SYNOPSIS OF THE HAPLOPHYLLUM GENUS DISTRIBUTED IN NATURAL BORDER OF FERGANA VALLEY

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Annotation. This article investigates the taxonomy, geography and ecology, of Haplophyllum Juss. species distributed in the Fergana Valley. Eight species were identified and analyzed with respect to morphology, phenology, ecological preferences, and geographical ranges. The study produced an updated annotated taxonomic conspectus, spatial distribution maps. These outcomes provide a valuable contribution to Uzbekistan's national flora inventory and future studies, support the preparation of the next edition of the Red Data Book of Uzbekistan.

Introduction

Haplophyllum A.Juss. is a genus of plant species belonging to the Rutaceae family and comprises 160 species of which only two are accepted, i.e., *Haplophyllum dauricum* (L.) G. Don and *Haplophyllum suaveolens* Ledeb., whereas fifty species are considered to be synonyms and one hundred and eight are unresolved names [1] (Fig 1.1.).

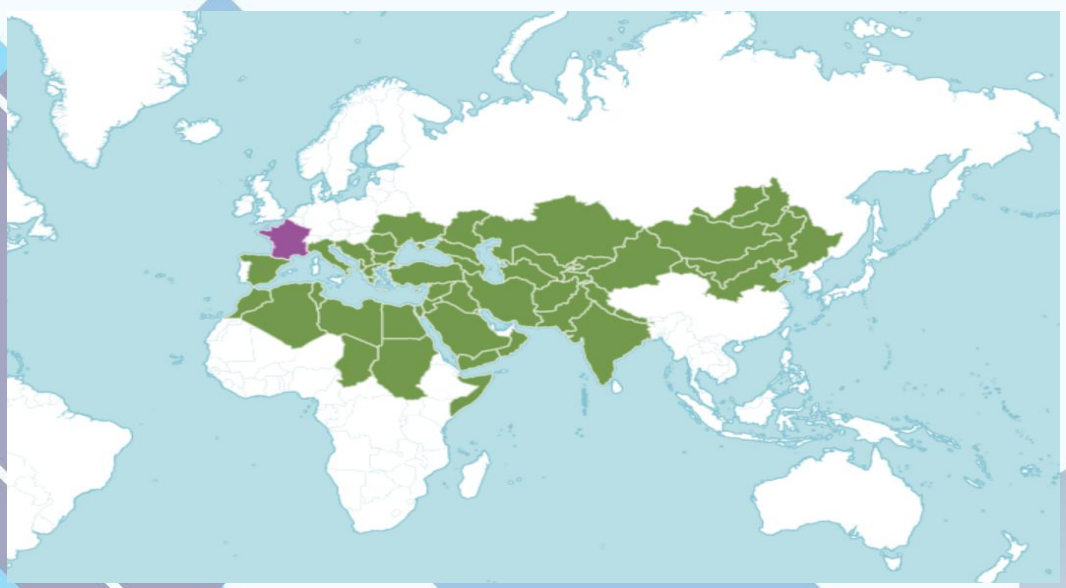

Figure 1. ***Distribution of Haplophyllum A Juss species***

The distribution area of this genus is quite wide, ranging from Morocco and Spain to China and passing through Romania, Somalia, Turkey, Iran, and Central

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Asia. Additionally, many relevant species are endemic and some even occur in small, unlinked populations[1].The main centre of diversity of *Haplophyllum* is the Irano-Turanian region—in particular, Iran, Turkey, and Central Asia—which harbours 60% of the species diversity. Thirty species of *Haplophyllum* are present in Iran, fourteen of which are endemic to the country. Fewer species occur in the other three floristic regions, most notably in the Mediterranean region, which contains 13% of the species diversity[2]. In particular, the latter characteristics concern the Iranian and Central Asian species, and, for this reason, the genus is locally and partially considered to be very susceptible to extinction[1].

As a result of field research conducted during 2023–2025, along with a critical analysis of relevant scientific sources and herbarium specimens preserved in the collections of TASH, FRU, LE, MW, and Khujand State University, the occurrence of 8 species of the genus across the Fergana Valley has been confirmed.

Material and methods. This study is based on both herbarium specimens and published taxonomic literature. The text describes the use of Uzbekistan National Herbarium (TASH) and Moscow State University Herbarium (MW) specimens. It mentions the utilization of resources such as the Global Biodiversity Information Facility and Plants of the World Online platforms. Google Earth Pro 7.1 was used to identify growth points in herbarium samples. Morphological characters such as stem height, leaf shape, indumentum, floral and fruit structures were analyzed using standard botanical terms . Terminology followed Vvedensky's original descriptions

1.1 ***Haplophyllum robustum*** Bunge in Mém. Acad. Pétersb. sav. étrang. **7(1851)** 241.— Introduced in *Flora of the USSR* 14 (1949) 293.— *Ruta robusta* B. Fedtsch. **Past. Turk. (1915)** 555.

