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A.A. Tastanbekova[1], K.K. Kulymbet[1,2*], M.S. Kurmanbayeva[1], A.B. Saduakhas[2]

[1]Al-Farabi Kazakh National University, Kazakhstan, Almaty
[2]Kazakh Research Institute of Soil Science and Agrochemistry
named after U.U. Uspanov, Kazakhstan, Almaty
*e-mail: qulymbet.qanat@gmail.com

DISTRIBUTION AND STRUCTURE CENOPOPULATIONS OF A RARE, ENDEMIC PLANT *ALLOCHRUSA GYPSOPHILOIDES* (REGEL) SCHISCHK. IN SOUTHERN KAZAKHSTAN

The article describes the features of the structure of cenopopulations and the distribution of the rare, endemic plant Allochrusa gypsophiloides. 3 populations, 4 cenopopulations were studied. 1 – population – Syrdarya Karatau- Sayasu Gorge; 2 – population – Syrdarya Karatau- Kuyuk pass; 3 – population Karatau plain, near Birlik village. At the same time, a map-scheme on plant species distribution was drawn up between 2011 and 2022.

A DEM map was created for the distribution zones of the 3 populations found in the study. Typical 2m^2 plots were constructed for all cenopopopulations, species density and age composition were calculated using A.A. Uranov's method. The average species density varied from 1.5 to 2.9 pcs.

Cenopopulation (CP) – the dominance of generative individuals 1 (population 1), 2 (population 2) and 3,4 (population 3) corresponds to the state of CP-1 – absolute maximum g_1(20,0%), cenopopulation 2-3 and 4- varies from 18,52%, 24,14% and 33,34%. The number of postgenerative individuals in the cenopopulations is not significantly high, varying within the subsenile ss (0% -13.34%). CP-2-postgenerative individuals do not occur, and conversely, there are a sufficient number of pregenerative, generative individuals. Specifically, individuals im (44.44%), v (33.34%), g1 (18.51%), g2 (3.71%) are found. CP-2 is the youngest cenopopopulation in terms of age composition of all cenopopulations.

When examined in all cenopopulations, immature age state (im) – 0% – 44.45% , virgin (v) – 6.89% – 33.34%, young generative (g_1) – 18.52% – 33.34%, mature generative (g_2) – 3.71% – 44.83% , old generative (g_3) – 0% – 28.57% , subsinile (ss) – 0% – varied between 13.34% and no senile (s) individuals were found.

Illustrative graphs, tables on age spectrum of Allochrusa gypsophiloides species cenopopopulations were created and the current state of structural features of distribution and cenopopulations of the plant was evaluated.

Key words: Allochrusa gypsophiloides, cenopopulation, endemic, age composition, SyrDarya Karatau, DEM map.

А.А. Тастанбекова[1], Қ.Қ. Құлымбет[1,2]*, М.С. Курманбаева[1], А.Б. Садуахас[2]

[1]Әл-Фараби атындағы Қазақ ұлттық университеті, Қазақстан, Алматы қ.
[2]Ә.О. Оспанов атындағы Қазақ топырақтану және
агрохимия ғылыми-зерттеу институты, Қазақстан, Алматы қ.
*e-mail: qulymbet.qanat@gmail.com

Оңтүстік Қазақстанда кездесетін сирек, эндем *Allochrusa gypsophiloides* (Regel) Schischk. өсімдігінің таралуы және ценопопуляция құрылымы

Мақалада сирек, эндем Allochrusa gypsophiloides өсімдігінің таралуы мен ценопопуляцияларының құрылымдық ерекшеліктері сипатталған. Түрдің жалпы 3 популяциясы, 4 ценопопуляциясы зерттелді. 1-популяция – Сырдария Қаратауы – Саясу шатқалы; 2-популяция – Сырдария Қаратауы – Күйік асуы; 3-популяция – Қаратау алды жазығы Бірлік ауылы маңынан табылды. Сонымен бірге 2011-2022 жылдар аралығындағы өсімдік түрінің таралуы бойынша карта-схема құрылды.

Зерттеу кезінде табылған 3 популяцияның таралу аймақтары бойынша DEM картасы жасалды. Барлық ценопопуляцияларға 2м^2 үлгі алаңшалары салынды, түрдің тығыздығы, жастық құрамы А.А. Урановтың әдісі бойынша есептелді. Түрдің орташа тығыздығы 1,5 мен 2,9 дана/2 м^2 аралығында өзгерді.

