

Some Endemic Plant Species of the Kashkadarya Botanical-Geographical Region: A Case Study of the Basins of the Katta Uradaryo and Kichik Uradaryo Rivers and the Gissar State Nature Reserve

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Abstract: The article presents data on certain endemic plant species distributed in the flora of the Kashkadarya region, specifically within the basins of the Katta Uradaryo and Kichik Uradaryo rivers and the Gissar State Nature Reserve. A total of 11 species belonging to 7 families and 9 genera were identified. Among these, 6 species are hemicryptophytes, 2 are chamaephytes, and therophyte, phanerophyte, and cryptophyte are represented by one species each. It was also established that 4 of these endemic species, belonging to 4 families and 4 genera, are listed in the "Red Data Book of the Republic of Uzbekistan" (2019). The article briefly discusses the local distribution of two regional endemics: *Rosa sumneviczii* and *Cicerincanum*.

Keywords: Gissar State Nature Reserve, Katta Uradaryo, Kichik Uradaryo, region, flora, Red Data Book, endemic, species.

Introduction

Endemic species are of high conservation priority due to their restricted geographic distribution. Because they often occupy rare or fragile ecological niches, even slight unfavorable environmental changes can lead to their rapid extinction [1].

The last left tributary of the Kashkadarya River is the Guzordarya (86 km long, with a drainage basin of 3,170 km²). The Guzordarya is formed by the confluence of the Katta Uradaryo and Kichik Uradaryo rivers. The Katta Uradaryo (113 km long, drainage area of 1,400 km²) originates near the Kharkush Pass (3,448 m), at the junction of the Chakchar and Yakkabog mountains, and is known as Egrisuv in its upper reaches. It flows almost entirely through mountainous terrain with a narrow valley, receiving tributaries such as Qizilsoy, Almatsoy, Zarangbuloq, Shursuv, and others.

The Kichik Uradaryo is 93 km long, with a drainage basin of 1,588 km², and originates from the southwestern slopes of the Gissar range at altitudes of 2,500-2,700 meters. Its main tributaries include Shirindaryo (17 km), Qoradahana (25 km), Gurota (20 km), and others.

The Qorasuv River (lower course of the Guzordarya) is the last right-hand tributary that flows into the Kashkadarya. The right-bank tributaries of the Kashkadarya begin on the southern slopes of the Qoratepa Mountains, where 18 major and numerous minor streams originate [2].

To optimize water use from the Katta Uradaryo and Kichik Uradaryo rivers, the Pachkamar Reservoir was constructed in the 1980s. As a result, water flow into the Guzordarya was reduced, which negatively affected the flora of the Guzordarya basin.

According to Uzbekistan's botanical-geographical zoning scheme, the basins of the Katta Uradaryo and Kichik Uradaryo rivers and the Gissar State Nature Reserve are located within the Kashkadarya botanical-geographical region of the Southwestern Gissar district [3].

The basins of the Katta Uradaryo and Kichik Uradaryo rivers lie within the Kashkadarya botanical-geographical region, with most of the area falling under the administrative boundaries of the Dehkanabad district. These basins also border the Yakkabag, Kamashi, and Guzar districts and partly fall within their territories. The elevation of the basins ranges from 654 to 2,875 meters above sea level and includes four altitudinal zones. To the northeast, it borders the Baysun botanical-geographical region of the Surxondaryo province and the Gissar State Nature Reserve; to the south and southwest — the Torqapchigay botanical-geographical region; to the north — the Guzar and Kamashi districts; and to the north — the Yakkabag district.

The basin stretches approximately 60 km from east to west (12 grid cells) and about 55 km from north to south (11 grid cells). The lowest point (654 m a.s.l.) is located in Bazartepa village of Dehkanabad district, corresponding to grid index AD186. The highest point (2,875 m a.s.l.) is located in Kiziltam village and the Maydanak Observatory area (Xon-Taxta) of Kamashi district, corresponding to grid index AH193. A 5×5 km grid mapping system has been developed for the region, covering 94 grid indices and a total area of 172,650 hectares, with a radius of 213 km. The region stretches 52.63 km north to south and 63.32 km west to east.

