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SOILS OF KARNOBCHUL LANDSCAPES

Abstract: This article studies the soil composition, mechanical properties and agrochemical status of the Karnabchul landscapes. The study analyzes the climatic conditions of the Karnabchul region, soil types (light gray, gray-brown, gray-brown) and their indicators such as density, salinity, humus content, water permeability. The vegetation cover of this region, in particular the composition of wormwood-ephemeral plant groups and the factors affecting them, are also highlighted.

Keywords : Karnobchul, landscape, gray soils, gray-brown soils, gray-brown soils, salinity, humus, water permeability, mechanical composition, plant cover, wormwood-ephemeral, desert flora, climate change, pasture degradation, agrochemical status, ecological monitoring, livestock resources.

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ПОЧВЫ ЛАНДШАФТОВ КАРНОБЧУЛА

Аннотация: В данной статье изучается состав почв, механические свойства и агрохимическое состояние ландшафтов Карнабчула. В исследовании анализируются климатические условия региона Карнабчула, типы почв (светло-серые, серо-бурые, серо-бурые) и их показатели, такие как плотность, засоление, содержание гумуса, водопроницаемость. Также выделен растительный покров этого региона, в частности состав полынно-эфемеровых растительных группировок и факторы, влияющие на них.

Ключевые слова: Карнобчул, ландшафт, серые почвы, серо-бурые почвы, серо-бурые почвы, серо-бурые почвы, засоление, гумус, водопроницаемость, механический состав, растительный покров, полынно-эфемеровые, пустынная флора, изменение климата, деградация пастбищ, агрохимическое состояние, экологический мониторинг, животноводческие ресурсы.

Introduction In recent years, in the desert and semi-desert regions of Uzbekistan, ecological problems have been deepening due to climate change, anthropogenic pressure, and improper pasture use. In particular, the degradation of pastures and natural landscapes, the decrease in soil fertility, and the loss of biodiversity have made maintaining ecological stability in desert regions an urgent issue. In arid regions such as Karnabchul, rational use of natural resources, in-depth study of the characteristics of soil and vegetation cover, and the development of mechanisms for their use are important for ecological and economic stability. This article analyzes the soil types of Karnabchul landscapes, their physicochemical properties, and the composition of vegetation cover, as well as the factors affecting them. Climate change and the expansion of anthropogenic impact around the world are leading to the degradation of existing landscapes and pastures and a sharp reduction in pasture areas. As a result, the need for research aimed at preserving existing landscapes and pastures has increased, and this type of research has become necessary.

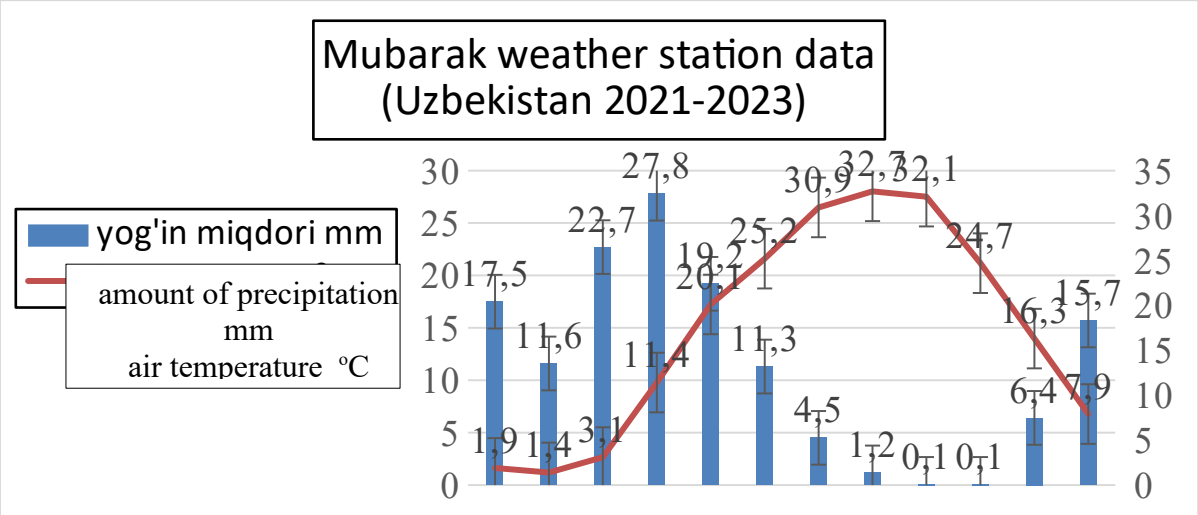
Relevance : Globally, the degradation of desert and semi-desert areas, the decline in pasture productivity, and the depletion of biological resources threaten ecological security. In particular, in desert areas that occupy a large part of Uzbekistan, including Karnobchul, effective management of land resources and the development of a soil-agrochemical monitoring system have become a necessity. The lack of comprehensive information on soil properties and vegetation cover of these areas is one of the significant obstacles to ecological planning. Therefore, this study is relevant not only scientifically, but also practically, and it serves to preserve and sustainably manage Karnobchul landscapes.

