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Phytocoenotic Distribution of *Capparis Spinosa* L. (Capparaceae) Under Different Ecological Conditions in Uzbekistan

Tashkhanim Rakhimova[1], Gulizebo B. Vaisova [2], Nodira K. Rakhimova[1]*, Anora Matkarimova[2]

[1]Institute of Botany, Academy of Sciences of the Republic of Uzbekistan.
[2]National University of Uzbekistan named after M. Ulugbek.
*E-mail: rakhimovanodi@mail.ru

Abstract:
Capparis spinosa L. is a very well-established plant that has adapted to various ecological conditions present in the Republic of Uzbekistan. The article presents the results of studies completed which focused on five communities described in the Urtachirchik and Akhangaran districts of the Tashkent region (in the semidesert) and four communities described in the eastern cliff on the Ustyurt Plateau with the participation of the fodder and melliferous species *C. spinosa*, which has rarely been studied in the Republic of Uzbekistan. The aim of this work was to study the current state of some plant communities that include *C. spinosa* under various ecological conditions in Uzbekistan. Phytocoenotic studies have shown that the amount of natural regeneration in the Tashkent region is satisfactory. However, exploration and prospecting, with the development of the oil and gas industry and other technogenic factors of the Eastern Chink on the Ustyurt Plateau, have had a negative impact on the life state of *C. spinosa*, and therefore, there were no young individuals. The plant is important for beekeeping and the creation of a forage base in the desert and semidesert zones of the republic.
Key words: association, desert, dominant, pastures, plant communities, Ustyurt Plateau.

Introduction

Desert and semidesert pastures in Uzbekistan are the main forage bases for the development of animal husbandry. Unfortunately, in recent years, there has been repeated violation of the systemic use of natural pastures. Due to the lack of equipment needed to provide Karakul sheep with water, most of the flocks have grazed around settlements. In dry years, due to the lack of forage in the summer-autumn period, many farms in neighbouring regions are forced to drive their flocks to Kyzylkum pastures. This has led to excessive pasture loading, which had contributed to the development of pasture degradation processes. As a result, along with other desert and semidesert plants, many foraged, food and medicinal plants have also suffered, particularly *C. spinosa.* In recent years, the growth of industry and geological exploration work on the Ustyurt Plateau have played an important role, which has led to an increased degree of the negative influence exerted by technogenic factors on vegetation. In addition, natural ecosystems that have arisen and developed under certain conditions in Ustyurt are negatively affected by drying the Aral Sea (i.e., climate change and dust storms). In this regard, the study of poorly studied economical species, including the elucidation of the current state of *C. spinosa*, which is of practical interest, becomes urgent.

At present, the mobilization of botanical resources for the expedient development of territories that are not suitable for the cultivation of cultivated plants is of great importance. The development of these lands will provide a huge reserve for increasing the production of feed and food products. In the Republic of Uzbekistan, the efficiency of using adyrs as pastures is very low, since their yield is variable between different years and on average does not exceed 3-3.5 c/ha. Additionally, the seasonal use of pastures is very short, covering mainly the spring and partial summer months. In the autumn and winter seasons, such lands

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are considered practically unusable. In this regard, a considerable increase in the efficiency of pasture use is considered an urgent task. One of the promising solutions to this immense problem is the development of *C. spinosa* plantations.

In recent years, the demand for *C. spinosa* buds and flowers has increased in foreign countries, especially in Mediterranean countries. As a result, the collection of flowers and buds from natural populations of *C. spinosa* is becoming more popular. This has led to negative consequences, i.e., the complete disappearance of this species from nature. Since this plant is considered highly profitable, it also grows on non-irrigated land and produces high yields during long growing seasons (up to 15 years); therefore, it must be introduced as a crop to create productive plantations.

In this regard, the study of valuable phytocenotic, biological, and economically traits of plants from thermoxerophytic species is urgent. In addition, one of the most promising wild plants is *C. spinosa*.

The Capparidaceae family worldwide contains 37 genera and approximately 400 species (Larin et al., 1951). In the flora of Central Asia, two genera in the Capparidaceae family can be found: the genus *Capparis* L. occurs with two species, namely, *C. rosanowiana* B. Fedtsch. and *C. spinosa* L.; and genus *Cleome* L. occurs with eleven species, namely, *Cleome ariana* Hedge et Lamond, *C. coluteoides* Boriss., *C. fimbriata* Vicary, *C. gordjaginii* Popov, *C. khorassanica* Bunge et Bienert, *C. lipskyi* Popov, *C. quinquenervia* DC., *C. raddeana* Trautv, *C. rostrata* Bobrov, *C. spinosa* Jacq., and *C. tomentella* Popov (Khassanov, 2015). In Uzbekistan, both species of the genus *Capparis* L. are found, and from the genus *Cleome* L., there are 4 species: *C. fimbriata* Vicary, *C. gordjaginii* Popov, *C. lipskyi* Popov, and *C. tomentella* Popov (Flora of Uzbekistan, 1955).