Description: A gray-green, herbaceous, pubescent plant covered with glandular tubercles. The stem is strong, branched at the top or in the inflorescence, 30–80 cm tall. Leaves are entire, somewhat thick, denser on the underside, oblong or obovate, usually broadly elliptical, blunt or more often shortly attenuated and obtuse, gradually narrowing into a long petiole that exceeds half the length of the blade. The inflorescence is corymbose, dense, with almost sessile flowers. Bracts are nearly absent. Sepals are persistent, oblong-ovate, obtuse, pubescent, about 1 mm long. Petals are light yellow, greenish along the back, sometimes slightly pubescent, oblong-lanceolate, abruptly narrowing into a short (1 mm), almost square claw, 6–8 mm long. Stamens are free, bearded on the inner side at the middle, almost 1.5 times shorter than the petals, unequal in size; the inner stamens are narrowly triangular-lanceolate, while the outer ones are broader, triangular-lanceolate, tapering into a short tip. The style is smooth. The ovary is sessile, tuberculate, more or less pubescent, with short appendages, containing two ovules in each locule. The capsule is dehiscent, sessile, tuberculate, more or less pubescent, with tubercular appendages, about 5 mm wide.

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Figura 2 Natural illustration of the species

Fenology: Flowers in May–June, fruits in June–July.

Ecology: Grows on outcrops of variegated rocks, stabilized sands, and rocky deserts.

General Distribution: Central Asia (Karakum, Southern Pamir-Alai), Northern Iran.

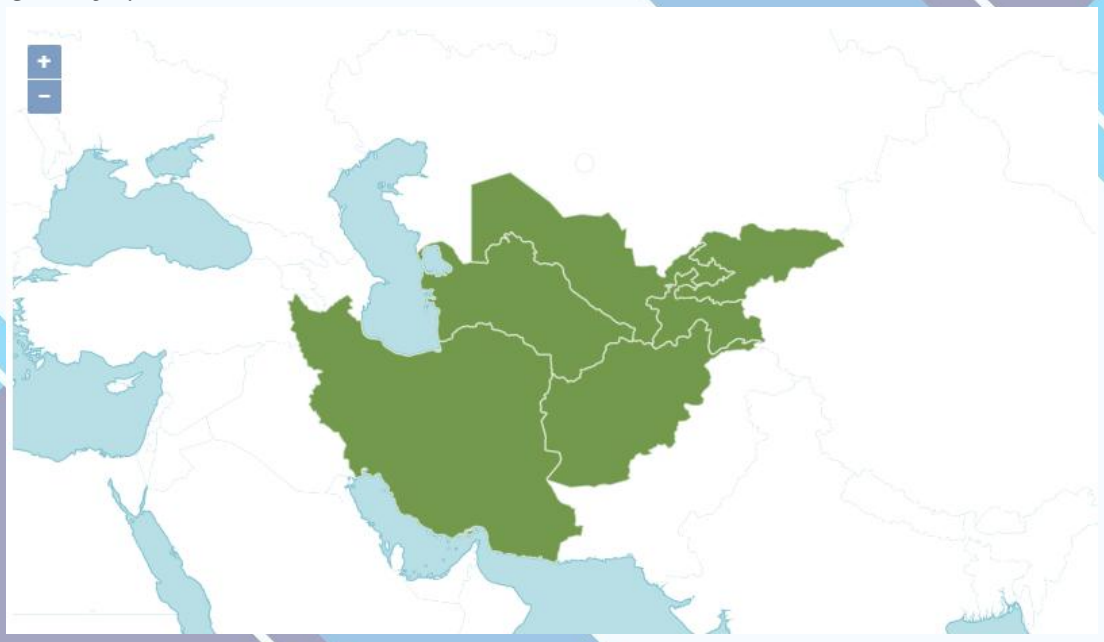

Figure 3 Species distribution map

Distribution in Fergana valley:

Fergana region. Vicinity of the Massalsky site (3 specimens). 10.06.1949 S.S. Sakhobiddinov, A.D. Li. Namangan region. Above the village of Kasansay, forest farm. 26.07.1977 Levichev. Tamdy district, 10 km west of the kolkhoz Chorykty. Light gray sandy soil. 29.05.1956 I. Momotov. Near the station Murgak. Sandy-clay saline desert. 1926.6 Kritsky.

1.2. *Haplophyllum pedicellatum* Bge in Boiss. Fl. or. **1 (1867)** 925. – Vved. in fl. **CCCP. 14 (1949)** 206. – **H. hirsutum** Rgl. et Schmalh. in Izv. Ob-a lyub. estestv.,

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antrop. i etnogr. **34, 2 (1882)** 17. – **H. pilosum** Franch. in Ann. Sc. Nat. Bot. **15 (1883)** 248, tab. 13. – **Ruta pilosa** O. Kuntze in AHP. **10 (1887)** 177. – **R. hirsuta** O. Kuntze in AHP. **10 (1887)** 177. – **R. pedicellata** Aitch. et Hemsl. in Trans. Linn. Soc. **2 ser. 3, 1 (1888–9)** 45. – **H. pedicellatum var. villosum** Zinger in A. H. Bot. Jur. **2 (1901)** 163. – **H. sublanatum** Freyn et Sint. in Bull. Herb. Boiss. **4 (1904)** 36.