Main part: Landscapes and the pastures in them are important natural resources. If natural resources are used wisely, they can regenerate themselves. Humanity has used deserts and steppe pastures since ancient times, has known how to preserve them, and has managed to do so to this day. People were well aware that caring for the land, including natural landscapes and pastures, was a source of their well-being [3].

Over the past 50 years, the vegetation crisis in the desert has intensified[4]. In addition, droughts and reduced atmospheric precipitation due to climate change have begun to seriously damage the flora of the pastures. In the pastures of Uzbekistan, where there are 1,700 species of plants, today 200 species have completely disappeared, and some have declined significantly [5].

Karnabchul is located in the southern part of the Zirabulak Mountains on the left bank of the Zarafshan River, occupying lands 310 m above sea level. In the literature, this area is referred to as the “Карнабская степь”. According to its climatic characteristics, Karnabchul is typical of the Mediterranean climate type, the relief of Karnabchul is generally sloping from east to west and flat, and only in the northern part, that is, the mountain slopes are low and high, wavy , and divided by numerous streams and temporary waterways.

According to climatic indicators, Karnobchul, like all Central Asian deserts, is characterized by aridity and sharply continentality. The average annual temperature is 17.1 °C . The hottest air temperature is observed in June-July, when in the shade this indicator is +40+47 °C . The coldest air temperature is observed in December-February, sometimes it is 20-30 °C . The average annual relative humidity is 30%, and in summer this indicator often does not exceed 10-20%. The main part of the precipitation falls on the months of November-April . The average annual precipitation varies from 81.9-297.4 mm, the average annual indicator is 162.0 mm.



I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Winter			Spring			Summer			Autumn		

Figure 1. Climate diagram of the study area (data from the Mubarak weather station (Uzbekistan), 2021-2023).

The soils of Karnobchul are light gray soils. In the zone of light gray soils, an average of 200-300 mm of precipitation falls per year. The saline salts in the upper layer of the soil are not washed out well, at a certain depth, about 40-60 cm, sometimes even 1-2 m below, a saline layer is found. Light gray soils are poor in organic matter according to their mechanical composition compared to soils of other regions . The humus layer contains 0.5 to 1.5 percent. Light gray soils account for 10 percent of the total fertile land (supplied fertile land) in the region and 18 percent of the total irrigated area (supplied fertile land). Newly irrigated land areas (Mirzachul, Jizzakh, Karshi) The vast majority of the deserts consist of light gray soils. Light gray soils have poor granularity. However, they are characterized by high permeability and high capillarity. Therefore, on slightly sloping lands, light gray soils are desalinated as a result of leaching, but on flat terrain, due to excessive irrigation and other factors, saline groundwater rises to the surface of the soil, causing re-salinity. This situation requires digging collector ditches, leaching soil salts, strictly regulating the irrigation regime of crops, leveling the land, introducing crop rotation, establishing hedges, and other

measures to reduce the level of groundwater. Soils in the gray soil region have a low content of humus, nitrogen, and phosphorus, and organic matter quickly mineralizes. The soil structure is not very strong. But the natural fertility of the soils of this region is significantly higher than that of the soils of the flat desert region.