The economic value of *C. spinosa* is known to the peoples of Asia and Europe. The population of Central Asia has long been using their seeds to obtain edible oil, eating pulp of the fruit (containing 12% sugar and more than 12% protein). In addition, caper is used in folk medicine; from its aboveground and underground organs, medicinal agents are prepared against haemorrhoids, diarrhoea, throat diseases, headaches and toothaches in rheumatism, tuberculosis, various tumours and ulcers. The leaves of *C. spinosa* contain approximately 1% rutin (Zakirov & Khudayberganov, 1972; Toyzhonov et al., 2016). The fruits of this type contain vitamin C (up to 136 mg%), a substantial pool of iodine (up to 27 mg%); up to 35% of a reddish semidrying fatty oil in the seeds; and glycoside capparidin in the root bark. The root bark of *C. spinosa* contains 1.2% alkaloids. Traditional medicine uses a decoction of *C. spinosa* roots for liver disease, nerve weakness, rheumatism, and jaundice. Fruits of this type strengthen the liver, heart, lungs and spleen and help with goiter, diabetes, and sore throat. The juice from the leaves has an anthelmintic effect (Khodzhimatov et al., 1995).

In beekeeping, *C. spinosa* is used as a first-class honey plant and perganos. Its flowers emit nectar in very large quantities. The duration of the flowering period lasts from early May to November, which is especially valuable for beekeeping. Flowers open at 17-18 hours and close the next day at 12-13 hours. Bee bread allocation is celebrated at the same time. On average, one flower contains 36 mg of bee bread and 37% sugar. In beekeeping, it is considered the tallest perganiferous plant (Khamidov, 1968). Publications on the pharmacological properties of *C. spinosa* can be seen in highly rated international journals (Yili et al., 2006; Ramezani et al., 2008; Yang et al., 2010; Cao Y-L et al., 2010; Bhoyar et al., 2011; Mohammad et al., 2012; Anwar et al., 2016; Nabavi et al., 2016; Mollica et al., 2017; Benzidane et al., 2020).

Since ancient times, in many countries, for example, Crimea, the Caucasus and Transcaucasia, marinades have been prepared from the flowers of *C. spinosa*. Paints are obtained from the roots. The aerial parts of *C. spinosa* are used for food (Zakirov & Khudayberganov, 1972).

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Under the conditions present in Uzbekistan and Central Asia, the use and cultivation of *C. spinosa* has been studied very poorly. The only exception is the work of K.Z. Zakirov & R. Khudayberganov (1972). There are data on the chemical composition of *C. spinosa* fruits and on cultivation under artificial conditions in the Jizzakh region (Eshankulova & Akhmedova, 2013).

Material and methods

Study area

The study area includes the Urtachirchik and Akhangaran districts, i.e., the administrative units within the Tashkent region in Uzbekistan. The Tashkent region is located in northeastern Uzbekistan between the western part of the Tien-Shan Mountains and the Syrdarya River. The climate is sharply continental with mild, humid winters and hot, dry summers. The average temperature in January is - 1°C, and that in July is + 36°C. The yearly amount of precipitation is approximately 300 mm (The climate of Tashkent, 1982).

The Eastern Chink is a large, morphologically indented, arid rocky desert. The steep slopes of the chink are composed of layers of limestones that sharply contrast the surrounding area and are just as clearly formed on the plateau in a flat plain. The climatic conditions of the Eastern Chink are sharp continental; the summers are hot, and the winters are relatively cold, with little precipitation. Fog conditions occur here often, and the air is more humid. The average monthly air temperature reaches its maximum in July, and in the northern half, it is equal to + 28.1^0C, and in the south, it is equal to - 32-35°C. The absolute minimum temperature reduction in January is - 40°C, and the absolute maximum temperature in July is + 32.6°C (Rakhimova et al., 2020).

Material

The object of the research is *C. spinosa*, which is a perennial herb from the Capparidaceae family (Fig. 1). The plant produces creeping branchy stems, up to 2.5 m in length, and is bare or has sparsely pubescent white hairs. The leaves are rounded, i.e., obovate or elliptical, 5-6 cm long, with a small spiny tip at the apex, and are green, glabrous short petiolate. The flowers are large, i.e., 5-8 cm wide, and white to pinkish when flowering. Its fruits are obovate or rounded-oblong, polyspermous, berry-like, 2.5-4.5 cm long, and 1.5-3 cm wide. its seeds are 3-3.5 mm long, kidney-shaped, brown, and punctate, with a spout. The plant blooms in May-June and bears fruit in July August. The plant is not protected (Fig. 2).

