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ECONOMICALLY VALUABLE SPECIES GROWING IN NORTHERN KYZYLKUM AND THEIR SIGNIFICANCE FOR PRACTICAL USE

Unique genetic resources of plant biodiversity are concentrated in Kazakhstan. Economically important species make a significant contribution to the structure of the Earth in comparison with taxa with insignificant or unknown economic use, many economically valuable species of Kazakhstan are of global importance.

The purpose of this work is to identify economically valuable species of Northern Kyzylkum within the Republic of Kazakhstan. Objects and methods of research: To collect and identify species, classical botanical, route-reconnaissance; ecological-systematic; ecological-geographical methods were used. The main groups of useful plants of economically valuable flora species of Northern Kyzylkum were identified: woody, food, medicinal, fodder, decorative, technical species.

During the research, it was revealed that 310 economically valuable species belonging to 62 families and 196 genera are found in Northern Kyzylkum within the Republic of Kazakhstan. According to the results of the classification, the dominant families are determined: Poaceae Barnhart has 34 genera, 58 species; Asteraceae Dumortier – 24 genera, 46 species; Chenopodiaceae Vent. – 19 genera, 30 species; Fabaceae Juss. – 11 genera, 23 species. The study analyzed 200 types of medicinal, 100 types of fodder, 22 types of decorative, 11 types of sand fixers, 9 types used for fuel according to significant economic valuable characteristics. According to the classification of economically valuable species by life forms, tree forms were identified in 6 species: Salix alba L., Populus diversifolia Schrenk, P. pruinosa Schrenk, Acer negundo L., Elaeagnus angustifolia L., Haloxylon persicum Bunge ex Boiss., 44 shrubs and semi-shrubs, 155 perennials, 105 biennial and annual plants.

Key words: economically-valuable species, Northern Kyzylkum, fodder, medicinal, useful, decorative.

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Солтүстік Қызылқұмда өсетін шаруашылыққа құнды түрлер және оларды практикалық қолдану үшін маңызы

Қазақстанда өсімдік биоалуантүрлілігінің бірегей генетикалық ресурстары шоғырланған. Экономикалық маңызды түрлер пайдалылығы аз немесе белгісіз таксондармен салыстырғанда Жер құрылымына айтарлықтай үлес қосады, Қазақстанның көптеген шаруашылық-құнды түрлерінің әлемдік маңызы бар.

Жұмыстың мақсаты Қазақстан Республикасы аумағында Солтүстік Қызылқұмның шаруашылық-бағалы түрлерін анықтау болып табылады. Зерттеу объектілері мен әдістері: түрлерді жинау және анықтау үшін классикалық ботаникалық, маршруттық-рекогносцировкалық; экологиялық-жүйелік; экологиялық-географиялық әдістер пайдаланылды. Солтүстік Қызылқұм флорасының экономикалық тұрғыдан құнды түрлерінің пайдалы өсімдіктерінің негізгі топтары айқындалды: ағаштар, дәрілік, жемшөп, сәндік, техникалық түрлер.

Зерттеу барысында Қазақстан Республикасының солтүстік Қызылқұмда 62 тұқымдасқа жататын 310 шаруашылық құнды түрі кездесетіні анықталды. Жіктеу нәтижесі бойынша басым тұқымдастар: Poaceae Barnhart – 34 туыс, 58 түр; Asteraceae Dumortier – 24 туыс, 46 түр; Chenopodiaceae Vent. – 19 туыс, 30 түр; Fabaceae Juss. – 11 туыс, 23 түрі анықталды. Маңызды құнды белгілері бойынша талдау нәтижесінде 200 түр – дәрілік, 100 түр – жемшөптік, 22 түр сәндік, 11 түр құм ұстайтын, 9 түр отынға пайдаланылатыны нақтыланды. Экономикалық құнды түрлердің тіршілік формалары бойынша жіктелуіне сәйкес: ағаштар 6 түр Salix alba L., Populus diversifolia Schrenk, P. pruinosa Schrenk, Acer negundo L., Elaeagnus angustifolia L., Haloxylon persicum Bunge ex Boiss, 44 түр жартылай бұталар мен бұталар, 155 түр көпжылдық, 105 түр екі жылдық және бір жылдық өсімдіктер екенін көрсетті.

Түйін сөздер: шаруашылық құнды түрлер, Солтүстік Қызылқұм, жем-шөп, дәрілік, пайдалы, сәндік.

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Хозяйственно ценные виды, произрастающие в Северном Кызылкуме, и их значение для практического использования

В Казахстане сконцентрированы уникальные генетические ресурсы растительного биоразнообразия. Экономически важные виды вносят значительный вклад в структуру Земли по сравнению с таксонами с незначительным или неизвестным экономическим использованием, многие хозяйственно-ценные виды Казахстана имеют мировое значение.

Целью данной работы является выявить хозяйственно-ценные виды Северного Кызылкума в пределах Республики Казахстан. Объекты и методы исследования: Для сбора и определения видов, использовались классические ботанические, маршрутно-рекогносцировочные; эколого-систематические; эколого-географические методы. Были выделены основные группы полезных растений экономически ценных видов флоры Северного Кызылкума: древесные, пищевые, лекарственные, кормовые, декоративные, технические виды.

В ходе исследований было выявлено, что в Северном Кызылкуме в пределах Республики Казахстан встречаются 310 хозяйственно ценных видов, относящихся к 62 семействам и 196 родам. По результатам классификации определены доминирующие семейства: Poaceae Barnhart насчитывает 34 рода, 58 видов; Asteraceae Dumortier – 24 рода, 46 видов; Chenopodiaceae Vent. – 19 родов, 30 видов; Fabaceae Juss. – 11 родов, 23 видов. В исследовании проанализированы по значимым хозяйственным ценным признакам 200 видов лекарственных, 100 видов кормовых, 22 вида декоративных, 11 видов закрепителей песков, 9 видов, используемых для топлива. Согласно классификации хозяйственно-ценных видов по жизненным формам, были выявлены древесные формы у 6 видов: Salix alba L., Populus diversifolia Schrenk, P. pruinosa Schrenk, Acer negundo L., Elaeagnus angustifolia L., Haloxylon persicum Bunge ex Boiss., 44 кустарников и полукустарников, 155 многолетников, 105 двулетних и однолетних растений.