Description: A green or bluish-green herbaceous plant, softly spreading, sometimes very densely hairy. The stem is ascending, rather strong, with barely noticeable glands, straight or branched, usually with shortened branches in the leaf axils, densely leafy, 20–50 cm tall. The leaves are entire, very rarely trifoliate, oblong-lanceolate or lanceolate, less often simply oblong, tapering into a long petiole usually equal to the leaf blade, blunt or sharp at the upper part. The inflorescence is corymbose, dense, with flowers on pedicels. The bracts are few and linear. The sepals are persistent, ovate, slightly blunt, hairy, about 1.5 mm long. The petals are yellow, often turning red at the tip, broadly ovate, blunt, with a very short claw, (7)-8-9-(10) mm long, 6–7 mm wide. The stamens are free, almost equal in length, with glands, gradually narrowing from the expanded base, bearded near the middle on the inner side, almost twice as short as the corolla. The style is glabrous. The ovary is sessile, tuberculate, with short appendages, containing 7–8 ovules in each locule. The capsule is dehiscent, almost sessile, tuberculate, more or less hairy or glabrous, about 5 mm wide.

Figure 4 Natural illustration of the species



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Fenology: Flowers from May to June, fruits from June to August.

Ecology: It grows in clay deserts and clay slopes in foothills.

General Distribution: Central Asia (Pamiro-Alay, Kopetdag, Parapamiz), Northern Iran, and Northern Afghanistan.

Distribution in Fergana valley: Alay Ridge. Basin of the Shahimardan River. Vicinity of the city of Fergana. Sadkak. 15.04.1965 Khalkuziev.

Turkestan Ridge. Foothills. Hilly adyrs. Beyond Namangan. 05.06.1937 E. Demurina. Turkestan Ridge. Foothills. Hilly adyrs. Beyond the Namangan collective farm. 05.06.1937 E. Demurina. Turkestan Ridge. Foothills. 4–6 km east of the Achi-Kishlak collective farm. 07.06.1937 E. Demurina.

1.3 *Haplophyllum bungei* Trautv. in AHP. **8 (1883)** 183.—Vved. in **Fl. USSR** 14 (1949) 292.— *Ruta Bungei* B. Fedtsch. **Past. Turk. (1915)** 555.— *H. versicolor* auct. fl. As. Med.— **Sh. Bunge.**

Description: A completely hairless, densely dotted glandular, and additionally covered with protruding glands, herbaceous plant. Stems are yellowish, shiny, straight or ascending, branched, leafless in the upper part, 30–60 cm tall. Leaves are entire, gradually tapering into a short petiole, sometimes slightly curly; lower leaves are broadly oblong or almost round, blunt; middle and upper leaves are oblong or lanceolate. The inflorescence is loose, almost without bracts. Sepals are persistent, ovate, slightly blunt, about 0.75 mm long. Petals are yellow, oblong, blunt, 6 mm long, abruptly narrowing into a short (about 1 mm) claw. Filaments of stamens are fused at the base, glandular, equal in size, 1.5 times shorter than the petals, abruptly widening in the lower half, bearded on the inner side. Ovary is sessile, smooth, tuberculate, almost without appendages, with 2 ovules in each locule. Style is smooth. Capsule is dehiscent, densely tuberculate, smooth, 4–5 mm wide.

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Figure 5 Natural illustration of the species

Fenology: Flowering in May, fruiting in June.

Ecology: Found in sandy deserts.

General Distribution: Central Asia (Kyzylkum, Karakum, Tian Shan (northern edges of Karatau), the mouth of the Fergana Valley, Southern Pamir-Alay).



Figure 6 Species distribution map

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Distribution in Fergana valley: ***I.Central Asian mountain province: I-1-e Chorkesar:*** Western Tian Shan. Kuramin Range. Parda-Tursun, the headwaters of Novbulak watershed, altitude = 3100-3200 meters above sea level 20.07.2009. Sh. Tojiboev; Turkestan range. Foothills. Hilly slopes. Beyond the city of Namangan. 5.06.1937. E. Demurina**.**

1.4. ***Haplophyllum ferganicum*** Vved. in Not. Syst. Herb. Inst. Bot. et Zool. Ac. Sc. Uzbek. **10** *(1948)* 32.—Vved. in Fl. CCCP. **14** *(1949)* 243.—*H. ferganicum*.