Ценопопуляция (ЦП) – 1 (популяция 1), 2 (популяция 2) және 3,4 (популяция 3) генеративті дарақтар басым, ЦП-1 – абсолюттік максимум g_1(20,0%) күйіне сәйкес, ценопопуляция 2-3 және 4-те 18,52%, 24,14% және 33,34% аралығында өзгереді. Ценопопуляциялардағы постгенеративті дарақтар саны айтарлықтай көп емес, субсинилді ss (0%-13,34%) аралығында өзгереді. ЦП-2 – постгенеративті дарақтар кездеспейді және керісінше прегенеративті, генеративті дарақтар саны жеткілікті. Нақтырақ, im (44,44%%), v (33,34%), g_1 (18,51%), g_2 (3,71%) дарақтар кездеседі. ЦП-2 – барлық ценопопуляциялардың ішіндегі жастық құрамы бойынша ең жас ценопопуляция.

Зерттеу кезінде барлық ценопопуляцияларда имматурлық жастық күйі (im) – 0% – 44,45%, виргинилді (v) – 6,89% – 33,34% , жас генеративті (g_1) – 18,52% – 33,34 %, орта генеративті (g_2) – 3,71% – 44,83%, кәрі генеративті (g_3) – 0% – 28,57%, субсинильді (ss) – 0% – 13,34% аралығында өзгерді, ал сенильді (s) дарақтар кездеспейді.

Allochrusa gypsophiloides түрінің ценопопуляцияларының жастық спектрі, тығыздығы бойынша түсіндірме графиктері, кестелер құрылды және өсімдіктің таралуы мен ценопопуляцияларының құрылымдық ерекшеліктерінің қазіргі жағдайына баға берілді.

Түйін сөздер: Allochrusa gypsophiloides, ценопопуляция, эндем, жастық құрамы, Сырдария Қаратауы, DEM картасы.

А.А. Тастанбекова[1], К.К. Кулымбет[1,2]*, М.С. Курманбаева[1], А.Б. Садуахас[2]

[1]Казахский национальный университет имени аль-Фараби, Казахстан, г. Алматы
[2]Казахский научно-исследовательский институт почвоведения
и агрохимии имени У.У. Успанова, Казахстан, г. Алматы
*e-mail: qulymbet.qanat@gmail.com

Распространение и структура ценопопуляций редкого, эндемичного растения *Allochrusa gypsophiloides* (Regel) Schischk. на юге Казахстане

В статье описаны особенности структуры ценопопуляций и распространения редкого, эндемичного растения Allochrusa gypsophiloides. Изучены были 3 популяции, 4 ценопопуляции. 1-ая популяция – Сырдарьинский Каратау – ущелье Саясу; 2-ая популяция – Сырдарьинский Каратау – перевал Куюк; 3-ая популяция – Подкаратауская равнина, вблизи села Бирлик. Вместе с тем, в период с 2011 по 2022 год составлена карта-схема по распространенности вида растений.

Была создана карта DEM по зонам распространения 3-х популяций, обнаруженных при исследовании. На все ценопопуляции были построены учетные площадки размером 2 м^2, плотность вида, возрастной состав рассчитывались по методу А.А. Уранова. Средняя плотность вида варьировала от 1,5 до 2,9 шт./2 м^2.

Ценопопуляция (ЦП) – преобладают генеративные особи 1 (популяция 1), 2 (популяция 2) и 3,4 (популяция 3), в соответствии с состоянием ЦП-1 – абсолютный максимум g_1 (20,0%), ценопопуляции 2, 3 и 4 колеблются в пределах 18,52%, 24,14% и 33,34%. Количество постгенеративных особей в ценопопуляциях существенно невелико, варьирует в пределах субсинилный ss (0% – 13,34%). ЦП-2 – постгенеративных особей не встречается, и, наоборот, существует достаточное количество прегенеративных, генеративных особей. В частности, встречаются особи im (44,44%%), v (33,34%), g_1 (18,51%), g_2 (3,71%). ЦП-2 является самой молодой ценопопуляцией по возрастному составу из всех ценопопуляций.

При исследовании во всех ценопопуляциях имматурное возрастное состояние (im) – 0% – 44,45%, виргинильное (v) – 6,89% – 33,34%, молодое генеративное (g_1) – 18,52% – 33,34%, средне генеративное (g_2) – 3,71% – 44,83%, старое генеративное (g_3) – 0% – 28,57%, субсинильные (ss) – изменялись в пределах 0% – 13,34%, а сенильные (s) особи не встречаются.

Созданы пояснительные графики, таблицы по возрастному спектру ценопопуляций вида Allochrusa gypsophiloides и дана оценка современного состояния структурных особенностей распространения и ценопопуляций растения.