Since gray-brown soils are formed from parent rocks of different compositions, their mechanical composition is also different, with sandy and light loamy types being more common. These soils often have jagged gravel on their surface. The upper layers of the soil are characterized by a large content (11-18%) of fine sand and large dust fractions, and in the illuvial horizon - silt particles smaller than 0.001 mm. The bulk of Karnobchul soils consists of light gray-brown soils. The gypsum salinity in these soils is quite high (at a depth of 50-60 cm), and the humus content is also quite high, about 1.17%. The main part of carbonates lies at a depth of 10-20 cm, and their amount decreases with depth. The mechanical composition of gray-brown and gray-brown soils is distinguished by its diversity. In terms of mechanical composition, Karnobchul is divided into the following types: loamy-sod soils of light gray-brown color, saline soils with deluvial-proluvial layers, gypsum-loamy light gray-brown soils, etc. All types of soils are characterized by layer-by-layer arrangement in terms of density, mechanical composition and salt content. The light silt layer alternates with medium silt, loam and other layers. In some layers, the amount of silt with a size of 0.001 mm reaches 21%.

The water-physical and agrochemical properties of gray-brown soils are quite unfavorable, due to the large and close location of gypsum in the soil and parent rocks, the complexity of the relief, etc., the development of these soils is quite difficult. The specific gravity and density of soil particles varies from 1.72 to 1.37 g/cm ^{3}, which indicates their different origin. The difference between them is expressed only in the ratio of rock fragments to small soil particles and the degree of cementation. The density of the overburden layer is 1.45-1.50 g/cm ^{3}, the density of the lower layers, where rock fragments are more common, is 1.72 g/cm ^{3}

. The total porosity is up to 48%, the porosity of aerated soil varies from 32% to 45%, and the maximum hygroscopicity varies from 10.4% to 2.2%.

In the vegetation cover of the Karnabchul, along with the group of wormwood-ephemeral plants, there are also groups consisting only of ephemeral herbs. The reason for this is the chemical and mechanical properties of the soil. However, the vegetation cover of the Karnabchul is characterized by the coexistence of more wormwood and ephemeral and ephemeroid species, that is, together they form a single plant community (phytocenosis). The deserts of Central Asia are divided into 4 main types according to the characteristics of the vegetation cover: shrub-herbaceous; herbaceous-saline; semi-shrub-ephemeral and ephemeral. In general, the vegetation cover of the desert region is distinguished by the diversity of life forms and species. According to the studies conducted, 238 species of flowering plants have been recorded in the flora of the Karnabchul. These plant species belong to 138 families, of which 216 species are herbaceous plants (90.8%), 12 species are semi-shrubs (5.0%) and 10 species (4.2%) are shrubs . The most common species in the vegetation cover of the studied area include: wormwood - Artemisia diffusa, Krasch. Ex Poljak, A.turanica Krasch, Salsola orientalis S.Gmel., Halothamnus subaphulla (GAMey), Carex pachyustulis L., Gade stritata Markel. Ex Bunge; Ferula assa foetida (Bunge) Regel, Anisantha tectorum (L) . Nevski, Bromus danthanige Trin, Malcolmia turkestanica Litv., Trigonella noeana Boiss., leptaleum Filefolim (Willd) DS species of fenugreek - Eremopyrum orientale (L.) Gaub. 1 Spach,E. hirsitum (Bertel.) Nevsky and others are found in abundance. In the natural flora of Karnobchul, annual salt grasses such as Salsola scleranta, fish eye -Climacoptera lanata, rabbit -Halocharis hispida , and coarse-stemmed plants such as Alhagi pseudalhagi, and carrack Cousinia resinosa are found . Wormwood-ephemeral Karnobchul pastures are based on wormwood, and only 15-20% are ephemeral grasses, and only in the spring season these barra grasses make up 40-50% of the food of Karakul sheep. Feed reserves in such pastures are 1.6-3.0 centners of dry mass per hectare in different years, and they also change sharply throughout the seasons.

Conclusion: It should be noted that pastures provide food for livestock in all seasons of the year. Therefore, almost all types of steppe pastures are suitable for year-round use. The diversity and complexity of soil conditions provide a diversity and specificity of plant cover. Unlike sandy deserts, the number of livestock kept in the hilly and gypsum desert regions is much higher, and in most farms one sheep has less than 1 ha of pasture. This, in turn, has led to a 3-4-fold increase in pressure on pastures and an increase in pasture degradation, as well as a gradual decline in biodiversity.

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