	+	+	-	-
34	<i>F.karatavica</i>	R F	- -	+ +	+ +	- -	- -	- -	+ -	+ -	- -	+ -
35	<i>F.korshinskyi</i>	T	-	+	+	-	+	-	+	-	-	-
36	<i>F.clematidifolia</i>	T	-	+	+	-	-	-	-	-	-	-
37	<i>F.penninervis</i>	R T S L F	- - - -	+ + + +	+ - - +	- - - -	+ - - +	- - - -	- - - -	- - - -	- - - -	- - - -
38	<i>F.schtschurowski ana</i>	R	-	+	-	-	-	-	-	-	-	-
39	<i>F.sumbul</i>	R	-	+	+	-	-	-	-	-	-	-
40	<i>F.karelinii</i>	T L F	- - -	+ - -	- - +	- + -	- - -	- - -	- - -	- - -	- - -	- - -
41	<i>F.vicaria</i>	R	-	-	+	-	-	-	-	-	-	-
42	<i>F.nuratavica</i>		-	-	-	-	-	-	-	-	-	-
43	<i>F.transiliensis</i>	R T F	- - -	- + -	- - +	- - -	+ - -	- - -	- - -	- - -	- - -	- - -
44	<i>F.karategina</i>	T	-	-	-	-	-	-	+	-	-	-
45	<i>F.kelifi</i>		-	-	-	-	-	-	-	-	-	-
46	<i>F.kirialovii</i>	R F	- -	+ -	+ +	- -	- -	- -	- -	- -	- -	- -
47	<i>F.rubroarenosa</i>	T	-	-	-	-	-	-	+	-	-	-
48	<i>F.pratovii</i>		-	-	-	-	-	-	-	-	-	-

\* Plant organ: 1.Overground part – T. 2. Roots – R. 3.Stems – S. 4. Inflorescences – I. 5.leaves- L. 6. Seeds - F

table 2

Distribution of species of the genus *Ferula* L. in the Republic of Uzbekistan

№	Type of ferula	Alt	Region	Area of growth
<b>MONOCARPICS</b>				
1	<i>F. diversivittata</i>	700-1200	Tashkent, Navoi Samarkand, Kashkadarya, Surkhandarya	Chatkal, Kurama, Zarafshan, Nuratau, Gissar
2	<i>F. gigantea</i>	600-2800	Surkhandarya	Babatag, Gissar
3	<i>F. foetidissima</i>	1200-2300	Jizzakh, Samarkand, Surkhandarya, Fergana	Turkestan, Zarafshan, Gissar, Alay
4	<i>F. kuhistanica</i>	1200-3500	Fergana, Jizzakh, Samarkand, Kashkadarya, Surkhandarya	Alay, Turkestan, Zarafshan, Gissar
5	<i>F. kokanica</i>	1300-3600	Fergana, Jizzakh, Navoi, Samarkand, Kashkadarya	Alay, Turkestan, Nurota, Zarafshan, Gissar
6	<i>F. tuberifera</i>	1700-2500	Surkhandarya	Gissar
7	<i>F. samarkandica</i>	700-3300	Tashkent, Jizzakh, Navoi, Samarkand, Kashkadarya, Surkhandarya	Chatkal, Turkestan, Nurotau, Zarafshan, Gissar
8	<i>F. juniperina</i>	1500-2300	Tashkent	Kurama, Chatkal
9	<i>F. nevskii</i>	1500-2100	Surkhandarya	Kugitang, Gissar
10	<i>F. dubjanskyi</i>	sands	Karakalpakistan	Aral Sea deserts
11	<i>F. lithophila</i>	900-1200	Tashkent	Kurama
12	<i>F. renardii</i>	2400-3200	Tashkent	Chatkal, Pskem
13	<i>F. oopoda</i>	to 1000	Bukhara, Navoi	Kizilkum
14	<i>F. nuda</i>	Plain, sands	Karakalpakistan	Aral Sea deserts
15	<i>F. varia</i>	to 800	Navoi	Kizilkum
16	<i>F. helenae</i>	to 900	Jizzakh	Nurotau
17	<i>F. tadshikorum</i>	650-1800	Surkhandarya	Gissar, Kugitang
18	<i>F. foetida</i>	Plain	Navoi, Bukhara, Surkhandarya, Karakalpakistan	Kizilkum, Surhan-Sherabad Valley
19	<i>F. szowitsiana</i>	400-2200	Karakalpakistan.	Kizilkum
20	<i>F. ovczinnikovii</i>	700-	Jizzakh	Malguzar