Ключевые слова: Allochrusa gypsophiloides, ценопопуляция, эндемик, возрастной состав, Сырдарьинский Каратау, карта DEM.

Introduction

One of the largest and most dynamically developing regions of Kazakhstan is South Kazakhstan, which is a source of about 50% of the total flora of Kazakhstan and 41% of the total number of endemic species of Kazakhstan [1].

Allochrusa gypsophiloides (Regel) Schischk. *(Acanthophyllum gypsophiloides* Regel*.)* is an endemic species listed in the « Red Book of Kazakhstan «, belonging to the family *Caryophyllaceae Juss.* [2]. This species is a herbaceous polycarp perennial. The plant has strong taproots and the above-ground part has a strongly

branched, spherical shape [3]. The species has a long life span and a strong rhizome that can weigh up to 2-3 kg.

Allochrusa gypsophiloides (Figure 1) is a perennial with strong roots. Rhizome long, up to 7 mm thick; stems 50-80 cm tall, upright, glabrous, whitish or purplish-coloured, with long branches; leaves 1-2 cm long and 0.5-3 mm wide, linear-shelled, glabrous or very rarely slightly rough, in axils with shortened shoots; flowers on stem and branch tops in loose dichasiums, forming wide paniculate inflorescences; pedicels 5-10 mm long; petals white or pinkish, 1.5 times longer than calyx, wide-oblong, rounded at top [4,5].

A. gypsophiloides-valuable medicinal and industrial plant, long exported as the main source of saponins [6,7]. The species is characterized by a high content (up to 30%) of oleanolic triterpene saponins with high surface and hemolytic activity [8].

In Kazakhstan, field studies of natural populations of *A. gypsophiloides* have revealed a significant reduction in the natural range of the species as a result of anthropogenic activities [9].

In creating the source database (Table 1), we considered locations where the plant *Allochrusa gypsophiloides* has been observed in the last 12 years [10,11].

Table 1 – Distribution of A. gupsophiloides species detected between 2011 and 2022

Location	Time, year	Defined species
South Kazakhstan, Upper Boralday, Karasai gorge	30 June 2011	Georgy Lazkov
South Kazakhstan, Lower Boralday, Akzhar valley	03 June 2012	Georgy Lazkov
Karatau mountain range, Kuyuk pass	13 July 2012	Vladimir Kolbintsev
Alatau mountains (Daubaba), Eastern Gorge	21 June 2014	Evgeny Davkaev
Saryagash district, north-west of Shymyrbai village	24 June 2015	N. Gemedzhieva, M. Valentina
Kazygurt district, south-west of Rabat village,	27 June 2015	N. Gemedzhieva, M. Valentina
Rabat and south-east of Amangeldi village	29 June 2015	N. Gemedzhieva, M. Valentina
Arys district, west of Moynaitas village	30 June 2015	N. Gemedzhieva, M. Valentina
Tolebi district, west of Abay village	21 June 2016	Vladimir Epictetov
Tien-Shan, Talas mountain range, western	28 June 2016	Vladimir Kolbintsev
Aksu-Jabagly, Aksu Canyon	25 June 2017	Vladimir Kolbintsev
Syrdarya Karatau, mountains Ulkunburultau	13 June 2020	Evgeny Belousov
Kyrgyz mountain range, Botamoynak mountains	14 June 2021	Fedor Shakula
Syrdarya Karatau, Sayasu gorge	01 May 2022	Pavel Gorbunov
Baidibek district, Birlik village surrounding, Karatau plain		
Baidibek district, Boraldai ridge, near Karatas		

Since 1981, *A. gypsophiloides* has been included in the «Red Book of the Kazakh SSR» [12], where it was proposed to limit the collection of raw materials to 100 tons of dry roots per year and to control the natural regeneration of the species. Intensive harvesting of roots without observance of the established rules has led not only to sharp reduction of the species number, but also to strong decrease of its distribution range. Only a small part of the population is protected in Aksu-Zhabagaly and Karatau nature reserves. The latter publication indicated that «a licence fee should be imposed» as necessary protection measures [13].

Previously, the species was one of the most common plants in its range. In the Kazakh SSR, the Merke occupied an area within the Taskumirsay-Saryagash borders. Now this species has a relatively limited territory and occurs in the foothills of some mountain ranges of the Western Tien Shan (Karatau, Talas Alatau, Kyrgyz Alatau and Kazygurt mountain) at a height of 400-1300 m above sea level [14]. It grows in semi-desert, desert-steppe communities, from the foothill plains to the middle mountain range.

