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Research Article

EFFECT OF EROSION PROCESSES ON SOIL PROPERTIES

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ABSTRACT

Today, global climate change, along with drought, the processes of soil degradation are becoming one of the urgent problems for scientists all over the world. In this regard, a number of works are being carried out in Uzbekistan. According to the National Report on the State of Land Resources of the Republic of Uzbekistan, only 10% (4.3 million ha) of the 44.9 million hectares in the Republic are irrigated. About 2 million hectares (45%) of these lands are subject to secondary salinization. There are problems with water erosion on 800,000 hectares and wind erosion on 2 million hectares. The object of the study is dark serozem soil belonging to the region of mountain and sub-mountain soils, formed under complex climate and relief conditions. morphological characteristics of these soils in the profile, changes in some properties of these soils according to different exposures and slopes of the slope, including non-eroded watershed, moderate and strongly eroded transit, and corresponding changes and washing in washed-accumulated horizons information on monitoring processes is given.

KEYWORDS

Climate, erosion, elevation, mechanical composition, dark serozem soil, fraction, physical sand, slope exposure, leached.

INTRODUCTION

Today, in the conditions of global climate change, natural and anthropogenic influences on the soil cover are increasing, and degradation, including the types and consequences of soil erosion, is pushing for more rapid development. According to the FAO, by 2050, soil erosion can reduce the production of agricultural crops

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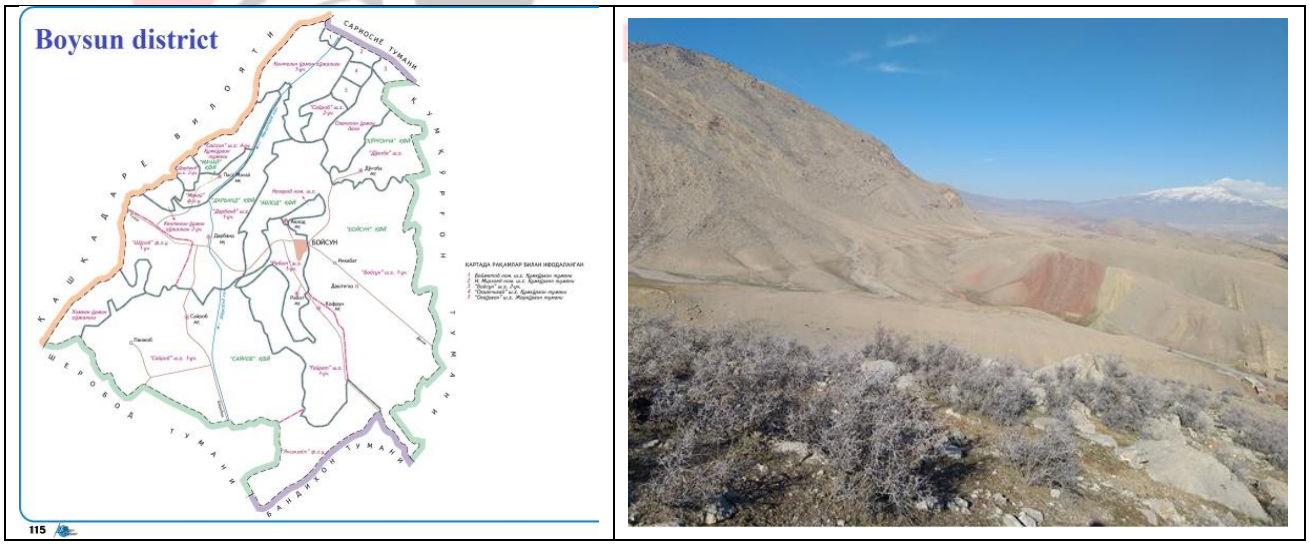
by 10% and lead to the loss of 75 billion tons of soil . The origin of these problems depends on the influence of natural conditions (climate, geomorphology, soil-forming rocks) and anthropogenic factors. Erosion risk is assessed by the volume of potential soil erosion. The geomorphological factor, soil characteristics largely determine the rate of erosion, because the speed and strength of water flows, their concentration in certain areas, the unevenness of the relief, and soil erosion resistance are related to the characteristics.