The Gissar State Nature Reserve is also located within the Kashkadarya botanical-geographical region, covering elevations from 1,750 to 4,366 meters a.s.l. within the administrative borders of Shakhrisabz, Yakkabag, and Kamashi districts of the Kashkadarya region. To the southeast, it borders Surkhandarya region, and to the east, the Republic of Tajikistan. The reserve stretches 37 km east to west and 90 km north to south. Its mountain peaks range from 2,500 m to 4,421 m in elevation, including Hazrati Sultan (4,030 m), Khojaqirshavor (4,303 m), Turtkuylik (4,366 m), and Bibi-Ulmas (4,349 m). The highest point in Uzbekistan — an unnamed peak at 4,421 meters — is located within the reserve, in the Turtkuylik mountains. Rivers and streams in the reserve have formed deep gorges and canyons [4]. A 5×5 km grid map of the Gissar State Nature Reserve has been developed, consisting of 58 grid indices and covering approximately 81,000 hectares.

Literature Review, Research Materials and Methods

The extinction of natural populations or even entire species is often directly linked to the increasing human population, which leads to the destruction and alteration of plant habitats. This, in turn, results in environmental pollution and climate change. As a consequence, the disruption of genetic diversity and the gradual disappearance of certain species are observed [5], [6].

Endemic species are less vulnerable to external environmental threats and natural changes, and are considered organisms at high risk of population decline or extinction. The preservation of such species is currently recognized as one of the most pressing and globally significant issues. To support species conservation, it is necessary to implement protective measures at the national level. Another effective method of conservation includes the establishment of seed banks, botanical gardens, zoos, and other rational and modern approaches [7].

In a study by S.M. Mustafayev (1966) [8], focused on raw plant resources in the Kashkadarya basin, 1,184 species of higher plants belonging to 73 families and 473 genera were recorded. Among these, 74 species were identified as endemics.

According to U. Eshtemirov (2019) [9], who studied rare and endemic plant species in the Kashkadarya basin, 70 endemic species were recorded in the flora of the region.

O'.Eshtemirov (2019) ning [9] Qashqadaryo havzasi noyob va endem o'simlik turlari ustida olib borgan tadqiqotlariga ko'ra, havza florasida 70 turga mansub endem turlar borligi qayd etilgan.

In recent years, the scope of research on endemic species specific to certain natural regions and floras has expanded. Such studies have focused on the species composition of families or particular endemic fractions [10], as well as their conservation status and broad-scale ecological analyses.

The first systematic account of endemic and rare species in the flora of Southwestern Gissar was conducted by L.I. Vasileva and I.T. Vasilchenko [11]. Their research, covering the Southwestern Gissar region, including the Sangardak and Tupalang river basins, documented 203 endemic species and 60 subendemic species across 29 families and 100 genera. Later, F.O. Khasanov [12] reported 124 endemic species belonging to 22 families and 55 genera specifically for the Southwestern Gissar flora, analyzing their phylogenetic relationships. According to recent studies, 121 endemic species have been recorded in the flora of the Southwestern Gissar district [13].

In recent years, research on the floristic composition of Uzbekistan has been conducted using new, modern methodologies. In particular, the entire territory of the Republic has been divided into 19,240 grid indices using a 5×5 km grid-mapping system [3].

Despite extensive studies in these and neighboring areas, literature analysis shows that the floristic composition of the studied regions has not been comprehensively and systematically investigated. The floras of the Gissar State Nature Reserve and the basins of the Katta Uradaryo and Kichik Uradaryo rivers have not been fully documented (Figures 1-2).

According to the botanical-geographical zoning scheme of Uzbekistan [3], the study area includes the Gissar State Nature Reserve and the Katta Uradaryo and Kichik Uradaryo river basins. Species geolocations were determined using the programs Google EarthPro (2019) and MAPS.ME. Fieldwork was carried out following methods developed by A.I. Tolmachev [14], A.V. Sherbakov, and C.R. Mayorov [15].

The grid map of Uzbekistan's natural flora was generated using ArcGIS version 10.6.1, based on the WGS 1984 (World Geodetic System 1984) projection. The research objects included the urban flora of Karshi city in Kashkadarya region and selected endemic species found in the Katta Uradaryo and Kichik Uradaryo river basins. Scientific names and accepted taxonomic classifications of endemic species were verified and listed using the Plants of the World Online (POWO, 2023) and the International Plant Names Index (IPNI, 2023) databases [16, 17].