The problem of conservation of useful plant biodiversity is among the topical issues of our time, and a proper approach to phytogenetic resources, their deep and comprehensive study, the search for ways to use, conserve and protect them is highly important [15,16].

It is well known that the productivity of species and the quality of plant raw materials are significantly influenced by environmental factors [17]. Therefore it becomes actual to study biological and ecological features of separate species in various geographical zones and biotopes and structure of their cenopopulations. In this regard, it was interesting to study the structure features of three

populations of *gypsophiloides* in different ecological and cenotic conditions of the South Kazakhstan region.

The research objective is to identify *A. gupsophiloides* populations and study their abundance, density and age composition.

Figure 1 – *Allochrusa gypsophiloides'* flowering period

Materials and methods of research

The subject of the study is a perennial herbaceous, rare species belonging to the family *Caryophyllaceae, Allochrusa gypsophiloides* (Figure 1).

The work was carried out according to generally accepted methods for studying cenopopopulations [18-20]. The classification of absolute maximums of ontogenetic groups proposed by A.A. Uranov and O.V. Smirnova was used to describe cenopopopulations.

Age composition has great importance for the self-maintenance of cenopopulations. Age spectrum help to make both an up-to-date diagnosis of the condition and an assessment of future development prospects and are the most important characteristic of a particular cenopopopulation [20].

To study the age spectrum in each cenopopopulation, longitudinal transects were laid, on which 10-20 m apart, 2m^2 (10 plots) were allocated to survey plots. All individuals of a given species were counted at each plot, with a distribution according to their age status. The age status was determined mainly by the aboveground parts: number, shape and size of leaves, number and length of shoots, presence of flowers and fruits.

When differentiating the age composition, A.A. Uranov's classification was used: p-sprouts; j-juvenile individuals, im-immature; v-virginil; g_1-young generative g_2-mature generative g_3-old generative; ss-subsenile; s-senile individuals [21].

The population density was estimated as the number of individuals per 2 m^2. We refer to a rooted shoot of generative or vegetative origin as an individual.

Mapping of locations was carried out in the ArcGIS 10.4 program. STRM satellite images (2014) were used to create the DEM map. Digital Elevation Model (DEM) is a three-dimensional representation of the earth's surface represented as an array of points with a defined elevation [22].

Research results and analysis

The research was carried out in May-June 2022 in different ecological and cenotic conditions of South Kazakhstan.

Based on the database collected before the study, a population map of *A. gypsophiloides* was created from 2011 to 2022 (Figure 2).

In late May and June 2022, *A. gypsophiloides* populations were found by us in the southern regions of Kazakhstan. These are: 1) Syrdarya Karatau – Sayasu Gorge; 2) Syrdarya Karatau – Kuyuk pass; 3) Pre-Karatau plain, Birlik village. Number of populations – 3, number of cenopopopulations – 4 (Table 2, (Figure3)).