The purpose of research. The main purpose of the research is to study the effect of erosion processes on some properties of dark serozem soils distributed in the Boysun mountain range of the Surkhandarya region of the Republic of Uzbekistan.

Research materials and methods. The object of research is dark serozem soils of various degrees eroded, not eroded and washed away, distributed in mountain and sub-mountain areas of Boysun district, Surkhandarya region of the Republic of Uzbekistan. Soil analysis was determined according to the generally accepted methods of Arinushkina's "Manual on chemical analysis of soil", and the mechanical composition of soils was determined according to the Kachinsky method.

RESEARCH RESULTS.

The research object is located in Boysun district, and according to its administrative location, it expands from north to southwest in the northern part of Surkhandarya region of the Republic of Uzbekistan. The total area is 3.2 thousand square kilometers (325 thousand 307.0 ha) [1]. The length of the border of Boisun district is 384 km, 80 km with Kashkadarya region in the west, 75 km with Sarosi district in the north, 92 km with Kumkurgan district in the east, 86.8 km with Bandikhon district in the south-west, and Sherabot district in the south. It forms a border of 50 km (Pic. 1).



Pic. 1. Location of the research object

The district's agricultural land area is 212,418 ha, of which 4,518 ha is irrigated, mainly dry land, gardens and pastures. As of January 1, 2022, the total arable land area of Surkhandarya region is 39.5 thousand hectares, of which the arable land area of Boysun district is 20294.7 hectares [2].

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Dark serozem soils are characterized by the beginning of the mountain brown soil stem in the uppermost region of the serozem soil zone. Dark serozem soils are distributed on the slopes of Boisun Mountain (Hisar Mountain Range) at an absolute height of 800-900 meters above the Mediterranean sea level to 1200-1400 meters and above. The division of the dark serozem soil profile into A-B1-B2-C genetic layers, the presence of a turf layer 3-8 cm thick in the upper layers of the soil profile, the structural structure of the melcozem is sandy, and it becomes sandy-granular towards the lower layers, according to its mechanical composition, it is characterized by being medium or heavy sandy and carbonates in the soil profile first appear in the form of pseudomycelium at a depth of 50 cm, and in the form of white pores from 100 cm.

Gravel sand, clayey, sandy and loess sands are the soil-forming rocks. The mechanical composition of these soils also depends on the parent rock-minerals from which they were formed. The mechanical composition of the soil is the sum of these mechanical fractions. Mechanical fractions are formed from particles of the same size. Particles or mechanical elements are formed during weathering of stones and rocks [3,4]. As mentioned above, the mechanical composition of soils depends on the composition of soil-forming minerals and the activity of weathering processes. Usually, soils formed from massive-crystalline parent rocks differ in their mechanical composition, and their proportions are related to the difficult weathering process of coarse mineral residues. The mechanical composition of the soils formed in clay parent rocks is heavy sand, and they are mainly distributed in the middle mountain areas. In the high mountain regions, the soils have a very light mechanical composition and rough skeletal characteristics. Coarse-grained soils have good water permeability properties, which quickly transfer rainwater to the deeper layers of the soil profile, causing rapid drying of the topsoil. At the same time, since the dark serozem soils distributed in the research object are mainly formed in loess parent rocks, it is observed that there are many dusty fractions in them. It is observed that the dark serozem soils distributed in various elements of the slope (southern and northern slopes, watershed and lower part of the slope) have a special mechanical composition. For example, in the flat part of the slope, that is, in the parts of the watershed (K-8), due to the low probability of encountering soil erosion processes, the large dust fractions in them made up 43.4% in the upper layer of the soil profile, while on the southern slope (The content of elements in this fraction in the upper layer of scattered soils (K-7) is in the range of 47.7% and in the northern slope (K-9) 48.3%. The amount of large dust in the dark gray soil that has been washed away (K-6) is around 41.2%. It was observed that the amount of physical clay in soils is 52.1% (K-8) in non-eroded soils, 42.1% in soils spread on slopes (K-7), and 54.4% in washed-out soils (K-6). It was observed that the amount of silt fractions in the soil profile varies according to the amount of silt and fine dust particles (Fig. 2).