Under the climatic and topographic conditions of Central Asia and the Caucasus, *C. spinosa* is confined mainly to plains and foothills, rarely inhabiting the lower strip of the mountain belt. Our observations collected in certain locations in the Republic of Uzbekistan showed that the maximum height of the distribution of *C. spinosa* thickets does not exceed 1200-1300 m above sea level. The range of *C. spinosa* is very wide and covers many areas of the globe, ranging from the mesothermal regions of Europe to the extremely xeric conditions of the deserts of Mongolia and Libya (Zakirov & Khudayberganov, 1972). In Central Asia, *C. spinosa* grows on the loess soil of the foothill plains and hills with relatively deep groundwater in the cracks of rocks on the mountain slopes and often on the rubble-stony soil of the low mountains (adyrs). Usually, this species chooses a denser substrate and a southern hillside and mountain exposure. In cities and villages, capers can be found in old cemeteries and basements and near human habitations in cracks in the walls of rocky buildings. This plant, both as weeds and ruderals, is found along the edges of roads and along railways. Sometimes it forms whole thickets covering large areas and is eaten by sheep, camels and horses (Flora of Uzbekistan, 1955). In the karakul farms of Central Asia and Kazakhstan, where rains are extremely rare in summer, under the conditions present in desert and foothill

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pastures, there is a shortage of forage. Capers, like phreatophytes, owing to their powerful, deep-reaching root system (to a depth of 10-18 m and deeper), continuously vegetate from spring to the onset of autumn frosts (Zakirov & Khudayberganov, 1972).

Figure 1. General view of *Capparis spinosa*. Jizzakh region, May 2019

Figure 2. Flowering plant (Photo by N.K. Rakhimova)

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Survey methods

Geobotanical descriptions of plant communities, in which the studied species were identified, were conducted according to the generally accepted method (Methodological guidelines…, 1980). When describing plant communities, the scale of P. Drude (1907) was used, in which the degree of participation is indicated by the following system: Sol - single; Sp1 - rare; Sp2 - fairly rare; Sp3 - mediocre; Cop1 - often. In all the studied plant communities, the plot size is 20x20 m.To determine the age composition of *C. spinosa*, transects were laid at 10x2 m. To describe the vegetation (plot size, plant grouping, geographical point and geographic coordinates, soil, species composition of plants, total projective cover (TPC)) and others), a special form is filled out (form No. 1). The Latin species names are given in accordance with the international taxonomic database, i.e., The Plant List (http://www.theplantlist.org/). When identifying the species of plants, the "Key to Plants of Central Asia" was used (1993). To build a map of the location of the species under study, the coordinates of the locations were imported into the geographic information system ESRI ArcGIS ArcView v.10.0 (2020).

Results and discussion

In the monograph "Vegetation cover of Uzbekistan" (Maylun, 1976; Melnikova, 1976), several associations with the participation of *C. spinosa* were identified: *Artemisia sogdiana-Kochia prostrata, Reaumuria turkestanica, Salsola orientalis*, *Scutellaria comosa-Acanthophyllum pungens, Capparis spinosa, Alhagi sparsifolia,* and *Aegilops triuncialis* association meets with abundance of Sp_1; *Carex pachystylis-Capparis spinosa, Poa bulbosa, Bunium hissaricum,* and *Aegilops triuncialis* associations with the abundance of Sp_3; *Amygdalus spinosissima-Capparis spinosa* Sp_2; *Capparis spinosa* Sp_2; *Zygophyllum atriplicoides, Atriplex moneta, Gamanthus gamocarpus, Salsola sclerantha* Sol; *Salvia bucharica-Achillea santolina, Ladyginia bucharica,* and *Cousinia radians* associations with the abundance of Sp_1; and *Atriplex moneta-Salsola orientalis, Gamanthus gamocarpus, Girgensohnia oppositiflora,* and *Salsola sclerantha* Sol. In communities, it occurs as a subdominant species and an assembler.

In geobotanical studies completed in 2016-2017 in the Jizzakh region, we identified several associations with the participation of *Capparis spinosa*: *Aegilops cylindrica, A. triuncialis, Avena trichophylla-Capparis spinosa-Eremurus sogdianus, Tribulus terrestris,* and *Alyssum maritimum* association meets with an abundance of Sp2; *Aegilops cylindrica, A. triuncialis,* and *Anisantha tectorum-Capparis spinosa* with an abundance of Sp1; *Alhagi pseudalhagi-Salsola sclerantha-Capparis spinosa* with an abundance of Sp1-Sp2; *Tamarix hispida-Alhagi pseudalhagi-Capparis spinosa* with an abundance of Sp1; and *Alhagi pseudalhagi-Capparis spinosa-Limonium otolepis* with an abundance of Sp2. In the above communities, capers participate as a subdominant component.

In addition, there is some information on the introduction of *C. spinosa* into the culture and on the economic efficiency of its cultivation in the Samarkand region (Rabbimov et al., 2020). However, the current state of *C. spinosa* in different plant communities in the republic is poorly studied.