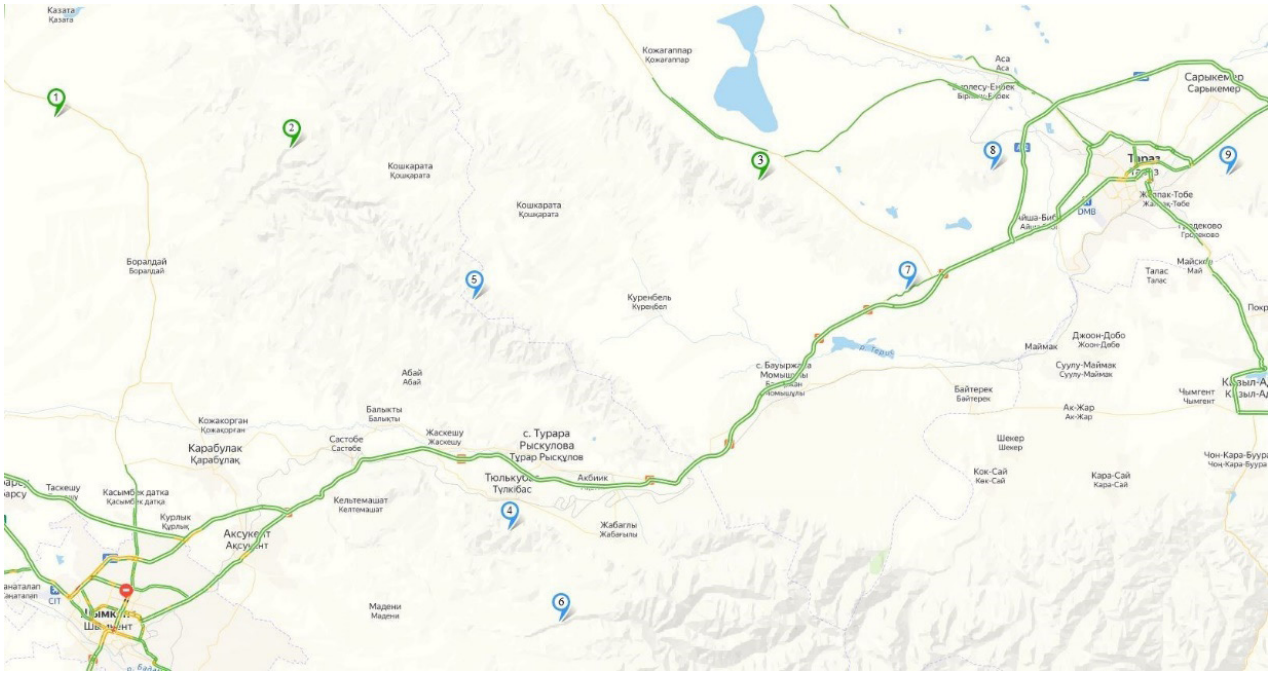

Figure 2 – Map of the distribution areas of *A. gypsophiloides* populations
(1-Karatau plain, Birlik village, 2-Boraldai Range, near Karatas village, 3 – Syrdarya Karatau, Sayasu Gorge, 4 – Alatau Mountains (Daubaba), 5 – Upper Boroldai, Karasai Gorge, 6 – Tien-Shan, Talas mountain range, Aksu-Jabagly nature reserve, 7 – Karatau Ridge, Kuyuk pass, 8 – Syrdarya Karatau, Ulkunburultau Mountains, 9 – Botamoynak Mountains)

Table 2 – Geographical location of the studied *A. gypsophiloides* cenopopulations

№	Location	Geographical coordinates
Cenopopulation 1	Syrdarya Karatau, Sayasu Gorge	42°53’52.1”N 70°42’51.1”E
Cenopopulation 2	Syrdarya Karatau, Kuyuk pass	42°45’33.0”N 70°58’40.0”E
Cenopopulation 3	Karatau plain, near Birlik village	42°59’01.1”N 69°31’16.4”E
Cenopopulation 4	Karatau plain, near Birlik village	42°59’00.0»N 69°31’18.2»E

The study of a rare, endemic species assemblage began by assessing the geographical location of the environment and establishing its geographical position. The phytocoenotic and ecological features of the habitat were then determined according to the main parameters.

The DEM map was produced for the 3 study populations (Figure 3). The DEM (Digital Elevation Model) contains information on the elevation of the true topography only, excluding vegetation and other anthropogenic features. It is essential for obtaining the most detailed information about the terrain.

As shown in Figure 3, the terrain varies from 230 m to 4,500 m, with populations varying in altitude as shown below:

1. Syrdarya Karatau, Sayasu Gorge – 709 m, gorge slope; 2. Syrdarya Karatau, Kuyuk pass – 838 m, ridge slope; *3. Karatau plain, Birlik village – 384 m,* undulating plain

Population 1 (cenopopulation 1) – Syrdarya Karatau, Sayasu gorge. Elevation: eastern, located on a slope of 40^0 incline. Community: wormwood-shrubby, population area is 1.0-1.1 km^2. Projective cover of the species: 70-80%, soils are foothill grey-brown, rocky-gravel, the proportion of large stones in composition is 60-65%.

Population 2 (cenopopopulation 2) – Syrdarya Karatau, Kuyuk pass. Exposure: western, located on 30^0 inclined slopes. Community: mixed grasses with currants; population area- 1 km^2. Projective cover of the species: 80%, soil is foothill grey-brown, rocky-gravel, stony 30-40%.