Ключевые слова: хозяйственно-ценные виды, Северный Кызылкум, полезные, кормовые, лекарственные, декоративные.

Introduction

Plants are globally recognized as a vital part of the world's biodiversity and as one of the planet's most important resources. Many thousands of wild plants are important economically and culturally, providing food, medicine, fuel, clothing and shelter, medicine, fuel, clothing and shelter worldwide. Plants play a key role in maintaining the Earth's ecological balance and the stability of its ecosystems because of their high ecological and economic values and functions. Recent ongoing climate change is undoubtedly affecting the distribution of species of economic importance, not only in Kazakhstan, but worldwide.

The solution tasks is to conserve endangered plant species in their natural habitat. Solving this problem will be an important step forward in halting the loss of diversity in the spread of endangered species. Endangered species include various medicinal plants, tree species and wild relatives of crops that are important for life support.

One of the most pressing problems of our time is therefore the depletion of plant resources. The protection and rational use of economically valuable species consists in a proper, rationed collection that eliminates the possibility of depletion.This problem is most relevant for arid territories, which is associated with a whole complex of negative factors. The main ones among them are: climate warming and anthropogenic load. Anthropogenic factors affecting the state of vegetation cover include: livestock (the impact of grazing on pastures); plowing of land for crops; haymaking; pyrogenic; technogenic, including transport; residential; harvesting of plant raw materials. The impact of the human factor in arid climate conditions is especially great in river valleys, which are characterized by high population density. Economically important species of plants are organisms that are well established in culture or are of potential use to humans, i.e. species that are at some stage of domestication and have traits and characteristics that are of practical interest for utilization in human livelihoods.

The Kyzylkum desert is located in the interfluve of the two largest Central Asian rivers the Amu Darya and the Syr Darya on an area of more than 300,000 km^2. Its eastern borders run along the low-mountain ranges of Pistalitau, Nuratau and Aktau, extending to the Sundukli sands in the south-east. The Amu Darya is a natural border in the south, west and northwest, separating Kyzylkum from Karakum. The modern territory of Kyzylkum has increased by

about 4 million hectares in the north-west due to the drying up of the Aral Sea. Moreover, this territory is mainly represented by powerful salt marshes and marching sands, and less often by elevations, bumpy sands, which are also characteristic of the entire north-western Kyzylkum. According to the botanical and geographical zoning, E. I. Rachkovskaya et al. (2003) [1] refers the main part of Kyzylkum to the South Turan province. At the same time, its small territory from the north (the south-eastern part of the Aral Sea) and the south-east are assigned to the North Turan and mountain-Middle-Asian provinces, respectively [2] (Fig. 1).

The Kyzylkum is the largest pasture region at the current level of development of productive forces in agricultural production. It is dominated by pastures of year-round use, which make up almost 80% of the total area of the district [3].

This vast desert area is diverse in geological and geomorphological terms: powerful sand formations (ridges, mounds, dunes); remnant mountain territories; plains, depression pits. Most of Kyzylkum consists of flat plateaus and low-lying clay plains. Flat plateaus are based on Cretaceous rocks covered with a cloak of sand and gravel deposits. Kyzylkum is also characterized by the fact that some of its massifs lose their typical features – flatness; in particular, numerous ravines, low hills or other relief formations become more frequent in places.

Figure 1 – Kyzylkum (Northern Kyzylkum within the Kyzylorda region)

There are also alluvial low plains in the geomorphology of Kyzylkum, and the relief of the Priaralsk part was formed under the influence of the Aral Sea. The deposition of loose and fixed sands characterize the eastern shore.

The sands of Kyzylkum are the product of centuries-old destruction of the sediments that make up the plateau itself. They have a characteristic reddish colour, which owes its name to the entire Kyzylkum desert [4].

In one word, according to the nature of the relief forms and their composition, there are Aeolian, ridge-bumpy sands, inter-ridge plains, outlier hills, depressions, undulating plains, etc. The local population usually divides the territory of the Kyzylkum desert into two ecologically distinct zones: sandy Kyzylkum, simply called “Kyzyl” and non-sandy Kyzylkum [4].

Sandy elevations usually alternate with sandy depressions, or between ridge plains. The length of the sand formations varies from several meters to several kilometers. The most height of the ridges often reaches 12-15 meters or more. The depressions and plains between the ridge elevations differ in the occupied areas, and they are more often randomly designed.

The profile of desert-sandy soils and formations is poorly differentiated into genetic horizons with or without an inconspicuous crust on the surface. They contain little humus (about 0.5%), which is more often formed at a certain (5-6 cm) depth [5].

Kyzylkum has features peculiar to the Turan agro-climatic province [6, 7].

The variety of ecological conditions of the Kyzylkum desert also left its mark on the vegetation cover, especially on its sandy massifs, which led to the development of psammophiles. The ecological regime and, accordingly, the plant conditions in the sandy desert are determined by the water-physical properties of sand, this kind of substrate [8].

The distinctive ecological environment of the sandy part of the desert naturally leaves a certain imprint on the formation of the vegetation cover, its composition and structure. Thus, the total number of plant species in different regions of the sandy desert of Central Asia is different: it is 215 species in Muyunkum, 275 species for the Ural-Emben sands, Kazakhstan sand deserts – 718 species [9, 10].

M. G. Popov [11] notes that the sandy deserts open up before us "an amazing, incomparable landscape, full of grandeur and beauty. In front of the naturalist, they additionally discover the original biological environment and the corresponding world of organisms of adaptations unknown in other landscapes" (p. 100). These epithets of the famous botanist – geographer about the sandy deserts, first, refer to the Kyzylkum desert with good reason.

