

## Biodiversity of the Karakalpak Ustyurt

Matjanova Kholida\*

Karakalpak Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan, Nukus

**\*Corresponding author:** Matjanova Kholida, Karakalpak Research Institute of Natural Sciences of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan, Nukus

Ustyurt is an elevated plateau located in the center of the Turan lowland, almost on all sides the plateau is bounded by cliffs or chinks. In the east, the Ustyurt chink is formed by the former western shore of the Aral Sea. In the south, it breaks off to the Kunya Darya ancient alluvial plain and the Uzboy Valley. In the west – to the Karynzhyrk depression and the sands of the North Caspian Karakums, and in the north – to the Caspian lowland. The leveled relief, the absence of watercourses and generally open fresh water make Ustyurt one of the most arid and extreme territories of the region [1].

With the botanical and geographical zoning of Kazakhstan and Central Asia (within the desert region), the Ustyurt plateau belongs to the West-North Turanian subprovincion of the North Turanian province. The total amount of precipitation is 100-150 mm per year. The snow cover in the northern part of Ustyurt is more stable [2]. The soil cover of Ustyurt is formed by a complex of gray-brown soils to varying degrees saline and saline.

Geomorphological factors of Ustyurt cause differences in the level of groundwater occurrence, their mineralization, the degree and nature of salinity of soils, etc., which affects the vegetation cover. Saline depressions are distinguished by a halophilic type of vegetation. The watershed plains of Ustyurt are characterized by a hypsophilic type, represented mainly by associations of semi-shrub formations (biyurgun - *Anabasis salsa* and white-earth wormwood – *Artemisia terrae-albae* and black boyalych shrub - *Salsola arbusciformis*) [3].

Many aspects of the vegetation of the Karakalpak part of Ustyurt have been studied by such scientists as [4-15]. The Ustyurt desert is characterized in mainly hypsophytes and halophilic types of vegetation. The vegetation of Ustyurt is composed mainly of complexes of biyurgun, wormwood, boyalych and Chernosaksaul communities [3].

According to the data of [6,16-18], the complexity of the soil

and vegetation cover is most pronounced in flat conditions. Here biyurgun acts as one of the indispensable components. In the northern part of Ustyurt, biyurguniks are combined with wormwood-boyalichniks and boyalichniks, in its more southern regions – with spots of wormwood growing on slightly compacted gray-brown soils from the surface. Biyurgun (*Anabasis salsa*) is distributed on soils much more diverse in degree of salinity (0.1-1.6%), and wormwood (*Artemisia terrae-albae*) and boyalych (*Salsola arbuscula*) are associated with slightly saline or practically not saline [3].

Boyalych (*Salsola arbuscula*) lives on significantly leached soils (Viktorov, 1971).

Biyurgun (*Anabasis salsa*) is common on soils that are much more diverse in degree of salinity (0.1-1.6%), and wormwood (*Artemisia terrae-albae*) and boyalich (*Salsola arbuscula*) are associated with slightly saline or practically unsalted [3]. Boyalich (*Salsola arbuscula*) lives on strongly leached soils [9].

According to [16], the soils of black saksauls belong to the derivatives of salt marshes – gypsum soils of saxaulnik. This is the result of the evolution of salt marshes that have lost their connection with groundwater. The Chernosaksaulniks of Ustyurt are composed mainly of the kyr form. The tree-like form does not form a special formation and is often found in small groups in ravines and gorges, along the outskirts of drainless depressions and along the bottom of large karst dips (ans). The tree-like form of the saxaul is combined with moisture-loving species characteristic of tugai (tamarix – *Tamarix*, sarsazan - *Halocnemum*, karabarak - *Halostachys*). Therefore, groups of tree-like saxaul are considered as an integral part of vegetation fragments [18].

3 types of saxaul can grow on the territory of Ustyurt. In addition to the black saxaul, there are also white and Zaisan [19,20].