		1200		
<b>POLYCARPICS</b>				
21	<i>F. Lehmannii</i>	sands	Karakalpakistan	Kizilkum
22	<i>F. Litwinowiana</i>	sands	Navoi, Bukhara	Kizilkum
23	<i>F. Lipskyi</i>	500-900	Fergana	Alay
24	<i>F. fedschenkoana</i>	2100-3000	Jizzakh	Turkestan, Malguzar
25	<i>F. prangifolia</i>	1000-2500	Tashkent	Ugam, Pskem, Chatkal, Kurama
26	<i>F. tschimganica</i>	1600-2700	Tashkent	Pskem, Ugam, Chatkal, Kurama
27	<i>F. ovina</i>	1200-3000	Jizzakh, Navoi, Samarkand, Kashkadarya, Surkhandarya	Turkestan, Malguzar, Nurotau, Zarafshan, Gissar, Kugitang
28	<i>F. kyzylkumica</i>	500-700	Navoi, Bukhara	Kizilkum
29	<i>F. dshizakensis</i>	800-1500	Jizzakh, Navoi, Samarkand	Turkestan, Nurotau
30	<i>F. pallid</i>	800-1900	Tashkent	Chatkal
31	<i>F. tenuisecta</i>	600-2500	Tashkent	Ugam, Pskem, Chatkal,
32	<i>F. angreni</i>	1000-1900	Tashkent, Jizzakh	Kurama, Nurotau, Malguzar
33	<i>F. ugamica</i>	1400-2200	Tashkent	Ugam, Pskem, Chatkal, Kurama
34	<i>F. karatavica</i>	500-1900	Tashkent	Ugam, Chatkal, Kurama
35	<i>F. korshinskyi</i>	100-1900	Namangan, Fergana	Chatkal, Alay
36	<i>F. clematidifolia</i>	600-2200	Samarkand, Kashkadarya, Surkhandarya	Zarafshan, Gissar, Babatag
37	<i>F. penninervis</i>	800-2900	Tashkent, Fergana, Jizzakh, Samarkand	Pskem, Ugam, Chatkal, Kurama, Alay, Turkestan, Nurotau, Zarafshan
38	<i>F. schtschurowskiana</i>	to 1400	Navoi, Samarkand, Kashkadarya, Surkhandarya, Jizzakh	Kizilkum, Nurotau, Zarafshan, Malguzar, Gissar, Kugitang
39	<i>F. sumbul</i>	1700-2500	Jizzakh, Samarkand, Kashkadarya, Surkhandarya	Nurotau, Malguzar, Zarafshan, Gissar
40	<i>F. karelinii</i>	sands	Navoi, Karakalpakistan	Kizilkum
41	<i>F. vicaria</i>	900-1500	Jizzakh, Fergana	Turkestan, Alay
42	<i>F. nuratavica</i>	1200-	Navoi, Samarkand	Nurotau



distribution of the genus *Ferula* L. in the flora of Uzbekistan

		1600		
43	<i>F.transiliensis</i>	1600-3700	Tashkent, Fergana	Chatkal, Kurama, Alay
44	<i>F.karategina</i>	1800-3500	Jizzakh, Samarkand, Kashkadarya, Surkhandarya	Turkestan, Zarafshan, Gissar
45	<i>F.kelifi</i>	700-2000	Surkhandarya	Gissar, Kugitang, Babatag
46	<i>F.kirialovii</i>	900-2700	Tashkent	Ugam, Pskem, Chatkal, Kurama
47	<i>F.rubroarenosa</i>	900-1700	Fergana	Fergana
48	<i>F.pratovii</i>	to 2400	Kashkadarya	Gissar

In Uzbekistan, species of the genus *Ferula* L. it contains about 39 types of resins, essential oils - 39, starch – bearing – 4, honey - bearing – 22, feed – 13, food-10, medicinal-22 (Table 3).