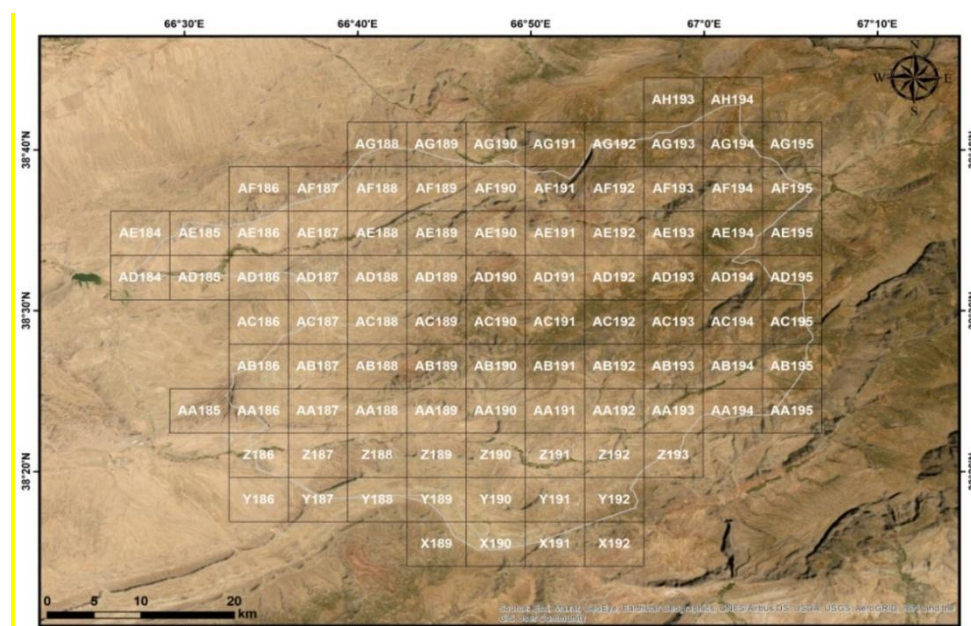


Figure 1: Grid-based map of the flora of the Katta Uradaryo and Kichik Uradaryo river basins.

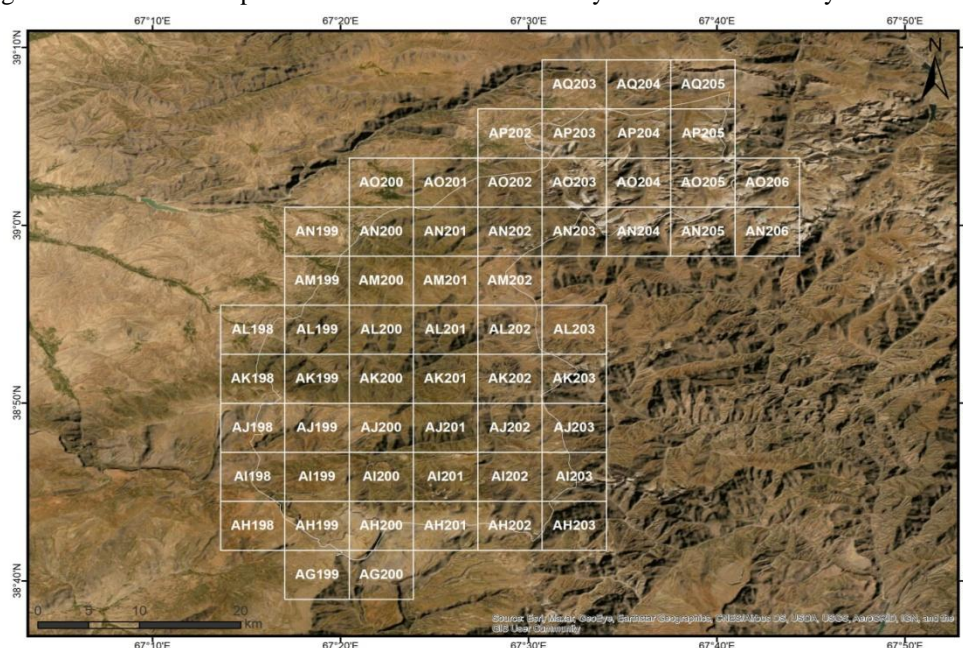


Figure 2: Grid-based map of the Gissar State Nature Reserve.

The statuses and distribution of rare and endemic species were determined based on the Red Data Book of the Republic of Uzbekistan (2019) [18].

Research materials consist of dissertations and scientific sources related to the study area and its surrounding regions. In addition, the following floristic works were used: the 11-volume “Identification Guide to the Plants of Central Asia” [19; 1963-2015], the 6-volume “Flora of Uzbekistan” [20; 1941-1962], and the 30-volume “Flora of the USSR” [21; 1934-1964]. Herbarium specimens preserved in the National Herbarium of Uzbekistan (TASH) and those collected during fieldwork were also utilized.