Description A bluish-green herbaceous plant. Stems are few in number, erect or ascending, simple or rarely branched, curly-hairy, 10–40 cm tall. Leaves are either clustered at the lower part of the stem or evenly distributed along the stem, entire, almost sessile, more or less curly-hairy. Lower leaves are obovate or oblanceolate, obtuse, while the upper leaves are oblong-linear-lanceolate or linear-lanceolate, obtuse or slightly pointed. The inflorescence is corymbose, dense, almost woolly, with nearly sessile flowers. Bracts are linear, hairy, and often absent. Sepals are persistent, ovate-triangular, slightly obtuse, hairy, 1–1.5 mm long. Petals are pale yellow, with a greenish or dull purplish hue on the hairy back, oblong, obtuse, suddenly narrowing into a long (about 1.5 mm) claw, 6–7 mm long. Staminal filaments are fused at the base, glandular, glabrous, or sometimes slightly hairy in the middle, suddenly widening in the lower third, and are nearly twice as short as the petals. The style is more or less hairy. The ovary is on a very short stalk, hairy or sometimes nearly glabrous, with short appendages, containing two ovules in each locule. The capsule is dehiscent, nearly sessile, more or less hairy, tuberculate, with wart-like appendages, about 4 mm wide.



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Figure 7 Natural illustration of the species

Fenology: Flowers from late April to July, fruits from May to July.

Ecology: Grows on clay and rocky slopes in foothills; sometimes occurs as a weed.

General distribution: Fergana Valley.



Figure 8 Species distribution map

Distribution in Fergana valley: Pamir-Alai. Basin of the Shahimardan River. Vicinity of the city Fergana. Sadkak. Rocky soil (2 specimens). 28.04.1968 – Khalkuziev P.Kh., Kovalevskaya S.S. Fergana Valley. Vicinity of Verevkino station. Rocky-gravelly soil. 31.07.1956 – Arifkhanova. Fergana region. Vicinity of Shor-Su, on the northwestern slope. 09.06.1949 – S.S. Sakhobiddinov, A.D. Li, Kovalevskaya S.S. Fergana Valley. On the adyrs near the kishlak Kholi (Kalinina collective farm). – Arifkhanova, Gringof. 2 km north of the village Shurab. 10.07.1963 – Arifkhanova. Alai ridge. From the Tuiamuyun tract to the village Markhamat. 18.05.1954 – Arifkhanova. Fergana Valley. Andijan district. Uch-Kurgan steppe. Northern section. 1.5 km southeast from point 45. 02.05.1929 – A.F. Ioffe. Pamir-Alay. Basin of the Shakhimardan River. Vicinity of Fergana city. Sadkak. Rocky soil (2 specimens). 28.04.1968, Khalkuziev P.Kh., Kovalevskaya S.S. Fergana Valley. Vicinity of Verevkino station. Rocky-gravelly soil. 31.07.1956, Arifkhanova ;Fergana Region. Vicinity of Shor-sum on the north-western slope. 09.06.1949, S.S. Sakhobiddinov, A.D. Li, Kovalevskaya S.S.; Fergana Valley. On the Adyrs near the village of Kholi (Kalinina kolkhoz).: Arifkhanova, Gringof 2 km north of the village of Shurab.10.07.1963, Arifkhanova; Alay Ridge. From Tuyamuyun tract to the village of Markhamat.

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18.05.1954, Arifkhanova Fergana Valley. Andijan District. Uch-Kurgan Steppe. Northern section. 1.5 km from ... 45° to the southeast. 02.05.1929, A.F. Ioffe; Fergana Valley. Andijan District. Uch-Kurgan Steppe. 5 km west of the village of Naushkent. 29.04.1929, A.F. Ioffe; Fergana Valley. Andijan District. Uch-Kurgan Steppe. Northern section. Sagebrush steppe. 07.05.1929, A.F. Ioffe; Fergana Valley. Andijan District. Uch-Kurgan Steppe. 3.5 km northeast of Uch-Kurgan station. 28.04.1928, A.F. Ioffe; Fergana Valley. Andijan District. Uch-Kurgan Steppe. Along the railway between Uch-Kurgan and Kugay stations. 02.05.1928 and 20.07.1928, A.F. Ioffe; Fergana Region. Namangan District. In the hills near Pakhtalyk-Kul. 11.05.1925, Solkina, Vvedensky; Fergana Valley. Andijan District. Uch-Kurgan Steppe. Northern section. Sagebrush steppe. 05.05.1929, A.F. Ioffe; Fergana Valley. Andijan District. Uch-Kurgan Steppe. 3.5 km southeast of Kugay station. 08.05.1928, A.F. Ioffe; Fergana Region. Namangan District. Naryn River Valley. 12.07.1909, V.I. Yuferov; Eastern Fergana. Naiman State Farm. Near an irrigation ditch. 07.08.1931, Semenikhina;

Northern foothills of the Alay Range. Between the Sukh and Shakhimardan rivers, "Kan" mine area. 20.05.1938, T.G. Glybin; Northern foothills of the Alay Range. Between the Sukh and Shakhimardan rivers. Alluvial cone of Shuran-say. 15.05.1938, T.G. Glybin; Fergana Valley. Balykchi District. Bus tract, between the villages of Kurganchi and Mingbulak. Loess soils with mild salinity. 26.05.1932, Garshin; Eastern Fergana. Uch-Kurgan State Farm, farmstead № 3. Cotton field. 30.08.1931, Semenikhina; Fergana Valley. Isfara District. Charhu collective farm. Hills. 27.06.1931, B.S. Zakrzhevsky; Eastern Fergana. "Savai" State Farm, farmstead № 6. Bank of the main irrigation canal. 07.07.1931, V. Blak