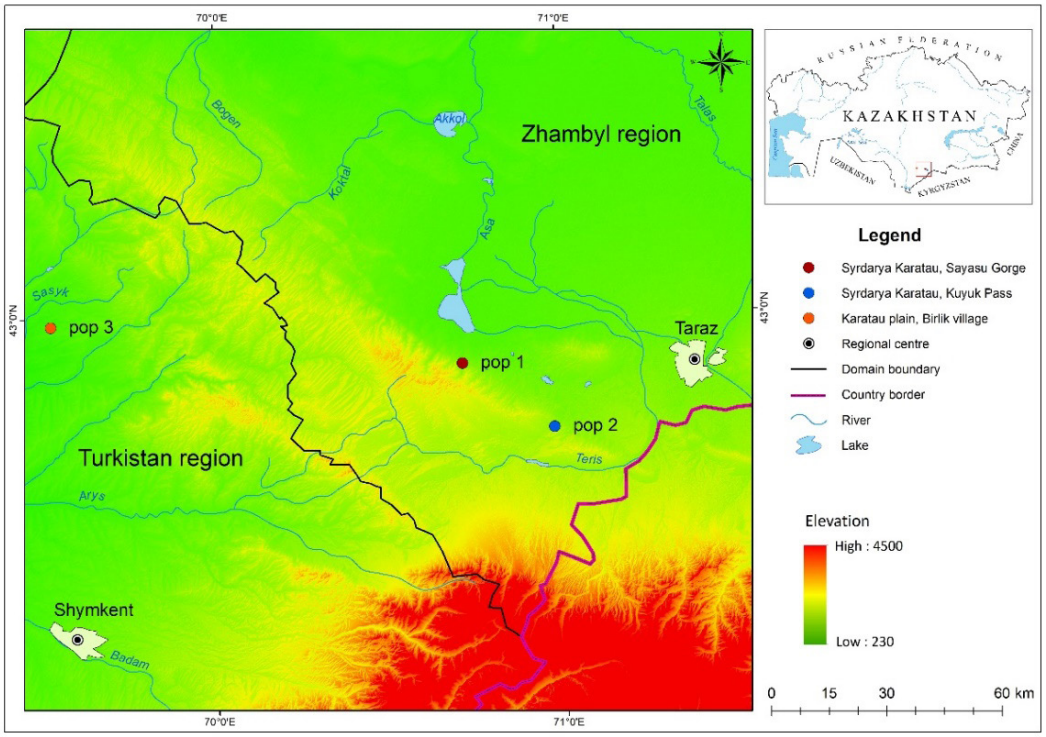

Figure 3 – DEM location map of the studied *A. gypsophiloides* population

Population 3 (cenopopopulation 3,4) – Karatau plain, near Birlik village two cenopopulations were found: cenopopulation 3- undulating plain; community: wormwood-grass; species cover: 70-75%; soil – foothill Southern common gray, slightly compacted; coordinates: 42°59'01 "N 69°31'16.4 "E; (cenopopulation 4) – wavy plain; association: cereals-mixed grass; species cover: 70-75%; soil: foothill common gray, slightly compacted. 1 "N 69°31'16.4 "E; cenopopopulation 4 – wavy plain; community: herb-grass; species coverage: 75-80%; soil: foothill Southern common gray, weakly compacted; coordinates: 42°59'00.0 "N 69°31'18.2 "E. Population area is 1.5 km^2; cenopopopulation distance is 100-110 m.

In all cenopopulations (CP) – the number of *A. gypsophiloides* plants was 91 individuals. In the study, the number of cenopopopulations ranged from 15 to 29 individuals (in the case of each cenopopopulation).

The average density of the cenopopopulations ranged from 1.5-2.9 individuals/2m^2 in the 3 populations (Table 3).

Table 3 – Average density of the species *A. gypsophiloides* (pcs/2m^2)

Population 1	**Population 2**	**Population 3**	
Cenopopopulation 1	Cenopopopulation 2	Cenopopopulation 3	Cenopopopulation 4
1,5±0,5	2,7±1,07	2,9±1,09	2,1±0,98

Results of A. gypsophiloides cenopopulation analysis at 10 observation sites (2m2 each) in Syrdarya Karatau mountains, Sayasu gorge, Kuyuk pass and Birlik village were as follows (Table 3, Figure 4,5): (im) averaged 0.3 plants belonging to virginile (v) state, 4.8 plants belonging to young generative (g_1) state, 6.5 plants belonging to mature generative (g_2) state, 6.8 plants belonging to old generative (g_3) state, 4.0 plants, (ss) averaged 0.8 plants, no senile (s) characteristic cenopopulations were found.

Table 4 – Cenopopulation of *A. gypsophiloides*

Location	Number of individuals, pieces (n=10)							Total
	im	*v*	g_1	g_2	g_3	ss	*s*	
Cenopopulation 1	1	3	3	3	3	2	-	15
Cenopopulation 2	-	12	9	5	1	-`	-	27
Cenopopulation 3	-	2	7	13	6	1	-	29
Cenopopulation 4	-	2	7	6	6	-	-	21
Average	0,3	4,8	6,5	6,8	4	0,8	-	23

CP-1 and CP-2 were recorded in a mountainous area. CP-1 – plant height of *A. gypsophiloides* ranges from 41-73 cm, east/west diameter 54.0-140.0 cm, south/north 32-70 cm. The high plant performance is due to sufficient rainfall during the year.