Based on the data from the National Herbarium of Uzbekistan, it can be stated that floristic research in this area began with the studies of Lipsky (1897) and continued most recently with those of Turginov (2022). Among the scientists who collected the highest number of species and herbarium specimens are:

- A. Pyatayeva (1942-1980) — 201 species, 495 specimens;
- E. Korotkova (1935-1972) — 85 species, 143 specimens;
- A. Arnold (1942) — 85 species, 114 specimens;
- S. N. Kudryashev (1935-1941) — 53 species, 67 specimens;
- M. G. Popov (1914-1916) — 49 species, 62 specimens;
- A. Gnezdillo (1935) — 42 species, 61 specimens;
- A. Li and B. Niyazov (1950-1959) — 39 species, 62 specimens;
- N. Koshurnikova (1941-1956) — 37 species, 43 specimens;
- O. Turginov (2011-2022) — 28 species, 42 herbarium specimens [22].

More recently, O. Turginov (2024), in his doctoral dissertation titled “Endemic Plants of Uzbekistan”, presented data on 2,391 herbarium specimens representing 326 endemic plant species of Uzbekistan [23].

In our previous studies [24], based on herbarium analyses preserved in the National Herbarium of Uzbekistan (TASH), it was reported that the studied area contains 606 species belonging to 256 genera and 55 families. As of today, 59 species representing 37 genera and 19 families from the flora of the study area have been included in the Red Data Book of Uzbekistan (2019) [25]. Furthermore, in our publication focusing on endemic species of the region [26], 52 species belonging to 30 genera and 17 families were identified.

An analysis of studies on the endemic species of the Katta Uradyo and Kichik Uradyo river basin flora conducted by both previous researchers and the authors reveals that research activities in the area span the years 1913 to 2025.

Results and Discussion

When we carried out a systematic analysis of certain endemic species of the study area, the results were as follows (see Table 1).

Table 1: List of certain endemic species found in the flora of the studied areas

№	Family	Genera	Species	Life form
1	<i>Boraginaceae</i>	<i>Rochelia</i>	<i>Rocheliajackabaghi</i>	Therophyte
2	<i>Asteraceae</i>	<i>Cousinia</i>	<i>Cousiniarosea</i>	Cryptophyte
3	<i>Asteraceae</i>	<i>Cousinia</i>	<i>Cousiniasubcandicans</i>	Hemicryptophyte
4	<i>Asteraceae</i>	<i>Tanacetopsis</i>	<i>Tanacetopsisbotschantzevii</i>	Hemicryptophyte
5	<i>Plumbaginaceae</i>	<i>Acantholimon</i>	<i>Acantholimonthissaricum</i>	Chamaephyte
6	<i>Plumbaginaceae</i>	<i>Acantholimon</i>	<i>Acantholimontaschkurganicum</i>	Chamaephyte
7	<i>Rosaceae</i>	<i>Rosa</i>	<i>Rosa sumneviczii</i>	Phanerophyte
8	<i>Apiaceae</i>	<i>Ferula</i>	<i>Ferula pratovii</i>	Hemicryptophyte
9	<i>Fabaceae</i>	<i>Astragalus</i>	<i>Astragalussubtrijugus</i>	Hemicryptophyte
10	<i>Fabaceae</i>	<i>Cicer</i>	<i>Cicerincanum</i>	Hemicryptophyte
11	<i>Euphorbiaceae</i>	<i>Euphorbia</i>	<i>Euphorbia kudrjaschevii</i>	Hemicryptophyte

Ushbu jadvaldan ko‘rinib turibdiki, mazkur hududlar florasida tarqalgan ayrim endem turlar 7 oila 9 turkumga mansub 11 ta tur borligini ko‘rishimiz mumkin. Bu turlardan gemikriptofitlar 6 tur, xamefitlar 2 tur, terofit, fanerofit va kriptofit bittadan turni tashkil qildi. Bu endem turlarning “O‘zbekiston Respublikasi Qizil kitobi” ga (2019) kiritilgan 4 oila 4 turkumga mansub 4 turi borligi aniqlandi (2-jadval).