In 2020, in the Tashkent region (Urtachirchik and Akhangaran districts), we examined some plant communities with *C. spinosa*. At the same time, thickets of this species prevail in the composition of the vegetation of the region, and they are found in large areas. As a result of the strong influence of anthropogenic factors, the natural areas of *C. spinosa* were reduced. During budding, the local population collects the fruits of the plant and pickles them. This has a negative effect on natural renewal. In addition, in many places, *C. spinosa* bushes were chopped up by the local population and seeds of other plants such as sunflower, watermelon and pumpkin were sown in their place.

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In the course of field studies on the vegetation cover of the Urtachirchik and Akhangaran districts of the Tashkent region, we described the following five plant communities with *C. spinosa* (Fig. 3). Because very little precipitation fell in the area during the winter-spring period (2019-2020), the species composition of the vegetation was relatively little diverse. In this regard, many species were absent in the surveyed territories during field work in October 2020, which mainly concerns ephemerals and ephemeroids. Below is a brief description of the habitats of these communities.

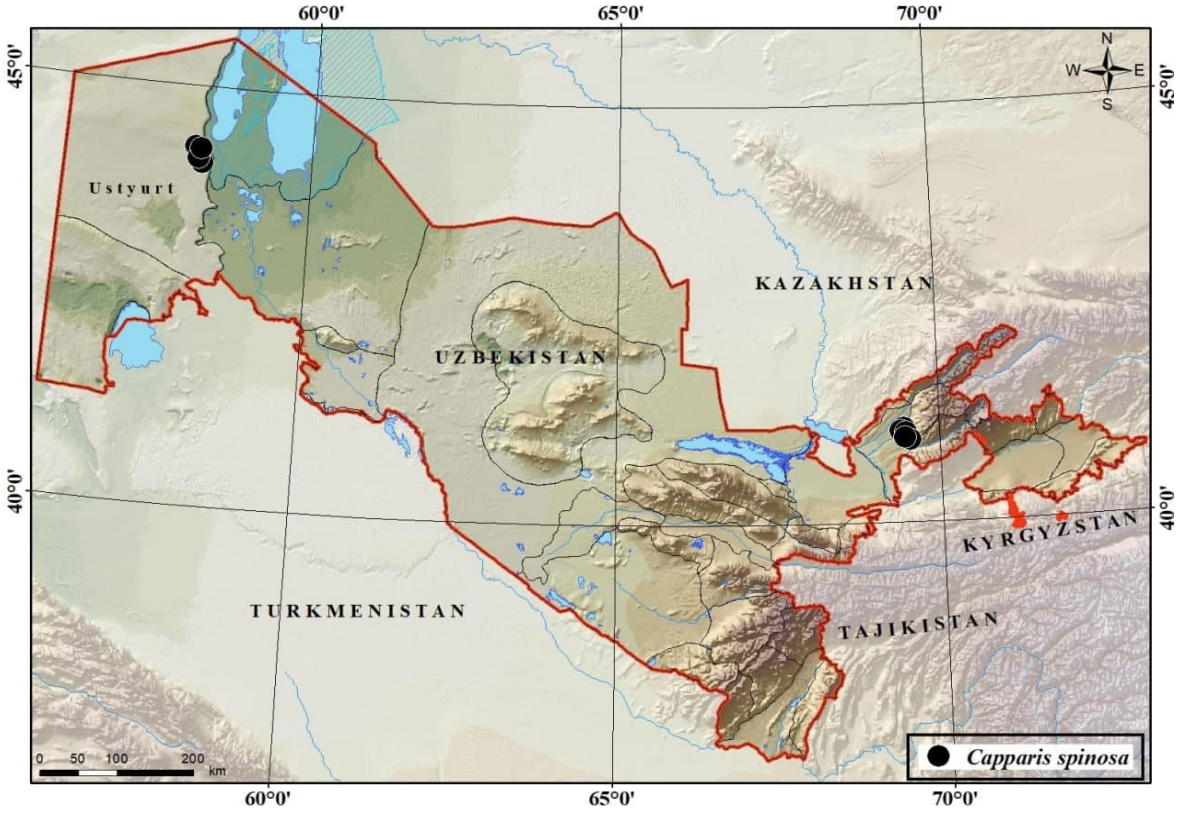

Figure 3. Map of the location of the studied communities

The *Capparis spinosa* + *Alhagi pseudalhagi* community is widespread in the Urtachirchik region around the village of Urtasaroy on adyrs. The community is located at 41°12'23"N, 69°44'36"E. The soil is sierozem, which is characterized by a small number of species. The community occupies 4 hectares. The main dominant plants are *Capparis spinosa*, with an abundance of Cop1 and *Alhagi pseudalhagi* Sp2, along with *Galium pamiro-alaicum* Sp1 and *Hulthemia persica* Sp1, and the rest are members of the community with an abundance of Sol. The total projective soil coverage with plants is 40%. The species composition is very poor, and there are 15 plant species in total. Of these, shrubs constitute 1, perennials constitute 7, annuals constitute 6, and biennials constitute 1. Natural regeneration is good in the area. On the laid 10x2 m transects, there are 10 large, 6 medium, and 5 small bushes and 8-9 juveniles.