At the same time, the process of "claying" is observed in dark gray soils distributed in mountainous areas. According to Rozanov, the process of clayification is related to alluvial processes in dark gray soils [5]. The mechanical composition of soils affects the susceptibility of soils to erosion processes. For example, soils with a heavy mechanical composition tend to be washed away in the process of erosion compared to sandy soils, due to the ratio of physical sand and physical clay in their composition.

If the mechanical composition of the soil contains a lot of sand fractions, then the erosion resistance of the soil weakens, if the physical clay fractions increase in the

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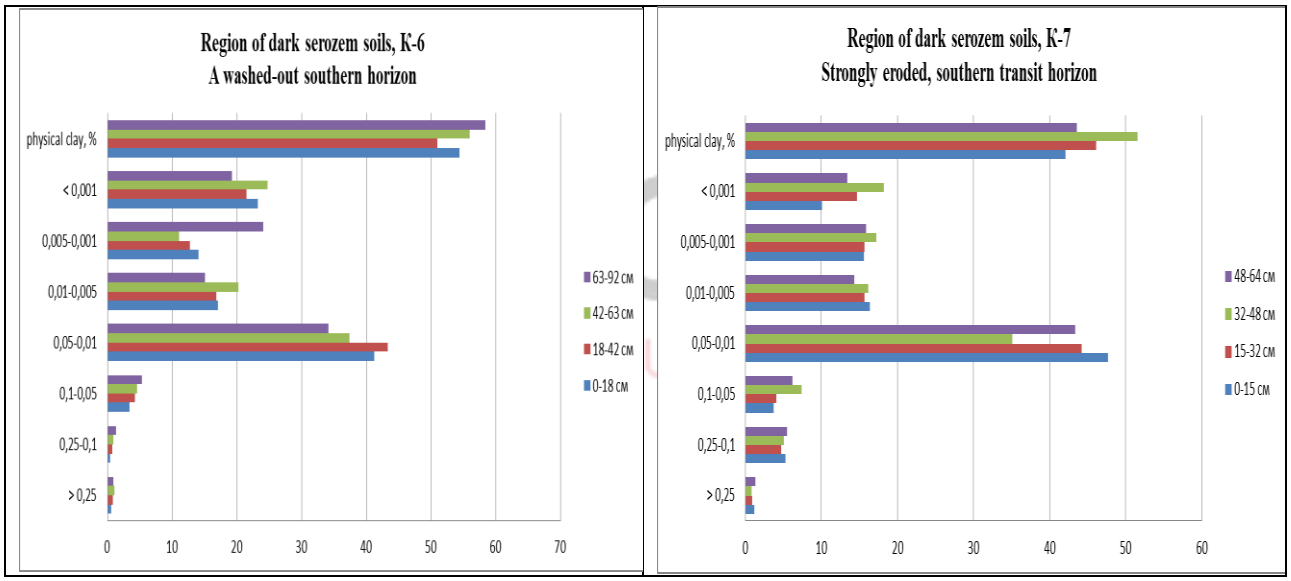
mechanical composition of the soil, then the erosion stability of the soil increases, that is, the increase in clay fractions reduces the separation of soil particles [6.5].

The amount of physical sand and physical clay in the dark serozem soils distributed in the study site is as follows, in washed-collected (K-6) soils, the large fraction of sand content is 0.6%, medium sand is 0.4%, and fine sand is 0.4%. the sand fraction was 3.4%, and the amount of physical clay in the upper layer was 54.4%. On the average slope of this exposure (K-7), the coarse sand fraction is 1.2%, the medium sand fraction is 5.3%, and the fine sand fraction is 3.7%, and the amount of physical clay is 42.1% in the upper layer organized.