As can be seen from this table, a total of 11 endemic species belonging to 7 families and 9 genera have been identified in the flora of the studied areas. Among these, 6 species are hemicryptophytes, 2 are chamaephytes, and there is one species each of therophyte, phanerophyte, and cryptophyte life forms. According

to the the Red Data Book of the Republic of Uzbekistan (2019), 4 of these endemic species, belonging to 4 families and 4 genera, are included in the list of protected species (see Table 2).

Table 2: List of certain endemic species found in the flora of the study areas included in the Red Data Book of the Republic of Uzbekistan (2019)

№	Family	Genera	Species	Status
1	<i>Euphorbiaceae</i>	<i>Euphorbia</i>	<i>Euphorbiakudrjaschevii</i>	0
2	<i>Apiaceae</i>	<i>Ferula</i>	<i>Ferulapratovii</i>	1
3	<i>Fabaceae</i>	<i>Cicer</i>	<i>Cicerincanum</i>	1
4	<i>Asteraceae</i>	<i>Tanacetopsis</i>	<i>Tanacetopsis botschantzevii</i>	2

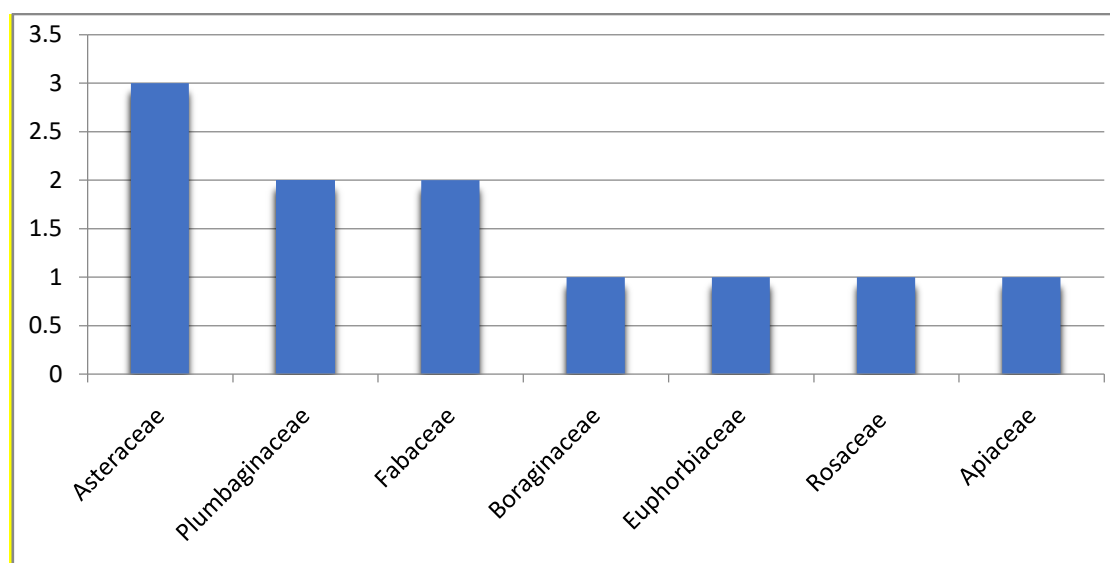


Figure 3: Systematic analysis of certain endemic species distributed in the flora of the study areas

Below we provide brief information about the identified species.

Rosa sumnevicii Korotkova —Endemic to the Katta Uradaryo river basin

This species was collected in 1937 by A. Granitov and T. Dolgikh in the area described as “Western Pamir-Alay. Spurs of the Zarafshan Range. Upper reaches of the Katta Ura Darya River, 12 km southeast of Ak-kishlak village, fine-earth slopes of the gorge. There are spots with variegated rock outcrops, altitude 1,900 m, specimen No. 508, dated 14.08.1937.”

The species was first described in science by Bazilevskaya in 1922.

During our field research, two populations of this species were identified in the Katta Uradaryo river basin:

1. In Dehkanabad district, Akkishlak village council, Shakhshar village, near the beginning of the Shakhshar gorge (09.06.2024), coordinates: 38.643716, 67.108879, elevation: 1,659 m above sea level, recorded by O. Omonov (specimen index AF195, No. 51).
2. In Kamashi district, approximately 3-4 km northeast of Kushkul village (08.06.2024), coordinates: 38.655149, 67.040456, elevation: 2,074 m above sea level, recorded by O. Omonov (specimen index AG194, No. 2820) [27].