CP-2 was isolated from the Kuyuk Pass, Syrdarya Karatau. Specifically, in the indicated cenopopulation, the plant height was 20-41 cm. Accordingly, the east/west diameter was noted to be 10.0-55.0 cm, south/north 7.0-41.1 cm.

In these cenopopulations (CP-2, CP-3), plant densities were reasonably acceptable. The plant density was 2.7 – 2.9 units.

Average plant and population numbers were recorded in cenopopopulations 2 and 4. A lower plant value was recorded in cenopopopulation 1.

CP 3 – plant height ranged from 29-64 cm. east/west diameter 22.0-121.0 cm, south/north 14.0-81.0 cm, plant density was 2.9 pcs. CP 4 – plant height ranged from 41-60 cm. diameter east/west 21.0-80.0 cm, south/north 25.0-77.0 cm, plant density was 2.1 units.

The study analysed the types of cenopopopulations. According to it, most of the cenopopopulations were generative and transitional (Figure 4,5).

A. gypsophiloides has many g_1 individuals in the plant. However, not all cenopopulations have individuals in the senile (s) young state and no individuals in the immature (im) young state of CP-3 and CP-4 (Figure 5).

CP-1 (population 1), CP-2 (population 2), CP-3 and CP-4 (population 3) are dominated by generative individuals, according to the state of CP-1-absolute maximum g_1 (20.0%) cenopopopulation varies within 2-3 and in cenopopulation 4 – g_1(18.52%, 24.14% and 33.34%) according to the state of individuals. The number of postgenerative individuals in the cenopopulation is not significantly high, varying within the ss subfamily (0% -13.34%). The condition of CP-1 is average, but species are very far apart and the number of species is very low compared to other cenopopopulations.

CP – 2-postgenerative individuals do not occur, and conversely, there are a sufficient number of pregenerative, generative individuals. In particular, individuals im (44.44%), v (33.34%), g_1 (18.51%), g_2 (3.71%) are found. CP-2 is the youngest cenopopopulation in terms of age composition of all cenopopulations (Fig. 4).

Specimens of CP-3 and CP-4 have two maximum age composition: the first (24.14% – 33.34%) is young generative plants (g_1), the second (28.57% -44.83%) is a group of mature generative plants (g_2) (Figure 5). The natural condition of the environment growing in this cenopopopulation can be explained by the fact that it is more favorable than the others.

CP-4 (population 3)-predominantly generative individuals (9.52% to 33.4%). Subsenile (ss) and senile (s) individuals also do not occur. The area of the cenopopulation is medium, the state of the species in the cenopopulation is medium, and the number of individuals in this cenopulation belongs to the normal category. In terms of species status in the cenopopulation, the species is complete, with fully mature leaves and flowers (Figure 5).

Of the generative group species, young generative (g_1) individuals are more common in all cenopopulations, with no senile generative (g_3) age status in CP-2 in the studied cenopopopulations, and varying between g_3, 20.0%, 20.69%, 28.57% in the other three cenopopopulations. At the same time, subsenile (ss) specimens of CP-1,3 are 13.34%, 3.45%, and they do not occur in the cenopopopulations.

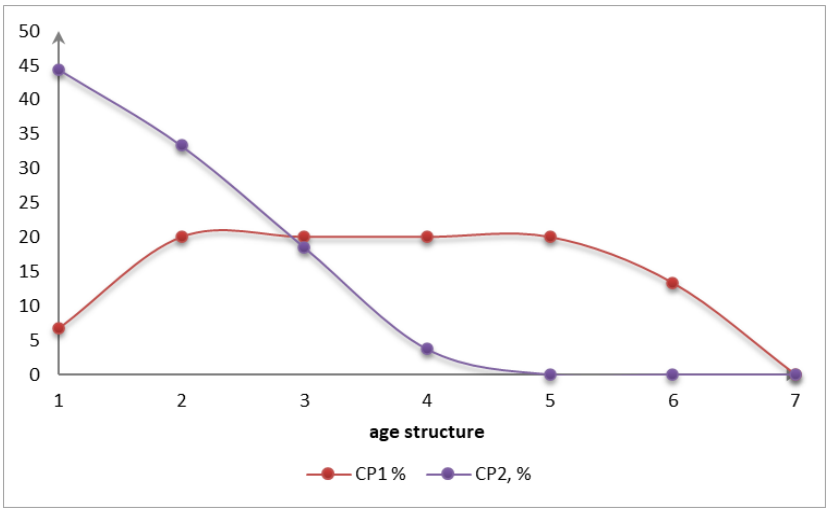

Figure 4 – Age composition (1,2) of *A. gypsophiloides* cenopopulations (number of individuals per group, %).
1 – immature (im), 2 – virginil (v), 3 – young generative (g_1), 4 – mature generative (g_2),
5 – old generative (g_3), 6 – subsenile (ss), 7 – senile (s)