Shrubs and trees play a dominant role in the vegetation cover of the Kyzylkum sandy desert. These include saxaul (white, black), sand acacia, species of the genus *Calligonum*, conifer, astragalus [4].

If there are 320-718 species in the flora of the sandy deserts of Central Asia, then the sandy part of Kyzylkum accounts for 320 species of flowering plants belonging to 31 families and 134 genera [10, 12, 13].

Among the variety of pasture types in the region, about 2 million hectares account for pastures on saline lands. It is this factor that is the main cause of botanical poverty and the relative sparseness of the vegetation cover of these pastures. The use of forage lands of the solyanka desert of Kyzylkum is of a narrow seasonal (autumn–winter) nature, their productivity is 60-70% lower than other types of pastures. In order to increase the feed productivity of the low–productive karakul-growing pastures of Kyzylkum, it is necessary to develop and improve the technology of phytomelioration of these pastures. Halophytic vegetation certainly plays an important role in solving this important national economic problem.

Relevance of the work. The study of economically valuable species has increased many times in the last decade, as most people have recently begun to pay attention to more natural foods, medicines, etc. Especially in medicine, they have begun to develop new drugs from plant raw materials. Also, in the agricultural business, the interest began to take their turn in pasture plants and the omission of pastures at the expense of natural vegetation. Of course, the use of vegetation is more understandable in mountainous areas, and the species population is naturally much larger. Vegetation is used in a very peculiar way in desert areas, not counting forage species. The Kyzylkum desert (Kazakhstan part) is chosen as an example and a selection of groups of historically used species.

Novelty of the study: In Northern Kyzylkum (within Kazakhstan) there have not yet been works on the characteristic species for this territory, and in particular the economically valuable species that are given in our work have not been given.

The purpose of the work: Identification and analysis of valuable species in economic application within the Northern Kyzylkum.

Materials and Methods

Economically valuable species growing in Northern Kyzylkum within the Republic of Kazakhstan.

In the course of research, classical botanical (route-reconnaissance; ecological-systematic; ecological-geographical) methods were used. The herbarium material of the (AA) Institute of Botany and Phytointroduction's collectionswas studied. The herbarium was collected based on the method. Fundamental summaries were used to identify the collected material. A new scheme of floral zoning has been adopted to indicate the distribution of species within the territory of Kazakhstan [13-20].

Vegetation was studied using traditional methods of field geobotanical studies. Standard land area: in the steppes and deserts – 10x10 sq.m. or 15x15 sq.m.

Literary data and expedition materials of 2017 and 2020 were used, as well as herbarium samples of the Herbarium Fund of the AA "Institute of Botany and Phytointroduction" were viewed (Fig. 2).

Figure 2 – Working moments during the expedition period and in the Herbarium Fund of the Institute of Botany and Phytointroduction (AA)

Results and Discussion

During the expedition works, 25 points indicating vegetation of this location were recorded (coordinates that were recorded (Fig. 3, Table 1). Based on the results of the expedition, an analysis of economically valuable species of the Northern Kyzylkum within Kazakhstan was carried out, a list of families with the number of genera and species was compiled (Table 2) and herbarium specimens from the herbarium collection of the Institute of Botany and Phytointroduction were also used. As a result of the research, 310 economically valuable species belonging to 62 families and 196 genera were found in Northern Kyzylkum in the Republic of Kazakhstan.

Table 1 – GPS-coordinates

№	Latitude	Longitude	Altitude above sea level	13	N 44°27’50.86»	E 63°46’36.61»	h-95 m
1	N 44°34’25.20”	E 62°58’14.60»	h-95m	14	N 44°26’6.82»	E 63°47’14.78»	h-75 m
2	N 45° 09’ 31,5”	E 63°12’23.3»	h-112m	15	N 44°25’8.95»	E 63°48’49.26»	h-105 m
3	N 44°50’33.67»	E 63°13’15.73»	h-102m	16	N 44°25’28.39»	E 63°50’6.52»	h-100 m
4	N 44°51’51.50»	E 63°12’38.77»	h-118m	17	N 44°24’23.04»	E 63°52’41.02»	h-111 m
5	N 44°49’23.34»	E 63°18’0.95»	h-105m	18	N 44°24’56.19»	E 63°54’15.10»	h-90 m
6	N 44°37’30.14»	E 63°24’20.20»	h-100m	19	N 44°30’49.46»	E 65°37’15.80»	h-103 m
7	N 44°41’31.29»	E 63°30’40.98»	h-85m	20	N 44°30’53.28»	E 65°33’37.64»	h-102 m
8	N 44°42’14.98»	E 63°33’42.80»	h-103m	21	N 44°27’43.57»	E 65°37’54.73»	h-92 m
9	N 44°44’1.14»	E 63°39’27.69»	h-98m	22	N 44°29’34.38»	E 65°39’37.63»	h-96 m
10	N 44°45’22.42»	E 63°45’16.42»	h-101m	23	N 44°26’5.84»	E 65°42’43.02»	h-90 m
11	N 44°31’57.93»	E 63°38’37.75»	h-110m	24	N 44°25’39.91»	E 65°43’3.02»	h-105 m
12	N 44°30’5.11»	E 63°43’13.38»	h-80m	25	N 44°25’8.82»	E 65°41’57.36»	h-100 m