**Benefits from the introduction and use of *ferula* species:** Based on the study of ecological and biological properties and economically valuable characteristics of *ferula* species from the natural flora of Uzbekistan, ecologically significant species were selected, which are recommended as a source material for introduction into culture, increasing pasture productivity and use in pharmacology.

Growing medicinal plants that have a large market potential helps to preserve their

**Table 3**

**Economic significance of the genus *Ferula* L. in Uzbekistan**

№	Type of <i>Ferula</i> Plant	Resin-bearing	Essential oil-bearing	Starch-bearing	Honey-Bearing	Forage	Food	Medicinal
1	<i>F.diversivittata</i>	+	+	-	+	-	-	+
2	<i>F.gigantea</i>	+	+	-	-	-	-	-
3	<i>F.foetidissima</i>	+	+	-	+	+	+	+
4	<i>F.kuhistanica</i>	+	+	+	+	+	+	+
5	<i>F.kokanica</i>	+	+	-	+	-	-	+
6	<i>F.tuberifera</i>	+	+	-	+	-	-	-
7	<i>F.samarkandica</i>	+	+	-	+	+	-	-
8	<i>F.juniperina</i>	+	+	-	-	-	-	-
9	<i>F.nevskii</i>	+	+	-	+	-	-	+
10	<i>F.dubjanskyi</i>	-	-	-	-	-	-	-

11	<i>F.lithophila</i>	+	+	-	-	-	-	+
12	<i>F.renardii</i>	-	-	-	-	-	-	+
13	<i>F.oopoda</i>	+	+	-	-	-	-	-
14	<i>F.nuda</i>	+	+	-	-	-	-	-
15	<i>F.varia</i>	+	+	-	-	+	-	+
16	<i>F.helenae</i>	+	+	-	-	-	-	-
17	<i>F.tadshikorum</i>	+	+	-	+	+	+	+
18	<i>F.foetida</i>	+	+	+	+	+	+	+
19	<i>F.szowitsiana</i>	+	+	-	-	-	+	+
20	<i>F.ovczinnikovii</i>	+	+	-	+	-	-	-
21	<i>F.Lehmannii</i>	+	+	+	-	-	+	-
22	<i>F.Litwinowiana</i>	-	+	-	+	-	-	+
23	<i>F.Lipskyi</i>	-	-	-	-	-	-	-
24	<i>F.fedschenkoana</i>	+	+	-	-	-	-	-
25	<i>F.prangifolia</i>	+	+	-	+	+	-	-
26	<i>F.tschimganica</i>	+	+	-	+	+	+	+
27	<i>F.ovina</i>	+	+	-	+	+	-	-
28	<i>F.kyzylkumica</i>	-	-	-	-	-	-	-
29	<i>F.dshizakensis</i>	+	+	-	-	-	-	-
30	<i>F.pallida</i>	+	+	-	+	-	-	+
31	<i>F.tenuisecta</i>	+	+	-	+	+	-	+
32	<i>F.angrenii</i>	+	+	-	+	-	-	-
33	<i>F.ugamica</i>	+	+	-	-	+	-	-
34	<i>F.karatavica</i>	+	+	-	+	+	-	+
35	<i>F.korshinskyi</i>	+	+	-	-	-	-	+
36	<i>F.clematidifolia</i>	+	+	-	-	-	-	-
37	<i>F.penninervis</i>	+	+	-	-	-	-	+
38	<i>F.schtschurowskiana</i>	+	+	+	+	+	+	+
39	<i>F.sumbul</i>	+	+	-	-	-	+	+
40	<i>F.karelinii</i>	+	+	-	+	-	+	+
41	<i>F.vicaria</i>	-	-	-	-	-	-	-
42	<i>F.nuratavica</i>	-	-	-	-	-	-	-
43	<i>F.transiliensis</i>	+	+	-	-	-	-	-
44	<i>F.karategina</i>	+	+	-	-	-	-	-
45	<i>F.kelifi</i>	-	+	-	+	-	-	-
46	<i>F.kirialovii</i>	+	+	-	+	-	-	+
47	<i>F.rubroarenosa</i>	+	+	-	-	-	-	-
48	<i>F.pratovii</i>	-	-	-	-	-	-	-



**Figure 7.** *Ferula tadshikorum*



**Figure 8.** *Ferula tenuisecta*

diversity, generate additional profit, and also as a honey crop for beekeeping. Potential consumers of research results are karakul-growing and farming enterprises of the arid zone, Agency for the Development of the Pharmaceutical Industry under the Ministry of Health of the Republic of Uzbekistan, NGO "Vaccine". In folk medicine, ferula gum-resin is used in folk medicine for the treatment of pulmonary tuberculosis, plague, ulcers, whooping cough, toothache, nervous and other diseases. In scientific medicine, ferula gum in the form of powder, emulsion and tincture is used as an analgesic, expectorant, tonic and sedative.