Eastern Fergana. "Savai" State Farm, farmstead № 6. Bank of the Pervomaysky irrigation canal. 07.07.1931, V. Blak Andijan District. 1 km southeast of the Kaunchi collective farm. 16.05.1932, Pazy Basin of the Shakhimardan River. Road between the villages of Tashkurgan and Naukat. Pebble deposits near the Adyrs. 28.05.1932, Garshin Fergana Valley. Yangiaryk District. 7 km southeast of the Kakanbay collective farm. Sagebrush steppe. 09.06.1928, A.F. Ioffe Fergana Valley. Yangiaryk Irrigation District. Vicinity of Kyzyl-Ravat village. Fallow land. 07.06.1928, A.F. Ioffe Fergana Valley. Right bank of the Naryn River. Vicinity of Kyzyl-Ravat. Fallow land. 08.06.1928, A.F. Ioffe Fergana Valley. Left bank of the Syr Darya River. Vicinity of Kurgancha. Old fallow field. 27.07.1928, A.F. Ioffe Vicinity of Fergana city. Sadkak. 15.05.1966, Khalkuziev, Kovalevskaya S.S. Pamir-Alay. Basin of the Shakhimardan River. Vicinity of Fergana city. Sadkak. 30.04.1968, Khalkuziev, Kovalevskaya S.S. Pamir-Alay. Basin of the Shakhimardan River. Vicinity of Fergana city. Sadkak. Rocky-clay areas. 11.04.1968, Khalkuziev, Kovalevskaya S.S. Central Fergana, Darvazakum. Rocky-clay area near the garden and Schröder River. 25.04.1965, P.Kh. Khalkuziev, A. Sultanov, Kovalevskaya S.S. North of Namangan, along the road from Kokumbay village to Tegidjar village.18.07.1949, O.N.

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Bondarenko, Kovalevskaya S.S. Fergana Region. Piedmont plain of the Akpilyal massif, near the airfield. 25.04.1956, S. Golovchenko, A. Khalmuradov North of Namangan, along the road from Kokumbay village to Tegidjar village. 13.07.1949, O.N. Bondarenko, Kovalevskaya S.S. Fergana Region. Vicinity of Shor-su on the north-western slope. 09.06.1949, S.S. Sakhobiddinov, A.D. Li Pap District. Vicinity of Khanabad village. Fields and irrigation canals. 10.06.1949, O.N. Bondarenko, Kovalevskaya S.S. Pamir-Alay. Basin of the Shakhimardan River. Vicinity of Fergana city. Sadkak. 30.04.1968, Khalkuziev, Kovalevskaya S.S. Uzbekistan, Fergana Region, Kampirkok Mountains, mixed-flowered vegetation, rocky gentle slope. 16.06.2022, Tulkin Tillayev Uzbekistan, Fergana Region, Kampirkok Mountains, clayey dry riverbed, mixed-flowered vegetation. 19.05.2021, Tulkin Tillayev Uzbekistan, Namangan Region, Yangikurgan District, vicinity of Yangikurgan settlement, north shore of the Eskiyer reservoir, clayey slope. 14.05.2019, Vyacheslav Yusupov

1.5. *Haplophyllum latifolium* K. et K. Described by: Karelin & Kirilov (1841) in Bulletin de la Société Impériale des Naturalistes de Moscou, 14: 398.
Vvedensky (1949) in Flora of the USSR*, 14: 225. Ruta latifolia B. Fedtschenko (1915) in Plants of Turkestan, 555.

Description: A green, completely glabrous, herbaceous plant. The stem is strong, corymbosely branched, and 25–60 cm tall. Leaves are almost sessile or on short petioles, entire, oblong-lanceolate, oblong, or broadly oblong, sometimes almost round, blunt or slightly pointed, with entire margins. Inflorescence is paniculate-corymbose, multi-flowered, with pedicellate flowers. Sepals are persistent, almost rounded, blunt, glabrous, about 1.5 mm long. Petals are glabrous, with glandular dots, dark yellow, oblong or oblong-ovate, abruptly narrowing into a short claw (about 1 mm long), 9–12 mm long, 5–6 mm wide. Staminal filaments are free, glandular, suddenly widening in the lower part, bearded inside, and twice as short as the petals. Ovary is sessile, glabrous, tuberculate, without appendages. Style is glabrous Capsule is indehiscent, glabrous, densely covered with rod-shaped tubercles, 4–5 mm wide.

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Figure 9. Natural illustration of the species

Fenology: Flowers in May–June. Fruits in July–August.

Ecology: Found on clay slopes, from foothills to the mid-mountain zone.