In the soils distributed in watersheds of dark serozem soils (K-8), the fraction of large sand is 0.7%, the fraction of medium sand is 0.6%, and the fraction of fine sand is 3.2%, and the amount of physical clay is 52.1 is equal to %. In the soils distributed on the slope, according to the exposure of the slope, large sand fractions are 0.1-1.2%, medium sand is 0.2-5.5%, and fine sand fraction is 2.7-8.1%, and the amount of physical clay is It was determined to be around 39.6-58.2%. (Pic. 2)



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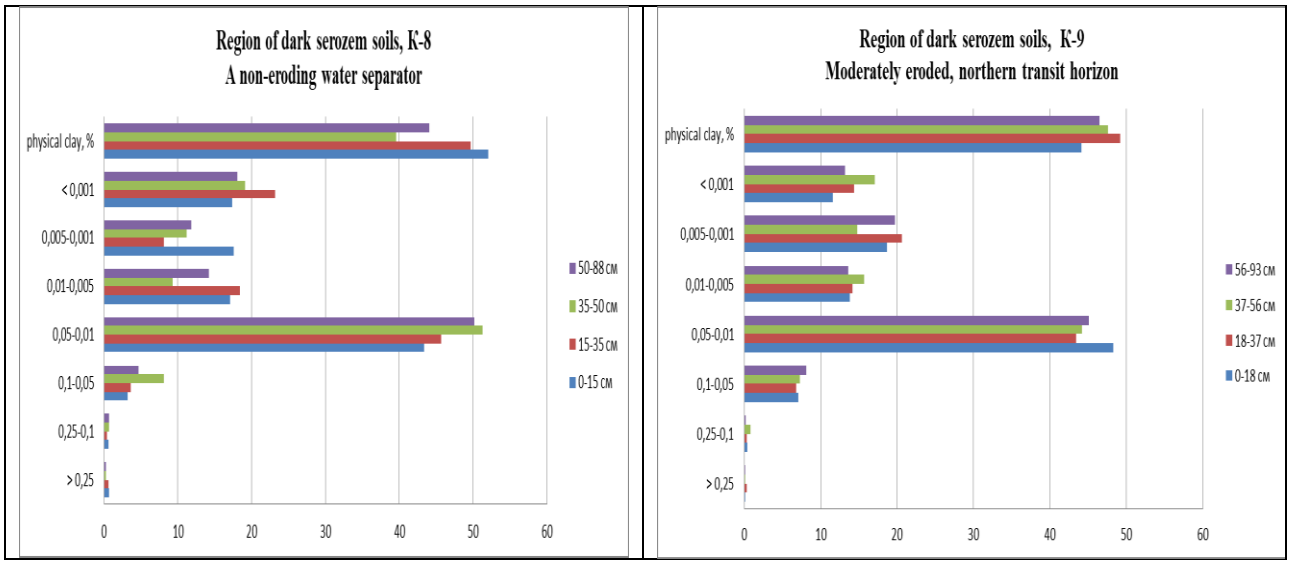

Pic. 2. Mechanical composition of the soil of the research object

As a result of soil erosion processes, the amount of silt and colloidal fractions in their composition also changes. The smaller the size of the mechanical elements, i.e. the fractions, the higher the humus and nitrogen content of this soil [7,8,9,10,11]. In addition, it is observed that 60-70% of the humus content of the soil accumulates mainly in the layer of the soil rich in silty and fine dust fractions (Table 1).