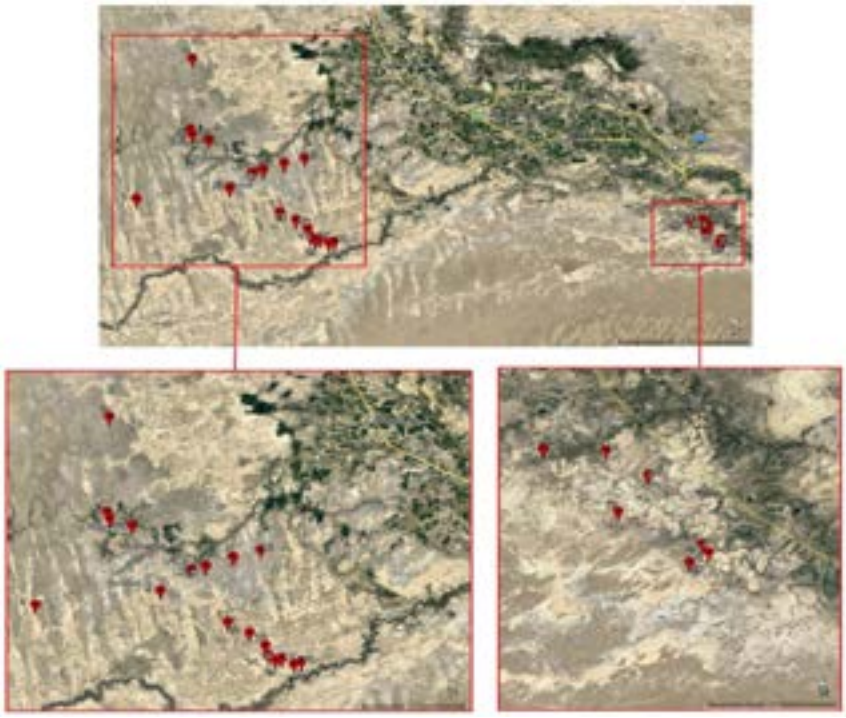


Figure 3 – Map showing the points marked in 2017 and 2020

Table 2 – Families of economically valuable species identified from expedition and herbarium (AA) data

№	Family	Amount of genera in the Family	Amount of species in the Family
	Ephedraceae Dumort.	1	2
	Nymphaeaceae DC.	1	1
	Ceratophyllaceae A. Gray.	1	1
	Ranunculaceae Juss.	4	6
	Berberidaceae Torr. et Gray	2	3
	Papaveraceae Juss.	3	4
	Hypecoaceae (Dumort.) Willk.	1	1
	Fumariaceae DC.	1	1
	Caryophyllaceae Juss.	7	7
	Amaranthaceae Juss.	1	1
	Chenopodiaceae Vent.	19	30
	Polygonaceae Juss.	6	11
	Limoniaceae Lincz.	1	2
	Hypericaceae Juss.	1	1
	Primulaceae Vent.	2	2
	Tamaricaceae Link.	1	6
	Salicaceae Mirb.	2	4
	Cucurbitaceae Juss.	1	1
	Brassicaceae Burnett	6	6
	Malvaceae Juss.	4	4

Continuation of the table

№	Family	Amount of genera in the Family	Amount of species in the Family
	Cannabiaceae Endl.	1	1
	Urticaceae Juss.	1	1
	Euphorbiaceae J. St.-Hil.	2	4
	Thymelaeaceae Juss.	1	2
	Rosaceae Juss.	1	2
	Lythraceae Jaume.	1	1
	Onagraceae Juss.	1	1
	Haloragaceae R. Br.	1	1
	Fabaceae Juss.	11	23
	Aceraceae Lindl.	1	1
	Rutaceae Juss.	1	3
	Peganaceae Tiegh.	1	1
	Oxalidaceae Lindl.	1	1
	Biebersteiniaceae I. Agardh	1	1
	Elaeagnaceae Lindl.	1	1
	Apiaceae Lindl. (Umbelliferae)	5	5
	Rubiaceae Juss.	2	3
	Apocynaceae Juss.	1	1
	Solanaceae Juss.	4	6
	Convolvulaceae Juss.	1	3
	Cuscutaceae Dumort.	1	3
	Boraginaceae Juss.	5	6
	Scrophulariaceae Juss.	3	5
	Plantaginaceae Lindl.	1	3
	Lamiaceae Lindl. (Labiatae Juss.)	6	6
	Asteraceae Dumortier	24	46
	Butomaceae Rich.	1	1
	Alismataceae Vent.	2	2
	Potamogetonaceae Dumort.	1	6
	Najadaceae Juss.	1	1
	Melanthiaceae Botsch.	1	1
	Iridaceae Juss.	1	1
	Liliaceae Juss.	1	1
	Alliaceae J. Agardh	1	3
	Ixioliriaceae Nakai	1	1
	Asparagaceae Juss.	1	1
	Cyperaceae Juss.	3	5
	Poaceae Barnhart	34	58
	Araceae Juss.	1	1
	Lemnaceae F. Gray	1	1
	Sparganiaceae Rudolphi	1	1
	Typhaceae Juss.	1	1
Total amount		196	310

This table shows that the dominant species from the families Chenopodiaceae Vent., Fabaceae Juss., Asteraceae Dumortier, Poaceae Barnhart, Polygonaceae Juss., Brassicaceae Burnett, Ranunculaceae Juss., Caryophyllaceae Juss., Apiaceae Lindl. and Lamiaceae Lindl. The family Poaceae has the highest number of economically valuable species 58 and the Asteraceae family 46 species.

A list of 310 economically valuable species was compiled, taking into account their life forms 6 woody species, 44 semi-shrubs and shrubs, 155 perennials, 105 biennials and annuals were identified. Woody plants of the Northern Kyzylkum include *Salix alba* L., *Populus diversifolia* Schrenk, *P. pruinosa* Schrenk, *Acer negundo* L., *Elaeagnus angustifolia* L., *Haloxylon persicum* Bunge ex Boiss, fig. 4

The analysis of the studied species for their economic value revealed that 200 species had medicinal properties, 100 were fodder plants, 22 were used as ornamental plants, and sand fixers and plants used for fuel were also identified, Fig. 5.