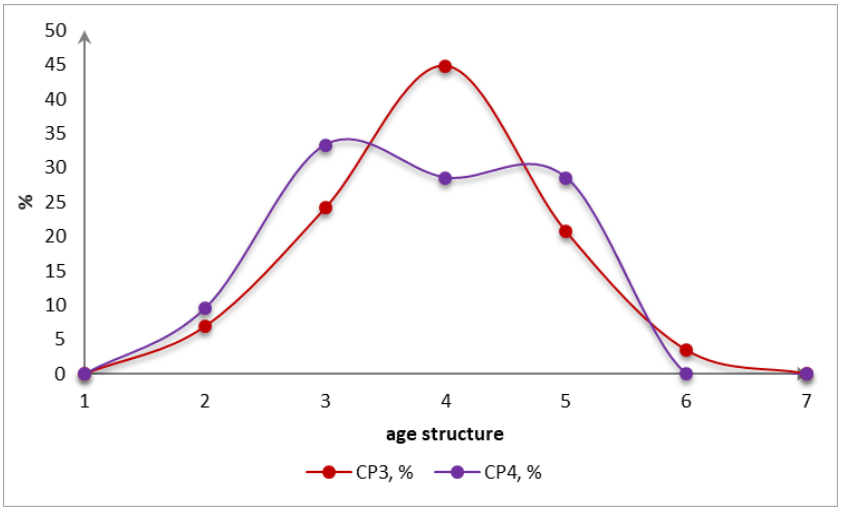

Figure 5 – Age composition (1,2) of *A. gypsophiloides* cenopopulations (number of individuals per group, %).
1 – immature (im), 2 – virginil (v), 3 – young generative (g_1), 4 – mature generative (g_2),
5 – old generative (g_3), 6 – subsenile (ss), 7 – senile (s)

During the study in all cenopopulations immature age state (im) – 0% – 44.45% , virgin (v) – 6.89% – 33.34% , young generative (g_1) – 18.52% – 33.34%, mature generative (g_2) – 3.71% – 44.83% , senile generative (g_3) – 0% – 28.57% , subsinile (ss) – 0% – varied between 13.34% and no senile (s) individuals were found.

Conclusion

Data on the distribution range and structure of the cenopopulation of rare *Allochrusa gypsophiloides* are needed to clarify the prospects of their existence.

The result of the research carried out in this paper is an assessment of the current state of the four cenopopulations (three populations) of the *A. gypsophiloides* plant.

1. According to prevalence of *A. gypsophiloides* plant species, 3 populations, 4 cenopopopulations were found: Syrdarya Karatau – Sayasu gorge; Syrdarya Karatau – Kuyuk pass; Karatau foothill plain, near Birlik village area. Herewith, a map-scheme on plant species prevalence has been drawn up for the period from 2011 to 2022.

2. A DEM map of the distribution zones of the 3 populations found was produced during the study. SRTM images were downloaded and subsequently used according to the occurrence point of the populations.

3. The total number of *A. gypsophiloides* species in the cenopopulations was 91 individuals: CP-1 had 15 individuals, CP-2 had 27 individuals, CP-3 had 29 individuals, and CP-4 had 29 individuals. The average species density varied from 1.5 to 2.9 individuals/2 m^2.

4. In terms of age composition young generative g_1 individuals dominated (20.0%, 18.52%, 24.14% and 33.34%). The life condition of all studied cenopopopulations was at an average level, CP-1 number of species too low in comparison to the others and species too far apart. The number of individuals of g_3 age composition does not occur in CP-2, and in the other three cenopopopulations ranges from 20.0% to 28.57%, the number of immature (im) age composition occurs only in CP-1, CP-2. Specimens of CP-3, CP-4 have two maximums of age composition: the first (24,14% – 33,34%) is the group of young generative plants (g_1), the second (28,57% -44,83%) is the group of mature generative plants (g_2).

Illustrative graphs, tables on the number and density by structural features of *A. gypsophiloides* plant cenopopopulations were constructed. According to the total 4 cenopopulations of the *A.gypsophiloides* plant, an assessment of their structural features and the current state of distribution is given.

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