General Distribution: Central Asia: Tarbagatai, Dzungarian Alatau, Tian Shan, Pamir-Alai (Turkestan Range).



Figure 10 Species distribution map

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Distribution in Fergana valley: ; Western Tien Shan. Kuramin Ridge. Northern slope. Urgaz Sai. Northern slope. Juniper grove. 15.05.1940 A. Usmanov, A. Khalmuradov. Alay Ridge. Basin of the Shahimardan River. Yardan. 04.06.1967 Khalkuziev. Kuramin Ridge, Altyn-Topkan mountains, 3.5 km east of the Altyn-Topkan mine, upper part of the western gravelly slope. 17.06.1953 R. Vernik, M. Nabiev, T. Tsukervanik. Fergana. Vicinity of the village Charvak. Couch grass steppes. 09.07.1926 Korovin E.P. Pamir-Alay. Khodzha-Gurgur-Ata mountains. Upper reaches of the Turgan-Darya River. Outcrops of red sandstones in Kizyl-Sai. Stabilized sites among slopes (2 specimens). 09.07.1934 Butkov A.Ya., Adylov. Pamir-Alay. Khodzha-Gurgur-Ata mountains. Upper reaches of the Turgan-Darya River. Juniper grove at the mouth of Kizil-Sai, southern slope. 08.07.1934 Butkov A.Ya.

1.6. ***Haplophyllum perforatum*** **(MB.) K. et K.** in Bull. Soc. Nat. Mosc. 14 (1841) 397. – Vved. in Flora of the USSR 14 (1949) 226. – Ruta perforata MB. Beschr. Länd. casp. (1860) 172. – H. Sieversii Fisch. in Schrenk. Enum. pl. nov. 1 (1841) 89. – Ruta Sieversii B. Fedtsch. Plants of Turkestan (1915) 555. – H. acutifolium auct.

Description: A green or bluish-green herbaceous plant covered with glandular dots. The stem is erect, umbellately branched, glabrous, and 30–70 cm tall. The leaves are glabrous, ranging from broadly oblong to lanceolate, sharp or slightly obtuse, gradually tapering into a short petiole, and entire-margined. The inflorescence is a panicle-like umbel, many-flowered, with more or less pubescent branches. Bracts are linear and somewhat pubescent. Sepals are persistent, triangular, almost free to the base, sharp, somewhat pubescent, and about 1 mm long. Petals are yellow, small, (3)–3.5–(5) mm long, oblong-lanceolate, usually gradually narrowing into a short (about 1 mm) claw. Stamens are free, bearded on the inner side, glandular, almost equal in length, suddenly widening in the lower half, and 1.5 times shorter than the petals. The style is glabrous. The ovary is sessile, glabrous, tuberculate, without appendages. The capsule is dehiscent, with falling locules, on a very short stalk, densely tuberculate, with depressed tubercles at the apex, and 3-(4) mm wide.

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Figure 11 Natural illustration of the species

Fenology: Flowering May to July and Fruiting from June to August.

Ecology: It grows on fine soil and, less commonly, on rocky slopes, from foothills to the middle mountain belt.

General distribution: Central Asia (Tarbagatai, Dzungarian Alatau, Tian Shan, Pamir-Alai, Parapamiz).



Figure 12 Species distribution map

Distribution in Fergana valley: Eastern Fergana. Sovkhoz Uch-Kurgan, Hamlet No. 10 Zelezhi. 22.09.1931 – Semenikhina. Fergana region, Namangan district. At the confluence of the Khodzha-Atta and Kara-Su rivers. 26.07.1915 – R.Yu. Rozhevits. Pamir-Alai. Western part of the Alai ridge. Vicinity of the village Shahimardan. 15.06.1964 – Shonazarov. Fergana region. On fine-earth and rocky slopes in the vicinity of the village Yordan. 15.06.1967 – Khalmuradov.

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Fergana. Foothills of Khan-Zhailau. 08.06.1916 – A. Rozanov, E.P. Korovin. Fergana. Interfluve of the lowlands in the adyrs to the east of canal Mzhan, plots No. 189, 190, 191, 192. 10.05.1916 – A. Rozanov, E.P. Korovin. Northern slope of the Alai ridge. 9–10 km south of the city of Fergana, on the road to Chimion. On adyrs. 15.05.1952 – M.M. Arifkhanova. Fergana Valley. On the road from Andijan to the kishlak Madaniyat. Rocky soils. 20.05.1952 – Arifkhanova, Gringof.Western Tien Shan. Kurama Mountains. Valley of the Abjas (Abiyaz) River. Horse breeding state farm 68. Mountain hamlet. 200 m east of the hamlet. Western gentle slope. Fallow field. 16.06.1936 – M. Fedorova.