The *C. spinosa* community is located 1 km west of the village of Urtasaroy, Urtachirchik district, Tashkent region, in adyrs. the geographic coordinates of the community are 41°09'39"N, 69°39'09"E. The soil is sierozem. The total projective soil coverage with plants is 40%. At this site, the abundance of *Alhagi pseudalhagi* decreases. The dominant C. *spinosa* is widespread with an abundance of Sp2-Sp3; the rest of the species are mostly ephemeral, with an abundance of Sol, and they are almost all withered. The species composition is not rich, with only 16 species. Of these species, perennials constitute 7, biennials constitute 2, and annuals constitute 7. There are many young populations, and up to

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10 young plants and 7-8 juveniles were recorded on the 10x2 transect.

The *Heliotropium lasiocarpum + Capparis spinosa* community does not occupy large areas and is distributed 2 km south of the second site along Akhangaran Road, which is 4-5 km long. The community is located at 41°07'36"N, 69°47'38"E. The soil is sierozem. The total projective soil cover with plants is 60-70%. *Heliotropium lasiocarpum* with an abundance of Cop1 can act as a dominant and subdominant genus; *Capparis spinosa* Sp2, *Anchusa italica, Cynodon dactylon, Hordeum bulbosum, Convolvulus arvensis, C. subhirsutus, Verbascum songaricum,* and *Rumex crispus* with abundance Sp1 are present, and the rest are mostly annuals, i.e., *Aegilops crassa, Koelpinia linearis, Strigosella africana, Salsola sclerantha, Bromus macrostachys,* etc., with an abundance of Sol. The species composition is not rich, with only 19 species. Of these species, trees constitute 1, perennials constitute 9, annuals - 9. On the laid 10x2 m transects, 15-16 individuals of young plants and 5-7 juveniles were found.

The *Capparis spinosa + Poa bulbosa + Phleum paniculatum + Taeniatherum crinitum + Ceratocarpus utriculosus* community does not occupy large areas and is distributed in Balgali along the right line of the road up to 8 km to the south of the Akhangaran district of the Tashkent region on the adyrs. the geographic coordinates of the community are 40°98'73"N, 69°54'08"E. The soil is sierozem. The total projective soil cover with plants is 50-60%. The landscape plants consist of *Capparis spinosa* with Sp2 abundance and *Ceratocarpus utriculosus* with Sp1-Sp2 abundance. Usually, cereals predominate in the cover with a substantial composition: *Cynodon dactylon, Poa bulbosa* with abundance Sp2, *Eremopyrum orientale, Hordeum bulbosum, Aegilops cylindrica, Anisantha tectorum, Phleum paniculatum, Taeniatherum crinitum, Lolium persicum, Bromus macrostachys* with Sp1abundance. The species composition is 23, of which there is 1 shrub, 8 perennials, and 14 annuals. On the laid 10x2 m transects, 10 plant individuals were found. Of these, 4 were large, 3 were medium, 3 were small and 6-7 were juveniles.

The *Capparis spinosa + Cynodon dactylon, Eremopyrum orientale, Hordeum bulbosum, Anisantha tectorum*, and *Taeniatherum crinitum* communities occupy two hectares of land. They are distributed in the northern Akhangaran district of the Tashkent region on adyrs along the left line of the road. The community is located at 41°01'34"N, 69°46'25"E. The soil is sierozem. The total projective soil cover with plants is 70-80%. Within the landscape, only capers remained green, and all other types of cereals have dried up. This area has only 25 species. As in the previous sites, cereals also predominate here, i.e., *Cynodon dactylon, Hordeum bulbosum, Taeniatherum crinitum* with abundance Sp2, *Poa bulbosa, Lolium persicum,* and *Bromus macrostachys* with an abundance of Sp1, as well as other species with an abundance of Sol. Four large, 5 medium, 3 small and 5-8 juveniles were recorded on the 10x2 m transects. The list of plants from all communities is shown in Table 1.

B. Sarybaev et al. (1977) identified two associations in the type of hypsophilic vegetation in northwestern Ustyurt: *Caragana grandiflora + Atraphaxis spinosa* and *Caragana grandiflora + Convolvulus fructicosus*. *Capparis spinosa* are involved with the appearance of Sp1-Sp2.

During field studies (2017) completed in the eastern cliff of Ustyurt, we found 4 communities with the participation of *Capparis spinosa*. Below is a brief description of these communities.