## Commentary

Zaisan saxaul (*Haloxylon ammodendron*) is less common than black (*Haloxylon aphyllum*) and white (*Haloxylon persicum*) species. It has a curved trunk. A distinctive feature of this species is a bright specific smell from the tree.

The white saxaul (*Haloxylon persicum*) differs from the black one (*Haloxylon aphyllum*) by the presence of poorly developed, but quite distinguishable leaves. They resemble small scales, turning into a rather long sharp point at the top. Such scales are located on the shoots in pairs, opposite and closely adjacent to the surface of the stem.

Another difference of saxauls: black shoots taste salty or sour-salty, and white shoots taste bitter.

The black saxaul (*Haloxylon aphyllum*) has a coarser crown. Another distinctive feature of the black saxaul is the developed root system. With the help of a well-developed root system, the saxaul is saturated from nearby groundwater. Therefore, by the location of this species, it is possible to judge the presence of water and, if necessary, dig a well (as an indicator of the presence of water).

Due to this property, the black saxaul (*Haloxylon aphyllum*) tolerates significant salinization of the soil more easily, while the white saxaul (*Haloxylon persicum*) prefers to grow on more sandy and friable soil. The participation of saxaul in the sands is explained by the fact that the composition of the sands contains many crystals of salts and gypsum [21].

On Ustyurt, the vegetation cover consists of a few species forming monodominant communities - these are *Salsola arbusculiformis*, *Anabasis salsa*, *Artemisia terrae-alba*, *Haloxylon aphyllum*, *Salsola orientalis*. Less commonly, the dominant and subdominant plant communities are *Salsola arbuscula*, *Atraphaxis spinosa*, *Stipa richteriana*, *S.hohenackeriana*, *S.gemascens*, *Nanophyton erinaceum* [22].

In the south of Ustyurt, large areas are occupied by the monotonous vegetation cover of the biyurgun association, which creates a monotonous gray background for many kilometers. The microcomplex combination of associations of biurgun (*Anabasis salsa*), wormwood (*Artemisia terrae-albae*), black boyalych (*Salsola arbusculiformis*) and some other plants in the central and northern parts of Ustyurt give the vegetation cover original features.

Vegetation cover often forms only one species with a relatively uniform distribution of plants over the entire area of the community. So, associations of biyurgun (*Anabasis salsa*), wormwood (*Artemisia terrae-alba*), black saxaul (*Haloxylon aphyllum*) often look like. There is something to study and protect on the Karakalpak Ustyurt. Endemic species of flora and unique representatives of fauna live here.

The variety of vegetation on Ustyurt along the entire length of the road along its direction is rich, this can be explained by the abundance of rains this spring. A wide variety of bushes are found here – *Artemisia terrae-albae*, *Nanophyton erinaceum*, *Peganum harmala*, *Eremopyrum orientale*, in places *Haloxylon aphyllum*, *Atraphaxis spinosa*, *Ferula Lemannii*. As we move away from the roads, the number of species changes: large territories are occupied by the monotonous vegetation cover of the biyurgun (*Nanophyton erinaceum*) association, which creates a monotonous gray background for many kilometers.

This year, in early May, heavy rains fell on the Ustyurt plateau, and the air temperature did not exceed 20-22 °C. As a result of favorable conditions, the territory turned into an atypical meadow for this place.

After a heavy rain (May) in the Saxaul Forest area we found a parasitic plant *Cistanche salsa* on the roots of the saxaul on the right side of the road.

The area of Beleuli is located at a distance of 30 km from the main highway to the right 1108 kilometers from the road. There are the remains of a historical arch (caravanserai) on the way of the Great Silk Road. The vicinity of the arch is covered with plants such as boyalych (*Salsola arbuscula*), species of wormwood (*Artemisia terrae-albae*, *A.turanica*), nanophyton (*Nanophyton erinaceum*), rhubarb (*Rheum tataricum*), etc.