### CONCLUSIONS

Thus, studies have established that about 48 species of ferula grow on the territory of Uzbekistan, including 20 species of monocarpica, 28 species of polycarpica, in addition to the Red Book includes *F. sumbul*, *F. tuberifera*, *F. kyzylkumica*, *F. fedtschenkoana*, *F. korshinsky*, *F. vicaria* and *F. pratovii*.

### REFERENCES

1. Pimenov M. G., Klyuikov E. V. -Umbelliferae Kirghizia. M., 2002, 286 p. (russ)
2. Tournefort J.P. Institutiones rei herbariae. vol. 1-3. Parisiis, 1700.
3. Linnaeus K. Genera plantarum. – Holmiae, 1753, v.1, 560 p.
4. Falconer H. Description of the *Assa foetida* plant of Central Asia. – Frans. Linn. Soc. 1848, t.2, 285 p.
5. Korovin E. P. - Illustrated monograph of the genus *Ferula* (Tourn). Tashkent, ANUz SSR Publishing House, 1947, 82 p.
6. Korovin E. P. – The main lines in the systematics of the genus *Ferula*. Byull. Moscow Society of Nature Testers Department of Biology, 1939, vol. 48, issue 5-6, 65 p. (russ)
7. Korovin E. P. -Differentiating role of conditions of existence in the evolution of plants of the genus *Ferula*. Plant and environment. M.-L., 1940, vol. 1, 237 p. (russ)

8. Aleksandrov V. G., Pervukhina N. V.-Features of the structure of umbrella fruits with a thick pericarp. Sov. botany, 1946, vol. 14, No. 1, 31 p. (russ)
9. Kiryalov N. A., Budkevich E. E.-Anatomical and chemical features of fruits of some species of the genus *Ferula*. Botan. zh., 1948, vol. 33, No. 1, 45 p. (russ)
10. Kozo-Polyansky B. M. - On the phylogeny of the genera Umbelliferae. Caucasus. Tr. Tiflis. Nerd. sada, 1914, issue 16, pp. 179-229. (russ)
11. Pimenov M. G., Terekhin A. T., Devyatkova G. N., Baranova Yu. V – - Classification of species of the genus *Ferula* L. (Umbelliferae) using the method of hierarchical cluster analysis. Questions of cybernetics. 1978, 47 p. (russ)
12. Pervukhina N. V. Morphological and anatomical analysis of the umbelliferous fetus as applied to their taxonomy. Diss. Cand. Biol. Nauk., L., 1947. 28 p. (russ)
13. Mukumov I. U. Resource characteristics of some species of the genus *ferula* L.-sources of biologically active compounds. Diss. Cand. Biol. Science, Tashkent, 1993, 22 p. (russ)
14. Djumaniyozova F., Rakhmankulov U., Avalbaev O., Mukumov I., Khaydarov K., Mukimov T., Djumayeva Z. Family Apiaceae Lindl In Flora Of Jizzakh Region. European Journal of Molecular & Clinical Medicine ISSN 2515-8260. Volume 07, Issue 07, 2020, pp. 4968-4977
15. Rabotnov T. A. Phytocenology. - M.: MSU Publishing House, 1992. - 352 p. (russ)
16. Beideman I. N. Methodology for the study of phenolic plants and plant messages. - Novosibirsk: Nauka, 1974. – 153 p. (russ)
17. Czerpanov S.K. Vascular plants of Russia and adjacent states (the former USSR). Cambridge University press. 1995. 516 p. (russ)
18. The determinant of plants of average value. Taste: Fan. 1983. Vol. 7. pp. 276-313. (russ)
19. A. Korchagin. A. T. Field geobotany.5. Leningrad. The science. 1976, p. 132-140. (russ)