Table 1. List of plants of common *C. spinosa* communities in Urtachirchik and Akhangaran districts of the Tashkent region

Plant communities	***Capparis spinosa,***	***Cappa ris***	***Heliotro pium***	***Capparis spinosa, Poa***	***Capparis spinosa,***	**Height, cm**

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	Alhagi pseudalhagi	***spinosa***	***lasiocarpum, Capparis spinosa***	***bulbosa, Phleum paniculatum, Taeniatherum crinitum, Ceratocarpus utriculosus***	***Cynodon dactylon, Eremopyrum orientale, Hordeum bulbosum, Anisantha tectorum, Taeniatherum crinitum***	
Projective cover	40	40	60-70	50-60	70-80	
Trees						
Ulmus densa Litv.	-	-	Sol	-	Sol	200-230
Shrubs						
Hulthemia persica (Michx. ex C. Juss.) Bornm.	Sol	-	-	Sp1	-	30-50
Perennials						
Achillea millefolium L.	-	-	-	-	Sol	25-30
Alhagi pseudalhagi (M. Bieb.) Fisch.	Sp1-Sp2	Sol	-	Sol	Sp1	50-60
Althaea nudiflora Lindl.	-	-	-	-	Sol	100-150
Anchusa italica Retz.	-	-	Sp1	-	-	50-60
Capparis spinosa L.	Cop1	Sp2-Sp3	Sp2	Sp2	Sp2	100-200
Convolvulus arvensis L.	Sol	-	Sp1	-	-	50-60
C. lineatus L.	-	Sol	-	-	-	5-8
C. subhirsutus Regel & Schmalh.	-	-	Sp1	-	-	40-50
Cousinia pseudomollis C. Winkl.	-	-	Sol	Sol	-	40-70
Cynodon dactylon (L.) Pers.	-	-	Sp1	Sp2	Sp2	10-15
Eremopyrum orientale (L.) Jaub. & Spach	Sol	Sol	-	Sp1	-	10-15
Galium pamiro-alaicum Pobed.	Sol-Sp1	Sol	-	-	-	15-20
Hordeum bulbosum L.	Sol	Sol	Sp1	Sp1	Sp1-Sp2	70-80
Poa bulbosa L.	-	-	-	Sp2	Sol-Sp1	20-25
Polygonum aviculare L.	Sol	Sol	-	-	-	15-20
Polygonum equisetiforme Sibth. & Sm.	-	-	Sp1	Sp1	Sp1	50-90

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Rumex crispus L.	-	-	Sp1	-	-	10-15
Annuals and biennials						
Aegilops crassa Boiss.	Sol	Sp1	Sol	Sol	Sol	30-40
Aegilops cylindrica Host	-	-	-	Sp1	Sp1	40-50
Amaranthus retroflexus L.	Sol	-	-	-	Sol	10-15
Artemisia scoparia Waldst. & Kit.	-	-	-	Sp1	Sp1-Sp2	20-25
Bromus macrostachys Desf.	Sol	Sol	Sol	Sp1	Sp1	20-25
Ceratocarpus utriculosus Bluket	-	-	-	Sp1-Sp2	Sp1	30-35
Centaurea iberica Trevir. ex Spreng.	-	-	Sol	Sol	-	30-40
Cousinia radians Bunge	Sp1	Sol	-	-	Sol	50-100
Cousinia tenella Fisch. & Mey.	-	-	-	Sol	-	35-40
Diarthron vesiculosum (Fisch. & C.A. Mey. ex Kar. & Kir.) C.A. Mey.	Sol	-	-	Sol	-	20-25
Heliotropium lasiocarpum Fisch. & C.A. Mey.	-	-	Cop1	Sp1	Sol-Sp1	30-50
Koelpinia linearis Pall.	-	Sol	Sol	Sol	-	10-15
Phleum paniculatum Huds.	-	-	-	Sp1	Sp1	20-25
Pulicaria prostrata (Gilib.) Asch.	-	-	-	Sp1	Sp1	20-30
Salsola pestifer A. Nelson	Sol	-	Sol	-	Sp1	40-50
S. sclerantha C.A. Mey.	-	Sol	Sol	-	Sol	10-15
Strigosella africana (L.) Botsch.	-	Sol	Sol	-	Sol	15-20
Taeniatherum crinitum (Schreb.) Nevski	-	Sol	-	Sp1	Sp1-Sp2	20-25
Verbascum songaricum Schrenk	-	Sol	Sp1	-	-	10-20
Lolium persicum Boiss. & Hohen.	Sol	-	-	Sp1	Sp1	10-15

Note: Sol - single; Sp1 - rare; Sp2 - fairly rare; Sp3 - mediocre; Cop1 - often

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We found the *Rosa laxa + Malacocarpus crithmifolius* community 1.2 km north of cape Ulkentumsuk. Its community geographic coordinates are 44°08'26"N, 58°23'04"E. The soil consists of fine-earth gypsum under large-stony landslides. The dominants and subdominants of the community are *Rosa laxa* and *Malacocarpus crithmifolius.* The projective grass cover is 25-30%. The floristic composition of the community consists of 20 species, most of which are shrubs and perennials. Within the projective grass cover, the largest share is accounted for by *Rosa laxa* (20%), followed by the share of *Malacocarpus crithmifolius* (5%). The rest of the species are found as single individuals, including *Capparis spinosa*, which occurs as a member of a community with an abundance of Sol.