The main natural habitat with a higher biodiversity value in the vicinity of the project area is the Saxaul (*Haloxylon aphyllum*) shrub thickets measuring 5 km by 1 km, which is located on the northeastern side, between 95 and 99 km of the project road, about 10 km north of the city of Jaslyk. National experts believe that it is an important local habitat for conservation and ecosystem services (for example, cattle grazing, firewood), and is also used for autumn and winter grazing, being a valuable forage plant.

Herbaceous species can thrive under closed canopies of Saxaula Shrub thickets, and the thickets can produce significant amounts of edible biomass. It is reported that it sometimes supports nesting birds, including birds of prey. In no case does the road pass directly through the thickets of Saxaul Bushes.

In the Churuk area (83 km from the turn to Bostan (1120 km)), in the western part of the Saigachiy Reserve and on the eastern outskirts, the largest black saxaul (*Haloxylon aphyllum*) massifs in Karakalpakstan grow.

Boyalych (*Salsola arbuscula*), species of wormwood (*Artemisia terrae-albae*, *A.turanica*), nanophyton (*Nanophyton erinaceum*), rhubarb (*Rheum tataricum*), astragalus (*Astragalus sp.*), sand horn (*Ceratocarpus arenarius*), *Descurainia* (*Descurainia sophia*), leontice (*Leontice incerta*) and others.

White-earth wormwood (*Artemisia terrae-albae*), boyalych (*Salsola arbuscula*), mortuk (*Eremopyrum orientale*) and some other species are confined to the desalinated (slightly saline) territories of Ustyurt.

In addition to the above plants, it is possible to meet single individuals of bordered-leaved goatgrass (*Tragopogon marginifolius*) and tuberous zopnik (*Phlomoides tuberosa*).

Only *Rheum tataricum*, *Atraphaxis spinosa* and *Stipa richteriana* are clearly visible against the background of sagebrush and hawthorn. In plant communities, *Rheum tataricum* is marked singly and in small thickets, sometimes acts as an edifier.

Environmental conditions on the Ustyurt plateau have been changing negatively for vegetation growth in recent decades due to the drying up of the Aral Sea and the development of road construction and the oil and gas industry. Due to large-scale exploration and prospecting, the number of cobweb-like roads previously used to connect wells has increased [23].

In the Saxaul Forest area, which is located north of Jaslyk, several individuals of the Central Asian Tortoise and the parasitic plant *Cistanche salsa* were found on the roots of the saxaul (*Haloxylon*) on the right side of the road.

This area is important as an “ecological habitat”, and not only as a tugai area. Saxaul trees reach maturity more than 3-5 m in height and 15-20 cm in girth. The sandy soil under the trees contains a large amount of humus and soil organic substances from the saxaul, as well as numerous burrows of small mammals (for example, gerbils, jerboa), foxes and other species. It is also probably the habitat of a number of reptiles (snakes, lizards) and a Central Asian Tortoise that was recently found there.

In fact, these trees are an important maternal stand as a genetic seed stock. The Tugai massif is currently still in good condition, despite evidence of the burial of glass bottles and parties at campfires. As an initial environmental measure to protect this saxaul tugai, control over protection and protection is required, as well as the installation of a signboard with detailed information (name of the locality, area, etc.), local authorities (Kungrad district, Department of State Ecology, forestry) need to take “ownership of this area”. The signboards were only for the contractors and could only be placed on the Road Right of Way – they are a temporary measure only.

The area needs enrichment of plantings, as well as further government designation and management with an official planting sign closer to the forest. Since this is an important environmental area of ongoing concern, regular monitoring is required to determine the state of ecosystems and the impact of

the road. The saxaul tugai is part of a broader ecological habitat with saxaul thickets located to the west of the main road and extending along the western side of the village of Jaslyk. Thus, it is part of a broader wildlife conservation corridor.

Growing species are key elements of the trophic food chain and are drought- and salt-resistant. Black saxaul grows only by the road in the area south of Jaslyk, where it found optimal conditions for growth.