Right bank of the Syr Darya within the Fergana Valley and Chatkal ridge. Southwestern slope of the Chatkal foothills near Chodak. Chodak-Su valley. Rocky and gravelly scree. 30.06.1936 – V.I. Skorokhodov, A.A. Azatyan, A. Khalmuradov. Western Tien Shan. Kuramin ridge. Northern slope. 3 km from sovkhoz N, in a southern direction. In a sedge–Scaligeria association. 04.05.1940 – A.P. Vasilkovskaya, A. Khalmuradov. Western Tien Shan. Kuramin ridge. Northern slope. 3 km from sovkhoz No. 6, southwards. In a sedge–Scaligeria association. 04.05.1940 – A.P. Vasilkovskaya. Northern slopes of the Kuramin ridge. Abjazsay, 4th department of the pedigree sovkhoz, in a juniper grove, 1700 m a.s.l., southeast slope. 07.09.1956 – Sh. Kamalov, A. Khalmuradov. Alai ridge. Basin of the Shahimardan River. Vicinity of the village Yardan. Left bank of the Shahimardan River. 28.06.1961 – A.D. Pyataeva, Students. Western Tien Shan. Kurama Mountains. Valley of the Abjas (Abiyaz) River. 1935.5 – M. Sovetkina. Vicinity of the city Namangan, west of the village Pakhtalyk-Kul. Bottom of a rocky ravine. – A.F. Ioffe. Western Tien Shan. Southern spurs of the Chatkal ridge. Vicinity of the village Kasansay. Sag-Khana ravine. 23.06.1933 – V. Drobov, S. Sakhabutdinov. Fergana Valley. Andijan district. Uch-Kurgan steppe. Near an irrigation ditch. 07.05.1928 – A.F. Ioffe. Northern foothills of the Alai ridge. Between the Sukh and Shahimardan rivers. Alluvial cone of Shursan-say. 15.05.1938 – T.G. Glybin. Fergana Valley. Andijan district. Uch-Kurgan steppe. Northern section, on gravel by the Naryn River. 09.05.1929 – A.F. Ioffe. Fergana region. Skobelev district. Northern slope of the Alai ridge. Basin of the Shahimardan River. Ankhorsky area. Clay slope. 13.07.1915 – V. Drobov. Eastern Fergana. Sovkhoz Naiman. Virgin land. 10.08.1931 – Semenikhina. Alai ridge. Basin of the Kara-Kazyk River. Vicinity of Shahimardan resort. Mount Isbasar opposite the resort, northern slope. Dry wormwood-grass steppe at an elevation of 1800 m. 03.08.1935 – M. Sovetkina.

Fergana Valley. Road from the village Chust to the village Gavasay. 25.05.1952 – Arifkhanova, Gringof. Fergana Valley. Between the villages Lyakkan and Okhcha. 03.08.1956 – Arifkhanova. Turkestan ridge. Road from the village Batken to the village Sukh, at 13 km. 18.05.1954 – Arifkhanova. Chatkal ridge. Charki-Sar tract, northern slopes. 12.05.1950 – Arifkhanova. Vicinity of Chodak, adyrs. 11.06.1949 – S.Kh. Chevrenidi. Fergana region. 8 km south of Vandovskaya

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station, on adyrs (3 specimens). 03.06.1949 – S.S. Sakhobiddinov, A.D. Li. Pap district. East of the village Mazarsay, Uryukli. 13.06.1949 – O.N. Bondarenko.

1.7. *Haplophyllum versicolor*

Description A perennial herbaceous plant with a short rhizome, sparsely pubescent or almost glabrous. The stem is thin, rarely completely glabrous, covered with sparse hairs or sometimes glandular hairs. The stem is erect or ascending, branched or rarely simple, 10–25 cm in height. The leaves are simple, almost sessile or with short petioles, with a gradually narrowing base, often wavy along the edges. The lower leaves are obovate or obovate-lanceolate, while the upper leaves are lanceolate or oblong-lanceolate, blunt or with an abruptly pointed tip. The flowers are few, gathered in branched inflorescences, almost sessile. The sepals are persistent, ovate-triangular, pubescent, about 0.75 mm long. The sepals are green or grayish-purple, covered with hairs, and very rarely glabrous.The petals are pale yellow, oblong, blunt, suddenly narrowing into a short (about 1 mm) claw, 5–9 mm long and 2.5–4 mm wide. The stamens are fused at the base, almost glabrous, about 1.5 times shorter than the petals.The fruit is pubescent or glabrous, with tuberculate appendages. The ovary is hairy, with two seeds in each nest.



Figure 13 Natural illustration of the species

Fenology: Flowers bloom from May to June, and fruits mature in June.

Ecology: Found in sandy and rocky areas, deserts. Distributed in the Tashkent region, Samarkand, Bukhara, Kashkadarya, and Surkhandarya regions.

General Distribution: Central Asia (Western Tian Shan, Pamir-Alai, Karakum Desert, and the Fergana Valley).