A *Crataegus korolkowii + Medicago sativa* community occurs 4 km north of the Karakuduk well in a rocky-gravelly fine earth habitat between the walls of the first terrace of the chink and forms dense thickets that are difficult to pass through. The location of this community is 44°27'45"N, 58°11'15"E. Within the projective cover, the share of *Crataegus korolkowii* reaches 20%. *Medicago sativa* (5%) is subdominant; in addition, xerophytic species such as *Anabasis salsa* (2%) and *Artemisia terrae-albae* (2%) are noted here. The grass cover is rich in species (23) but is not consistent and depends on microecological conditions, since between the wall in narrow gorges, aside from the bushes of *Crataegus korolkowii*, no other species were found. In open areas, the vegetation is rich in mesophytic species; near the community borders, the distribution of representatives of xerophilic groups can be observed.

The *Agropyron fragile + Echinops meyeri* community is widespread in the Kabanbai tract (190-200 m from the Kabanbai descent). It is located at 44°14'14"N, 58°1655"E. It grows on loess deposits with an admixture of crushed stone and pebbles. The basis of the herbage is *Agropyron fragile* and *Echinops meyeri. Atraphaxis spinosa*, frequently *Acroptilon repens, Artemisia diffusa*, rarely *Salsola orientalis*, and *Artemisia turanica* are found in the upper tier as single individuals. The community includes 15 species, of which there are 2 shrubs, 3 semishrubs, 10 herbaceous perennials, and 1 annual, since the herbage is built mainly by herbaceous perennials, shrubs and semishrubs in small abundance. The total projective cover of herbage is 50-60%.

Due to the drying up of the Aral Sea, changes have also occurred in the *Agropyron fragile* community. In particular, the intensification of drought led to the intensive development of *Echinops meyeri*, which, as permanent members of the *Agropyron fragile + Medicago sativa* community, gradually replaced *Medicago sativa* in the community. At the present stage, it is a codominant component within the *Agropyron fragile + Echinops meyeri* community. The change in the codominance of this community can be attributed to several reasons. One of them is the geographical location of the community on the southernmost border of the Eastern Chink and its confinement to dry, open habitats. This ecotope contributed to the widespread dispersal of *Echinops meyeri* in vacated areas, where *Medicago sativa* specimens fell out due to increased drought. The change in the community towards xerophytization was also confirmed by the presence of a number of xerophytes (*Atraphaxis spinosa, Ephedra distachya, Artemisia turanica, A. terrrae-albae, Salsola orientalis*). *Capparis spinosa* is noted as a member of the community, with an abundance of Sol.

Agropyron fragile + Acroptilon repens, the *Cynoglossum viridiflorum* community is described in the vicinity of Korgansh descent. The community is located at 44°25'71"N, 58°19'25"E. There are 16 species in this community, in which shrubs are absent, semishrubs constitute 1, perennials constitute 14 and annuals constitute 1. The total projective cover is high at 85-90%. Compared to other communities, this community attracts attention with a high abundance of *Agropyron fragile* (60%). The subedifiers of this community were *Acroptilon repens* (15%) and *Cynoglossum viridiflorum* (10%). It should be noted that

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Capparis spinosa participates in all communities as an assembler with an abundance of Sol (Table 2). In all the studied plant communities, natural regeneration was not observed.

Table 2. List of plants of selected communities with the participation of *Capparis spinosa* on the Eastern Chink of Ustyurt

Plant species	***Rosa laxa, Malacocarpus crithmifolius***	***Crataegus korolkowii, Medicago sativa***	***Agropyron fragile, Echinops meyeri***	***Agropyron fragile, Acroptilon repens, Cynoglossum viridiflorum***
Shrubs				
Atraphaxis spinosa L.	Sp1	Sol	Sp1	-
Clematis orientalis L.	Sol	-	-	-
Crataegus korolkowii L. Henry	Sol	Sp3	-	-
Ephedra distachya L.	-	-	Sol	-
Hulthemia persica (Michx. ex C. Juss.) Bornm.	-	Sol	-	-
Malacocarpus crithmifolius (Retz.) C.A. Mey.	Sp2	-	-	
Rosa laxa Retz.	Sp3	-	-	-
Semi-shrubs				
Artemisia diffusa Krasch. ex Poljakov	Sol	-	Sp1	Sol
A. terrae-albae Krasch.	-	Sol	-	-
A. turanica Krasch.	-	-	Sol	-
Anabasis salsa (C.A. Mey.) Benth. ex Volkens	-	Sol	-	-
Salsola orientalis S.G. Gmel.	-	Sol	Sol	-
Nitraria schoberi L.	Sol	-	-	-
Herbaceous perennials				
Acroptilon repens (L.) DC.	-	-	Sp1	Sp3
Agropyron fragile (Roth) P. Candargy	-	Sol	Cop1	Cop2
Anabasis brachiata Fisch. & C.A. Mey. ex Kar. & Kir.	-	Sol	-	-
Atriplex fominii Iljin	Sol	-	-	-
Asparagus inderiensis F.K. Blum ex Pacz.	Sol	Sol	Sol	Sol
Biebersteinia multifida DC.	-	-	-	Sol
Capparis spinosa L.	Sol	Sol	Sol	Sol
Cardaria repens (Schrenk) Jarm.	-	-	-	Sol
Centaurea apiculata Ledeb.	-	Sol	-	Sol
Chenopodium album L.	-	-	Sol	Sol
Cistanche trivalvis (Trautv.) Korsh.	-	Sol	-	-