## REFERENCES

1. Shomurodov HF, Saribaeva Sh.U, Akhmedov A (2015) Distribution and current state of rare plant species on the Ustyurt plateau in Uzbekistan. *Arid Ecosystems*, Volume 21, No. 4 (65), pp. 75-83.
2. Rachkovskaya EI, Safronova IN (2003) Rare communities of sagebrush (*Artemisia gurganica*, *A.kaschgarica*) // *Botanical geography of Kazakhstan and Central Asia (within the desert region)*. Saint Petersburg: BIN. pp. 49-128.
3. Kabulov SK (1990) Change of phytocenoses of deserts during aridization. Tashkent, Fan. p.238.
4. Korovina ON, Bakhiev AB, Tazhetdinov MT, Sarybaev B (1983) *Illustrated determinant of higher plants of Karakalpakstan and Khorezm*. Tom.2. Tashkent, Fan, p.214.
5. Granitov II. *Issues of rational use and improvement of desert pastures*. Tashkent, Science, UzSSR.
6. Momotov IF (1953) *Plant complexes of Ust-Urt*. Tashkent, ANUzSSR. p.134.
7. Aitbayev K (1973) *Bioecological characteristics of the main plants of the Karakalpak Ustyurt*. Tashkent, Fan. pp. 175-193.
8. Tursunbayev K (1970) *Dynamics of productivity of the aboveground mass of the main plant communities of the Karakalpak part of Ustyurt: Abstract...dissertation...Candidate of Biological Sciences*. – Tashkent. 21 p.
9. Viktorov SV (1971) *Ustyurt desert and issues of its development*. Moscow, Nauka. 133p.
10. Koibagarov K (1972) *Ephemers and ephemeroids of the Karakalpak part of Ustyurt*. Autoref. diss. cand. biol. sciences. Nukus. p.28.
11. Allaniyazov A (1973) *Bioecological characteristics of the main plants of the Karakalpak Ustyurt*. Tashkent, Fan. pp. 51-93.
12. Allaniyazov A, Sarybaev B (1983) *Ecological and geobotanical features of pastures of the Karakalpak part of Ustyurt*. Tashkent, an. 120 p.
13. Allaniyazov A (1987) *Biogeocenoses of Ustyurt and methods of creating artificial pastures*. Tashkent, Fan. 158 p.
14. Sarybaev B, Bondarenko ON (1973) *Bioecological characteristics of the main plants of the Karakalpak Ustyurt*. Tashkent, Academy of Sciences of the Uzbek SSR. pp.194-252.
15. Zaripov HZ (1973) *Bioecological characteristics of the main plants of the Karakalpak Ustyurt*. Tashkent, Fan. pp.141-174.

## Commentary



16. Korovin EP, Granitov II, Poslavskaya OY, Shuvalov SA (1949) Ust-Urt (Karakalpak) its nature and economy. Tashkent, Academy of Sciences of the Uzbek SSR. p.229.
17. Shuvalov SA (1949) Ust-Urt (Karakalpak), its nature and economy. Tashkent, Academy of Sciences of the Uzbek SSR. pp.4-25.
18. Allaniyazov A, Viktorov SV, Pelt NN (1984) Ecological aspects of the development of the Ustyurt desert. Tashkent, Fan. 124 p.
19. Bondarenko ON (1964) Determinant of higher plants of Karakalpakstan. Ed.Science of the UzSSR. 304 p.
20. Korovina ON, Bakhiev AB, Tazhetdinov MT, Sarybaev B (1982) illustrated determinant of higher plants of Karakalpakstan and Khorezm. Tom.1. Tashkent, Fan. p.215.
21. Allaniyazov A (1995) Ecological and biological bases and methods of increasing the productivity of pastures of the Ustyurt plateau (Karakalpak). Tashkent, Fan. 228 p.
22. Momotov IF (1973) Gypsophilic vegetation and ways of phytomelioration of pastures of gypsum deserts of Uzbekistan. Autoref...diss...Doctor of Biological Sciences. Tashkent. p.57.
23. Bakhiev A (1992) Effects of technogenic factors on the vegetation cover of Karakalpaksan. Tashkent, Fan. 114 p.