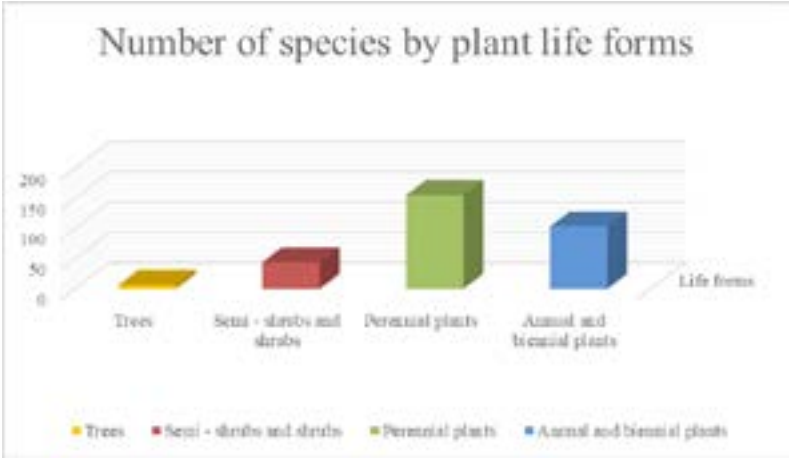


Figure 4 – Classification of economically valuable species by life forms

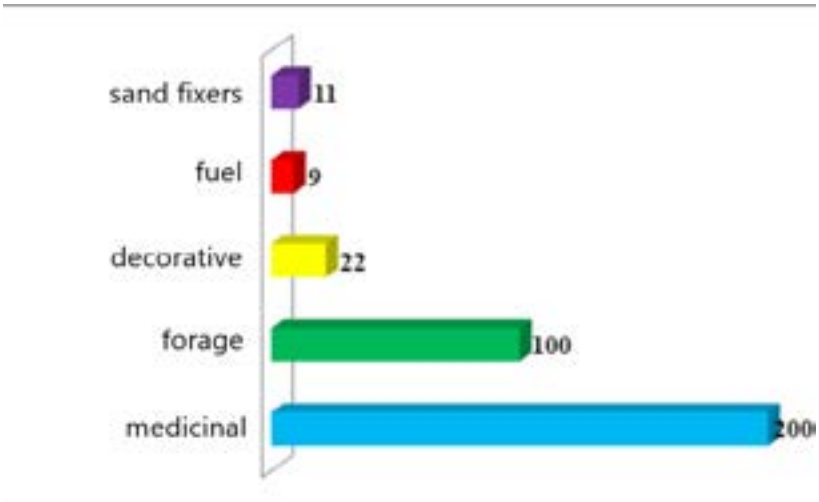
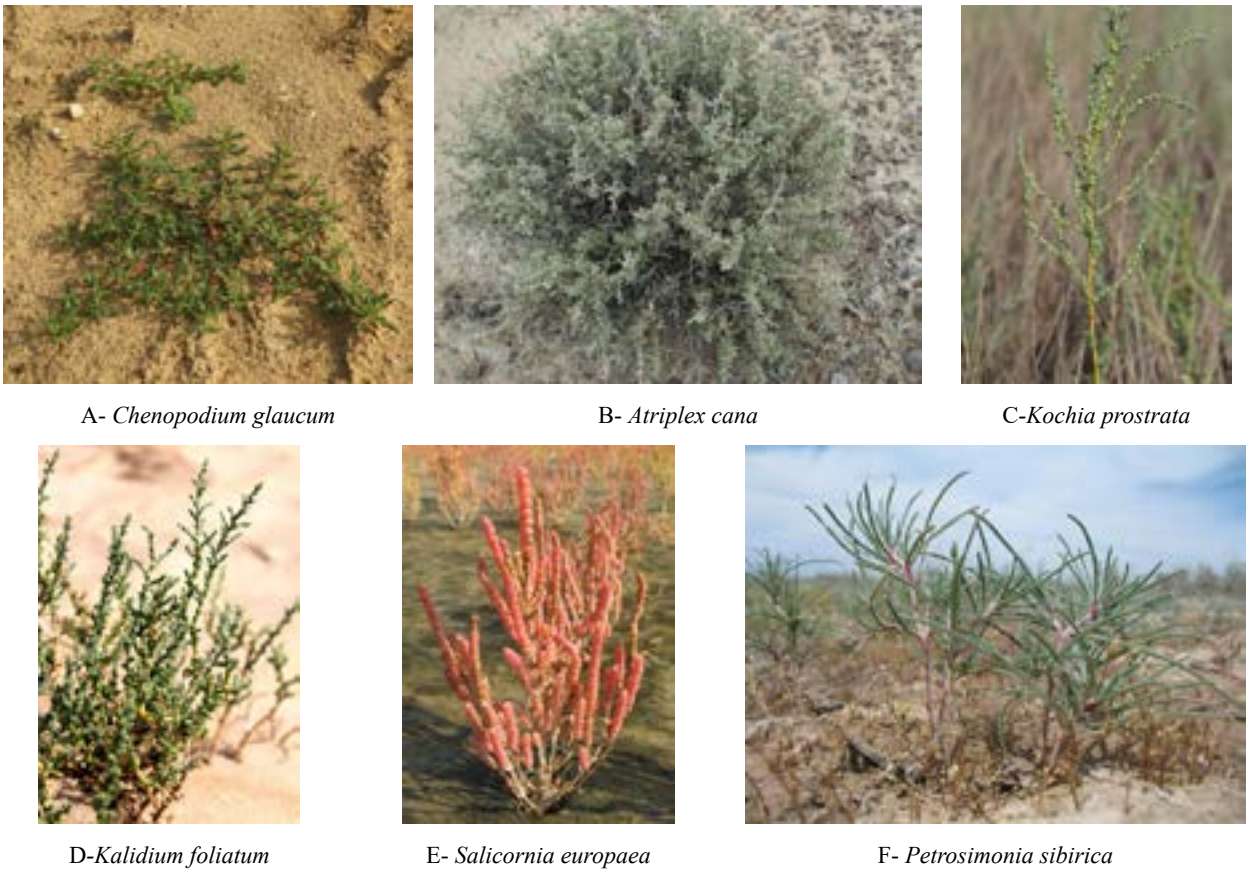