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Convolvulus arvensis L.	Sol	-	-	Sol
Cynoglossum viridiflorum Pall. ex Lehm.	Sol	Sol	-	Sp2
Echinops meyeri (DC.) Iljin	-	Sp1	Sp3	Sol
Ferula syreitschikowii Koso-Pol.	Sol	-	-	-
Gypsophila diffusa Fisch. & Mey. ex Rupr.	-	Sol	-	-
Medicago sativa L.	-	Sp2	-	Sp1
Onosma staminea Ledeb.	Sol	Sol	-	-
Poa bulbosa L.	Sol	Sol	Sol	-
Phragmites australis (Cav.) Trin. ex Steud.	Sol	-	-	-
Prangos sp.	-	-	Sp2	-
Rheum tataricum L.	Sol	Sol	-	-
Seseli glabratum Willd. ex Spreng.	Sol	Sol	Sol	-
Silene nemoralis Waldst. & Kit.	-	Sol	-	-
Takhtajaniantha pusilla (Pall.) Nazarova	Sol	-	-	-
Thalictrum isopyroides C.A. Mey.	-	Sol	-	Sol
Tragopogon marginifolius Pavlov	Sol	-	Sol	Sol
Annuals				
Galium spurium L.	-	-	-	Sol
Strigosella africana (L.) Botsch.	-	-	Sol	-
Zygophyllum turcomanicum Fisch. ex Bunge	-	Sol	-	-

Exploration and prospecting work, with the development of the oil and gas industry and other technogenic factors of the Eastern Chink of the Ustyurt Plateau, has exerted a negative impact on the vital state of *C. spinosa*, in connection with which there are no young individuals, and the projective cover is low. In addition, the absence of juvenile and virginal individuals in the population is associated with the washing away of young individuals in the winter-spring period and the dormancy of populations during the fall of the cliffs (*C. spinosa* grows under the cliff). Years with abundant precipitation here often contribute to soil erosion.

Conclusion

In the semi-desert zone of the Republic of Uzbekistan, *C. spinosa* participates in many plant associations. Dense thickets of *C. spinosa* are found in growing areas within the studied region it forms associations with the participation of *Alhagi pseudalhagi Limonium otolepis, Psoralea drupacea, Glycyrrhiza glabra, Cynodon dactylon, Aegilops cylindrica, A. triuncialis, Hordeum bulbosum, Poa bulbosa,* and other species. The useful properties of *C. spinosa* indicate the possibility of its complex use, firstly, as an object for the development of empty waterless territories of the republics of Central Asia, and, secondly, as a first-class

melliferous plant in beekeeping, as well as oilseed, sugar, vegetable and fodder plants in animal husbandry. Phytocoenotic studies showed that natural regeneration in the Tashkent region is satisfactory. However, in recent years, the strong impact of anthropogenic factors has led to a reduction in the natural areas of *C. spinosa*. During the fruiting period, the local population collects the fruits of the plant and pickles them, and this had a negative effect on natural regeneration.

The regeneration of *C. spinosa* under natural conditions is carried out by the seed route; however, it is rather weak. In soil, its seeds are stored for a long time and can sprout in a few years. Therefore, it is necessary to study the biology of seed germination and the main methods of primary agricultural technology employed for plant cultivation. The root system reaches deep ground moisture sources (10-18 m and deeper). Plants store moisture in their leaves, meaning that they do not require irrigation and do not suffer from summer heat and dryness. *C. spinosa* is ecologically adapted to xerothermal conditions and can be used for the ecological restoration of ineffective lands, i.e., the development of clayey degraded places in lower adyrs and the upper desert of the republic. This plant is also important for beekeeping and the creation of a forage base in the desert and semidesert zones of the republic. Sowing and establishing plantations in these zones is of interest due to the high-quality composition of plants for use, first of all, both in the medicinal and food industries, as well as for the development of beekeeping. Due to the collection of buds, flowers and mature fruits, the range of this species is reduced. In this regard, it is necessary to carry out environmental measures to preserve *C. spinosa.*

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