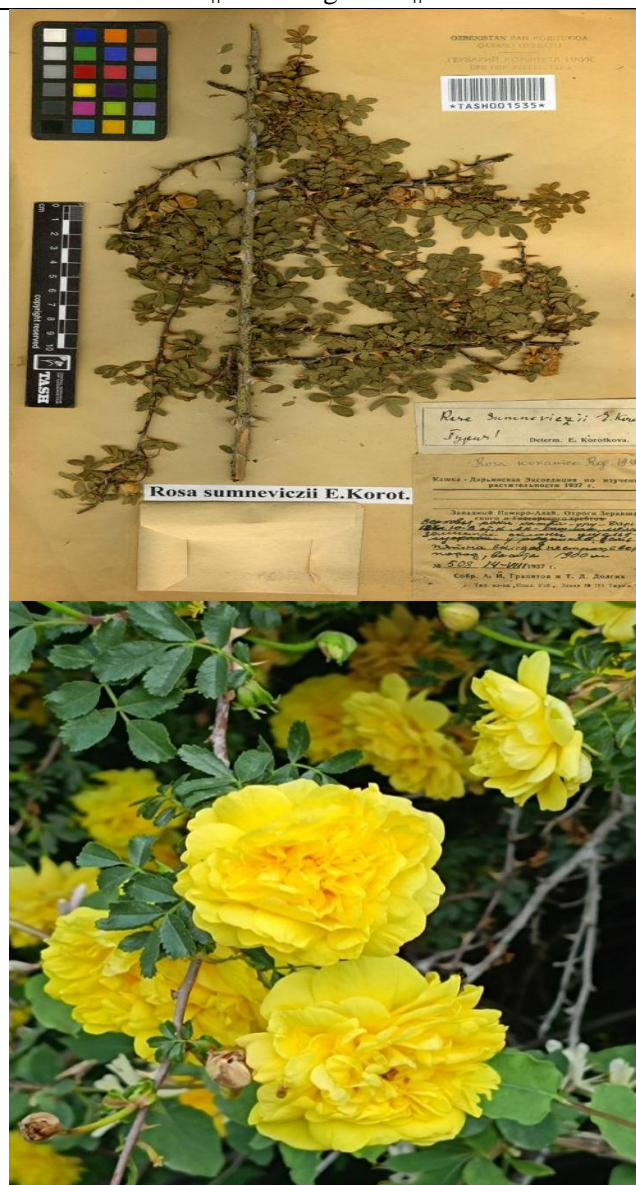


Figure 4: *Rosa sumneviczii* Korotkova. Katta Uradarya river basin vicinity of Akkishlak village, Dehkanabad district (right), and Kushkul village (Gavaz-ota area), Qamashi District (left).

Cicer incanum Korotkova —Status: 1. Rare endemic species [18].

1. Western Pamir-Alay. Upper reaches of the Yakkabag-Darya River. Vicinity of the Tash-Kurgan village. Pyr-pyreki Mountain. Limestone cliffs. 07.07.1936, V. Bochantsev, A. Butkov, s.n., (38.697233, 67.347389).
2. Southwestern part of the Gissar State Nature Reserve, Kizilsuv section, Arratash and Aksay stream, 28.07.2022, T. Aromov, (38.820345, 67.358476).
3. Southwestern part of the Gissar State Nature Reserve, Tankhozdarya section, Kuralay stream, 30.07.2022, T. Aromov, (38.897815, 67.476673).
4. Southwestern part of the Gissar State Nature Reserve, Gilon section, Hazrati-Sulton massif, Muqbul pass, 11.08.2022, T. Aromov, (39.129409, 67.674044).
5. Southwestern part of the Gissar State Nature Reserve, Gilon section, Bursbuta stream, 15.07.2022, T. Aromov, (38.994170, 67.483276).



Figure 5: *Cicer incanum* Korotkova in the Gissar State Nature Reserve, Tankhozdarya section, Quralay.

Conclusion

This article presents data on 11 endemic plant species found in the flora of the Kashkadarya region (Katta and Kichik Uradaryo river basins) and the Gissar State Nature Reserve. These species belong to 7 families and 9 genera.

Among them hemicryptophytes — 6 species, chamaephytes — 2 species, therophyte, phanerophyte, and cryptophyte — one species each.

Of these endemic species, 4 species belonging to 4 families and 4 genera are listed in the Red Data Book of the Republic of Uzbekistan (2019).

The article also provides brief information on the distribution areas of two local endemic species: *Rosa sumneviczii* and *Cicer incanum*.

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