Figure 5 – Number of species by economically important characteristics

Fodder species mainly are the families Poaceae, Fabaceae, Chenopodiaceae [21-36]. The main value of course for the food base is the family Poaceae (all species (*Echinochloa crusgalli* (L.) Beauv., *Setaria viridis* (L.) Beauv., *Stipa caucasica* Schmalh., *S. caspia* C. Koch., *S. lessingiana* Trin., *S. hohenackerana* Trin., *S. sareptana* Becker., *Crypsis aculeata* (L.) Ait., *Phleum paniculatum*

Huds, *Alopecurus ventricosus* Pers., *Polypogon semivertillatus* (Forssk.) Hyll., *Agrostis gigantea* Roth., *Calamagrostis epigeios* (L.) Roth., *C. pseudophragmites* (Hall. f.) Koeler, etc.)) and Fabaceae (half of species (*Trigonella grandiflora* Bunge, *Melilotus officinalis* (L.) Pall., *M. albus* Medik., *Trifolium repens* L., *Halimodendron halodendron* (Pall). Voss, *Astragalus flexus* Fisch., *A. campylorrhynchus* Fisch. et Mey., *A. commixtus* Bunge, *A. filicaulis* Fisch. et Mey., *A. rytilobus* Bunge, *A. paucijugus* C.A. Mey., *A. turczaninowii* Kar. et Kir., etc.). A forage species of the family Chenopodiaceae (mainly annual species, sometimes perennials and shrubs (*Chenopodium glaucum* L. (Fig. 6A), *Atriplex cana* C.A. Mey. (Fig.6B), *Halimione verrucifera* (Bieb.) Aell., *Kraschenninnikovia ewersmanniana* (Stschegel. ex Losinsk.) Botsch. et Ikonn., *Kochia prostrata* (L.) Schrad. (Fig. 6C), *K. scoparia* (L.) Schrad., *Agriophyllum squarrosum* (L.) Moq., *Kalidium foliatum* (Pall.) Moq. (Fig. 6D), *Salicornia europaea* L. (Fig. 6E), *Petrosimonia sibirica* (Pall.) Bunge (Fig. 6F), *Nanophyton erinaceum* (Pall.) Bunge and etc.).



A- *Chenopodium glaucum* B- *Atriplex cana* C-*Kochia prostrata*

D-*Kalidium foliatum* E- *Salicornia europaea* F- *Petrosimonia sibirica*

Figure 6 – Fodder plants

The main ornamental species of Northern Kzylkum are used in urban landscaping and botanical gardens located in the desert zone. Ornamental species are not only woody shrubs, but also perennial herbaceous species (*Tamarix litvinowii* Gorschk. (Fig. 7A), *T. laxa* Willd. (Fig. 7B), *T. hispida* Willd., *T. leptostachys* Bunge, *T. smyrnensis* Bunge, *T. ramosissima* Ledeb., *Lavatera thuringiaca* L., *Hibiscus trionum* L., *Halimodendron halodendron* (Pall). Voss, *Nepeta micrantha* Bunge, *Antirrhinum majus* L., *Ziziphora tenuior* L., etc).

In the desert zone, the most valuable economic parameters are sand fixers and fuel ones. Of course, the sand fixers did not have much significance in its history, but now such species are necessary for deserts. The main anchorage of the sands is still the saxaul (*Haloxylon persicum* Bunge ex Boiss.), but there are other species *(Dendrostellera arenaria* Pobed., *D. macrorhachis* Pobed., *Halothamnus subaphylla* (C.A. Mey.) Aell., *Salsola richteri* (Moq.) Kar. ex Litv., *Elaeagnus angustifolia* L., etc.)

A- *Tamarix litvinowii*

B-*T. laxa*

Figure 7 – Ornamental species

According to a survey of the population of desert zones and in historical terms, fuel species ((*Krascheninnikovia ewersmanniana* (Stschegel. ex Losinsk.) Botsch. et Ikonn., *Haloxylon persicum* Bunge ex Boiss., *Populus diversifolia* Schrenk (Fig. 8A), *P. pruinosa* Schrenk (Fig. 8B), etc.) are plants that are used mainly in cold periods of the year, but are harvested almost all year round. It was also revealed that these species are used not only for the firebox, but also for fencing vegetable gardens or cattle pens, and even as a palisade near the house (*Populus diversifolia* Schrenk, *P. pruinosa* Schrenk, *Elaeagnus angustifolia* L. etc.).

Interesting facts about the species *Populus diversifolia* Schrenk, *P. pruinosa* Schrenk, these species are included in the Red Book of the Kyzylorda region, and *P. pruinosa* Schrenk. is in the Red Book of Kazakhstan. These species usually grow near rivers, but sometimes they can be seen in harsh deserts, which means that ground water is close enough under these trees.

The valley of the ancient Zhanadarya Delta is the border of the Kyzylkums in the subzone of the southern deserts of the South Turan province. In the Kyzylkums of the Kyzylorda region, psammophyte-shrub-white Saxaul communities and sagebrush groups on broken sands dominate. Of the plants, the most characteristic are *Calligonum eriopodum*, *Anisantha tectorum*, *Ferula foetida*, *Secale sylvestre*, *Mausolea eriocarpa* etc.

For all elements of the relief, especially in the floodplain, vegetation of salt marshes is represented on soils with excessive salinization by depressions, with a low level of saline water occurrence, where hypergalophytes from the Chenopodiaceae family settle. These are: succulent perennial succulent pickles – *Halocnemum strobilaceum* at the edges of the sores, *Kalidium foliatum, K. caspicum* on plump salt marshes, *Halostachys caspica* and *Suaeda microphylla* in places of secondary salinization; annual pickles, such as *S. crassa* and others, *Salicornia europaea* on wet (black) salt marshes, as well as representatives of the genera *Climacoptera* and *Petrocimonia*.

Among the useful species there are many rare plants that are protected and in need of state protection. Of the economically valuable species of the desert part of the Syrdarya river valley, listed in the Red Book of Kazakhstan (2014), it should be noted the species of gray-leaved poplar (Populus pruinosa). It is found on the terraces of rivers, and sometimes on the churts of sands.