Table 1

Mechanical indicators of the soil of the research object

Location according to soil erosion	Depth, cm	Sand fractions, %	Dust fractions, %	Year fractions, %	Amount of physical clay, %	Amount of humus, %
(K-8) A non-eroding water separator	0-15 15-35 35-50 50-88	4,5 4,6 9,1 5,7	78,1 72,2 71,8 76,2	17,4 23,2 19,1 18,1	52,1 49,7 39,6 44,1	2,416 1,667 1,147 0,857
(K-7) Strongly eroded, southern transit horizon	0-15 15-32 32-48 48-64	10,2 9,7 13,3 13,0	79,7 75,6 68,5 73,6	10,1 14,7 18,2 13,4	42,1 46,1 51,6 43,6	1,473 0,972 0,673 0,385

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(K-9) Moderately eroded, northern transit horizon	0-18 18-37 37-56 56-93	7,6 7,4 8,2 8,4	80,8 78,2 74,7 78,4	11,6 14,4 17,1 13,2	44,1 49,2 47,6 46,5	1,717 1,288 0,752 0,588
(K-6) A washed-out southern horizon	0-18 18-42 42-63 63-92	4,4 5,7 6,6 7,5	72,4 72,8 68,7 73,3	23,2 21,5 24,7 19,2	54,4 51,0 56,0 58,4	2,464 1,514 0,971 0,724

In the data presented above, due to different exposures in the region of dark serozem soils, at the bottom of the slope, humus-rich accumulative soils "washed out" as a result of erosion are formed, and their color is much darker along the soil profile. It is classified by the inconspicuousness of carbonation and gypsum at the boundaries of the soil section.

The soils of the mountainous and sub-mountainous regions, formed in the conditions of complex relief, undergo erosion at different levels in different elements of the relief, and changes in the morphological characteristics of the soil are also different. These differences are reflected in the cross-section structure of non-eroded (K-8), moderately and strongly eroded (K-7, K-9), as well as "washed-out" (K-6) soils as a result of erosion. For example; If the humic horizon is thick in "washed-up" soils, it differs by the relative thinning of the humic horizon in the middle parts of the slopes of different exposures and levels. This, in turn, is felt in the distribution of the amount of hummus. [12,13,14,15,16,17]

The content of humus in non-eroded (K-8) soils located in the watershed of the region of dark serozem soils is 2.416%, while in moderately and strongly eroded (K-7, K-9) soils, this indicator is respectively It is 1,473-1,717%, and in soils "washed out" (K-6) as a result of erosion, it is 2,464%.

The above-mentioned differences in the soil profile can be observed in the color, structure, depth of accumulation of carbonate concretions, as well as skeletal structure.

As a result of water erosion, the mechanical composition of the soils scattered in different parts of the slope changes, the amount of humus in their content also changes, water and other properties deteriorate, as a result, it negatively affects the growth and development of plants and the ecological condition of the area. the biospheric function of the soil decreases.

Such differences in the soil profile are clearly visible mainly in the soils distributed in mountain and sub-mountain regions. Taking into account these indicators, it serves as a basis for monitoring the condition of the soil in the mountain and sub-mountain areas, for the correct assessment of the ongoing erosion processes, and for the mapping of areas with erosion risk.

CONCLUSIONS

The soil formation processes of the research object include humus accumulation, clayification and alkalization, and it takes a leading place in the process of humus accumulation. It is typical for the dark gray soils distributed in the research object to have a large

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amount of silt and dust fractions, as well as a small amount of sand fractions. As a result of washing of the studied soils due to erosion processes, the mechanical composition is reduced in the upper layers, but these soils are heavy sandy soils according to their mechanical composition. The more dusty and fine sand dust fractions are in the composition of soils, the more stable these soils are to erosion processes. The higher the amount of water particles in the soil, the higher the absorption capacity of the soil. The degree of slope plays a special role in eroded dark serozem soils. If the amount of physical clay is sharply reduced in the soils scattered in exposures of different degrees of erosion, on the contrary, their amount is increased in the washed-out soils. The humus supply of the soil of the research object is explained by the superiority of the humification process over the mineralization process in moderately humid and warm weather conditions. These soils have favorable agrochemical properties, while drainage soils are relatively favorable, and sunny slope soils have unfavorable agrochemical properties. The carbonate layer varies depending on the exposure of the slope, the slope, the nature of the soil-forming rocks and their depth. In the soils of the northern slope, compared to the soils of the southern slope, there is an increase in the thickness of the humic layer, an increase in color intensity, a deepening of the carbonate and gypsum border, and an improvement in the structure.

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