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Figure 14 Species distribution map

Distribution in Fergana valley: Western Tien Shan. Kuramin Range. Northern slope. 3 km from Dzhetym-Cheku, in ruderal-fallow vegetation. 14.05.1940 — A.P. Vasilkovskaya, A. Khalmuradov. Hills between Chust and Namangan. 14.07.1969 — A.Ya. Butkov, G. Khamidov, S.S. Kovalevskaya Turkestan Range. Foothills, hilly adyrs beyond the collective farm "Namangan" (2 specimens). 05.06.1937 — E. Demurina ;Turkestan Range. Foothills. Southern slightly loamy slope, 1 km north of the city of Ura-Tyube. 31.05.1937 — E. Demurina; Western Tien Shan. Kuramin Range, Parda-Tursun, upper reaches of the Novbulak watershed, elevation = 3100–3200 m a.s.l. (2 specimens). 20.07.2009 ;Western Fergana. Turkestan Range. Valley of the Khoja-Bakirgank River. Vicinity of the village Auchi-Kalacha. Along the canal (2 specimens) 25.07.1948 — Arifkhanova.

1.8. *Haplophyllum monadelphum Afan*.In "Botanical materials of the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR", vol. XI (1949) p. 125; Introduced in "Flora of the USSR", vol. XIV (1949) p. 215; Nikitin in "Flora of Kyrgyzstan", vol. VII (1957) p. 501. Sect. Monadelphae.

Description: Shrub-like perennial 30–50 cm tall. Stems are branched, glabrous, in the lower part dark gray, in the middle – with brown bark; young shoots green, iron-dotted. Leaves 2–4 cm long, basal up to 3.5 cm long, upper ones 1–1.5 mm wide, entire, linear or linear-oblong, tapering at the base, lanceolate, thick, dotted with iron glands. Inflorescence elongated, spike-like, loose. Bracts linear-lanceolate, glabrous or with iron glands. Calyx 2–2.5 mm long, glabrous or slightly glandular, with straight teeth. Petals 7–9 mm long, pale yellow, sparsely covered with iron glands, narrowly obovate. Stamens 7–9 mm long, pale yellow, sparsely dotted with iron glands, anthers free, elongated, slightly curved.Fruit – capsule, blong-ovate, dotted with iron glands. Seeds ovate, located in a free central placenta, smooth, brown.

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Figure 15 Natural illustration of the species

Fenology: Flowering July – August, fruiting: August – September.

Ecology: Rocky slopes, dry stony areas, gravelly soils.

General Distribution: Western Pamir-Alai – Turkestan Range (upper course of the Karasu River in the Dzhiptyk area and confluence of the Dzhingan and Karasu Rivers), Kyrgyz Range – upper reaches of the Alamedin River, etc.: Central Asia (Northern Pamir-Alai). Endemic.

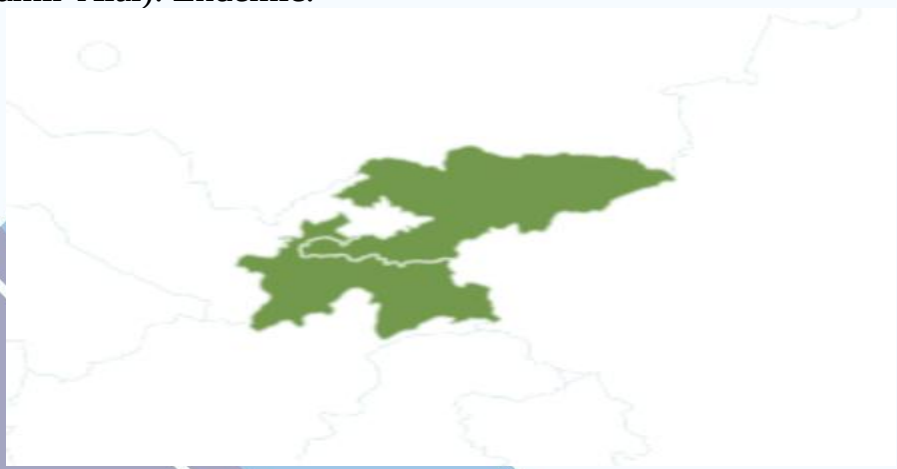

Figure 16. Species distribution map

Distribution in Fergana valley: Western Tien Shan. Kuramin Ridge. Northern slope. 3 km from Dzhetym-Cheku, in weedy-fallow vegetation. 14.05.1940 A.P. Vasilkovskaya, A. Khalmuradov. Adyrs between Chust and Namangan. 14.07.1969 Butkov A.Ya., G. Khamidov, Kovalevskaya S.S.Turkestan Ridge. Foothills. Hilly adyrs beyond Namangan collective farm (2 specimens). 05.06.1937 E. Demurina. Turkestan Ridge. Foothills. Southern, fine-soiled slope, 1 km north of Ura-Tyube city. 31.05.1937 E. Demurina. Western Tien Shan. Kuramin Ridge.

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Parda-Tursun, upper reaches of the Novbulak watershed, elevation 3100–3200 m a.s.l. (2 specimens). 20.07.2009 Tojibaev K.Sh. Western Fergana. Turkestan Ridge. Valley of the Khoja-Bakirgan River. Vicinity of the village Auchi-Kalacha. Along the canal 25.07.1948 Arifkhanova.

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