In the lower reaches of the Syr Darya, turang groves were marked by churrot sands and lake terraces. Currently, the tugai forests have been greatly reduced due to the drying up of the Aral Sea and the associated lowering of the groundwater level, the regulation of runoff by a system of hydraulic structures, the intake of large volumes of river water for irrigation of fields, forest fires, man-made winter water discharge and a number of other environmental problems of our time. There is an increase in the activity of *Elaeagnus oxycarpa*. Tugai forests, confined to river valleys, are the most economically used territory. It is here that a significant number of weed species are concentrated, some of which are

of economic importance. Despite the considerable diversity of flora species of the Syrdarya river valley with useful properties, the analysis of the demand for work to assess their resource potential and actual harvesting over the past 10-15 years indicates the inefficient use of plant raw materials.

A-*Populus diversifolia* B-*Populus pruinosa*

Figure 8 – Wood fuels

So, the most popular species, both in the Soviet and modern periods, is *Glycyrrhiza glabra*. Taking into account the wide distribution (in the form of pure thickets and as a subdominant) and, accordingly, large reserves of this species in the Syrdarya River valley, a licorice root processing plant was built in the Kyzylorda region.

Conclusion

In conclusion, it was revealed that 310 economically valuable species are found, which belong to 196 genera and 62 families in the Northern Kyzylkum within the Republic of Kazakhstan. The calculation of significant economic values was carried out: medicinal – 200 species, forage – 100 species, decorative – 22 species, anchors – 11 species, fuel – 9 species. Also, fuel-based tree-shrub species are used as palisade, fences, etc., and the species *Populus diversifolia* Schrenk, *P. pruinosa* Schrenk can serve as indicators of close groundwater. Moreover, according to the data shown by literary, herbarium (AA) and expedition work, this territory still needs to study economically valuable species and protect some rare species that are not used rationally.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

1. Rachkovskaya E. I. Prirodnye osobennosti Kazahstana i Srednej Azii // Botanicheskaya geografiya Kazahstana i Srednej Azii (v predelah pustynnoj oblasti). [Natural features of Kazakhstan and Central Asia. Botanical geography of Kazakhstan and Central Asia (within the desert region)]. St. Petersburg: BIN. (2003): 13-17. (in Russian).

2. Shomurodov Kh. F., Khasanov F. O. Kormovye rasteniya pustyni Kyzylkum. [Forage plants of the Kyzylkum desert]. *Arid Ecosystems*, vol 20, no. 3 (60). (2014): 94-101. (in Russian).

3. Sinkovsky L. P., Savchenko I. V. Prirodnye kormovye ugod'ya Evroaziatskoj aridnoj oblasti. [Natural feeding grounds of the Eurasian arid region]. *Problems of desert development*, no 5 (1981): 3-14. (in Russian).

4. Zakhidov T. Z. Biocenozy pustyni Kyzylkum. [Biocenoses of the Kyzylkum desert]. Ed., "Fan", Tashkent, (1971): 304. (in Russian).

5. Butskov N. A., Nasyrov Ya. M. Pochvy Jugo-Zapadnyh Kyzilkumov. [Soils of the South-Western Kyzylkums].Tashkent, (1961): 200. (in Russian).

6. Babushkin L. N., Kogay N. A., Zakirov Sh. S. Agroklimaticheskie usloviya sel'skogo hozyajstva Uzbekistana. [Agroclimatic conditions of agriculture in Uzbekistan]. "Mehnat" Publishing house, Tashkent, (1985): 160. (in Russian).

7. Balashova E. N., Sabinina I. G., Semenova O. A. Klimaticheskoe opisanie Kyzylkuma. [Climatic description of Kyzylkum]. Collection of works of the Tashkent Hydrometeorological Observatory, Tashkent, (1961): 5-42. (in Russian).

8. Makhmudov M. M. Agrobiologicheskie osnovy i tekhnologiya uluchsheniya pastbishch Kyzylkum. [Agrobiological bases and technology of improvement of pastures of Kyzylkum]. Abstract of the doctoral dissertation, Tashkent. (1998): 50. (in Russian).

9. Korovin E. P. Rastitel'nost' Srednej Azii i Yuzhnogo Kazahstana. [Vegetation of Central Asia and Southern Kazakhstan], book 1 Ed. AN UzSSR, Tashkent, (1961): 432 . (in Russian).

10. Ortikova L. S., Makhmudov M. M., Sindarov Sh. K. Ekologicheskie usloviya pustyni Kyzylkum v svyazi s fitomelioraciej pastbishch. [Ecological conditions of the Kyzylkum desert in connection with the phytomelioration of pastures]. I International Scientific and Practical Internet Conference "Modern ecological state of the natural environment and scientific and practical aspects of rational nature management" dedicated to the 25th anniversary of the Caspian Research Institute of Arid Agriculture. (2016): 264-274. (in Russian).

11. Gaevskaya L. S. Karakulevodcheskie pastbishcha Srednej Azii. [Karakul-growing pastures of Central Asia]. Tashkent, "Fan", (1971): 332. (in Russian).

12. Kurochkina L. Ya. Psammofil'naya rastitel'nost' pustyn' Kazahstana. [Psammophilic vegetation of the deserts of Kazakhstan]. Alma-Ata, (1978): 271 . (in Russian).

13. Melnikova R. D. Psammofil'naya rastitel'nost' Psammophyta. [Psammophyta Psammophyta vegetation]. Vegetation cover of Uzbekistan, vol. III, Tashkent,. (1973): 4-80. (in Russian).

14. Lednev S. A., Koroleva T.V., Semenkov I. N., Klink G.V., Krechetov P. P., Sharapova A. V., Karpachevskiy A. M. The natural regeneration of desert ecosystem vegetation at the 2013 crash site of a Proton-M launch vehicle, Republic of Kazakhstan // *Ecological Indicators*, no 101 (2019): 603–613.

15. Lednev S. A., Semenkov I. N., Korolevaa T. V., and Sharapovaa A. V. State of Desert Phytocenoses in the Republic of Kazakhstan at Crash Sites of Launch Vehicles // *Arid Ecosystems,* vol. 10, no 3 (2020): 244–250.

16. Krechetov, P.P., Neronov, V.V., Koroleva, T.V., and Chernistova, O.V., Transformation of the soil-vegetation cover in carrier rocket first-stage impact areas // *Arid Ecosyst*., vol. 1, no 1 (2011): 59–64.

17. Voronina P. Yu., Shuyskayaa E. V., Toderichb K. N., Rajabovd T. F., Ronzhinae D. A., and Ivanovae L. A. Distribution of C4 Plants of the Chenopodiaceae Family According to the Salinization Profile of the Kyzylkum Desert // *Russian Journal of Plant Physiology,* vol. 66, no 3 (2019): 375–383.

18. Saribaeva Sh. U. and Shomurodov Kh. F. Actual State of Coenopopulations of Astragalus cenralis Sheld. under Conditions of Kuldzhuktau Ridge (Kyzylkum Desert) // *Arid Ecosystems,* vol. 7, no 4 (2017): 265–270.

19. Shomurodov, Kh.F. and Khasanov, F.U. Fodder plants of the Kyzyl Kum Desert, *Arid Ecosyst.,* vol. 4, no 3 (2014): 208–213.

20. Baitenov M. S. Flora of Kazakhstan. Almaty. Vol. 2 (2001): 280. (in Russian).

21. Gosudarstvennyj kadastr rastenij Kyzylordinskoj oblasti [State Plant Cadastre of the Kyzylorda region] – Almaty – (2013): 410. (in Russian).

22. Krasnaya kniga Kazahstana. [Red Book of Kazakhstan]. – 2nd Ed., revised and expanded. Volume 2.: Plants (coll. auth.). – Astana, "ArtPrintXXI" LLP, (2014): 452. (in Russian).

23. Tuhtaeva H.T., Rahmatov Ju.B., Bozorkulova Sh.A. Vodnye resursy pustyn' Central'nogo Kyzylkuma [Water resources of the deserts of Central Kyzylkum] / / Chullanish muammolari: dynamics, bakholash, yechim. Halkaro ilmiy-amaliy conference materialari. Samarkand, (2019): 182-184. (in Russian).

24. Hasanov F.O., Shomuradov H.F., Kadyrov G. Kratkij ocherk i analiz endemizma flory pustyni Kyzylkum [A brief essay and analysis of the endemism of the flora of the Kyzylkum desert]. Vol. 96. no. 2 (2011): 237-245. (in Russian).

25. Rachkovskaja E.I., Safronova I.N., Volkova E.A. Botaniko-geograficheskoe rajonirovanie Kazahstana i Srednej Azii [Botanical and geographical zoning of Kazakhstan and Central Asia] / / Botanical geography of Kazakhstan and Central Asia (within the desert region). Saint-Petersburg: BIN. (2003): 192-222. (in Russian).

26. Zheng Y, Jiao P, Zhao Z, Li Z. Clonal growth of *Populus pruinosa* Schrenk and its role in the regeneration of riparian forests. *Ecological Engineering*, no 94 (2016): 380-392.

27. Lednev, S.A., Koroleva, T.V., Semenkov, I.N., Klink, G.V., Krechetov, P.P., Sharapova, A.V., and Karpachevskiy, A.M., The natural regeneration of desert ecosystem vegetation at the 2013 crash site of a Proton-M launch vehicle, Republic of Kazakhstan, *Ecol. Indic*., vol. 101, (2019): 603–613.

28. Meirman, G.T., Dimeyeva, L., Dzhamantykov, K., Wucherer, W., and Breckle, S.-W., Seeding experiments on the dry Aral Sea floor for phytomelioration, in Sustainable Land Use in Deserts, New York: Springer- Verlag, (2012): 318–322.

29. Ebrahimi, M., Mohammadi, F., Fakhireh, A., and Bameri, A., Effects of *Haloxylon* spp. of different age classes on vegetation cover and soil properties on an arid desert steppe in Iran, *Pedosphere*, vol. 29, no. 5 (2019): 619–631.

30. Abduraimov, O.S. The morphological indexes of *Tulipa buhseana* Boiss. in different cenopopulations, *Eur. Appl. Sci.,* no. 7 (2015): 3–5.

31. Abduraimov, O.S. and Shomurodov, H.F. The ontogenesis and ontogenetic structure of *Tulipa micheliana* Th. Hoog (Liliaceae) coenoticpopulations in Uzbekistan // *J. Nov. Appl. Sci.,* no. 4 (2015): 1089–1096.

32. Shuyskaya E., Toderich K., Gismatullina L., Rajabov T., Khohlov S. Genetic diversity of two annual *Salsola* species (Chenopodiaceae) among habitat types in desert plant communities // Biologia. vol 72, no 3 (2017): 267—276.

33. Lega M., Fior S., Li M., Leonardi S. & Varotto C. Genetic drift linked to heterogeneous landscape and ecological specialization drives diversification in the Alpine endemic columbine Aquilegia thalictrifolia // Heredity,. vol 105, (2014): 542–554.

34. Stikhareva T., Ivashchenko A., Kirillov V., Rakhimzhanov A. Floristic diversity of threatened woodlands of Kazakhstan formed by *Populus pruinosa* Schrenk // *Turk J Agric For,* vol 45 (2021): 165-178.

35. Hautier Y, Tilman D, Isbell F, Seabloom EW, Borer ET et al. Anthropogenic environmental changes affect ecosystem stability via biodiversity // Science, vol 348 (2015): 336-340.

36. Zheng Y, Jiao P, Zhao Z, Li Z Clonal growth of *Populus pruinosa* Schrenk and its role in the regeneration of riparian forests. *Ecological Engineering,*.vol 94 (2016): 380-392.