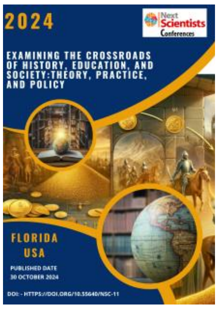

WATER-PHYSICAL PROPERTIES OF RAINFED SOILS

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ABSTRACT

In this article, the current state of rainfed soils in the northern part of the Turkistan mountain range and the changes in their properties under the conditions of climate change are described. In the conducted research, certain water-physical properties of rainfed soils were studied. In sections 1, 4, 7, and 8, the maximum hygroscopicity indicators were found to be high. This is explained by the high structure state, humus content, and nutrients in these sections. The same trend was observed regarding moisture content, with higher indicators found in sections 1, 4, 7, and 8.

KEYWORDS: Rainfed soil, hygroscopic, maximum hygroscopic, water-physical, moisture, degradation.

INTRODUCTION

Improving the properties of rainfed soils, changing their water-physical properties, and enhancing them further are among the most pressing issues of today in our republic. Various soil types and soils with different mechanical compositions are distributed in the northern part of the Turkistan mountain range, and their water-physical properties change depending on their mechanical composition. Soil mechanical composition is an important water-physical and physico-mechanical indicator, and soils with different mechanical compositions exhibit different properties. Due to the differences in mechanical composition, they possess specific agrochemical, chemical, and physico-mechanical properties [1;2;3;4;6].

The morphology, genesis, and genetics of rainfed soils in the northern part of the Turkistan mountain range, as well as their geographical distribution, have been studied by many scientists. Rainfed soils in this area were studied by B.V. Gorbunov between 1938 and 1942, after which no extensive studies have been conducted in this area, and their water-physical properties have not been studied at all. Compared to the previously studied period, significant changes have occurred in the properties of the soils today [1;2;3;4].

In this study, soil profiles were established in the field, samples were taken from soil layers, and certain water-physical properties were determined under laboratory conditions. Rainfed soils in the Zomin district of Jizzakh region were selected as the research object.

The rainfed soils in Zomin district, Jizzakh region, where we conducted our research, possess specific water-physical properties and are characterized by their diversity. They consist of multiple layers with sandy, heavy, medium, and light loamy mechanical compositions.

Incorrect organization of agrotechnical practices and the impact of anthropogenic factors disrupt the granular structure of rainfed soils, worsening their water permeability. In such soils, the layers become compacted, making it difficult for water to seep into the lower layers.

During the research, it was found that the water permeability of rainfed soils varies. In light-colored sierozem soils, water permeability also changes in soil layers depending on soil moisture, tillage time, and the quality of agrotechnical measures used in farming. For example, in soil layers with good water permeability, the capillary movement of moisture downwards during precipitation ensures sufficient water availability.

Degradation processes have intensified in rainfed soils under the influence of anthropogenic and natural factors. Such areas are widespread on sloping land. Degradation processes negatively affect plant growth and development as well as soil properties, disrupting soil structure, worsening water-physical and physico-chemical properties, and affecting microbiological activity.

Excess moisture or leaching (rain, downpours) of rainfed croplands is the second major degradation process and is widespread in rainfed soils.

Determining the hygroscopic and maximum hygroscopic moisture levels of soil allows for an understanding of the soil's composition. In some cases, the wilting moisture and wilting coefficient of plants can be calculated using the maximum hygroscopicity indicator.

The amount of hygroscopic water in soils is not a constant figure; its amount increases with increased air humidity, and it also increases with heavier mechanical composition, colloid particles, and organic matter.

In our research, the maximum hygroscopic moisture levels in rainfed soils were found to be:

- In section 1, the upper layer: 3.67-5.70%, lower layers: 2.58-3.14%
- In section 2, the upper layer: 3.14-3.44%, lower layer: 2.50-3.01%
- In section 3, the upper layer: 3.92-3.99%, lower layer: 2.28-2.64%
- In section 4, the upper layer: 3.44-5.16%, lower layer: 3.00-3.02%
- In section 5, the upper layer: 3.66-4.36%, lower layer: 5.09-5.25%
- In section 6, the upper layer: 3.63-4.37%, lower layer: 2.78-3.94%
- In section 7, the upper layer: 4.21-5.51%, lower layer: 4.42-5.06%
- In section 8, the upper layer: 5.00-5.55%, lower layer: 5.82-5.93%

It was determined that the maximum hygroscopicity indicators are higher in sections 1, 4, 7, and 8. This is explained by the high structure state, humus content, and nutrients in these sections (Table 1).

Table 1. Maximum Hygroscopic and Moisture Properties of Rainfed Soils (Zomin district, Jizzakh region).

Depth, cm	MG, %	Moisture, %	Depth, cm	MG, %	Moisture, %
Section 1			Section 4		
0-6	5,70	8,55	0-8	3,44	5,16
6-11	3,03	4,54	8-19	5,16	7,74
11-32	3,67	5,50	19-84	3,48	5,22
32-65	3,14	4,71	84-121	3,93	5,90
65-94	2,92	4,38	121-151	3,07	4,61
94-120	3,63	5,45	151-201	3,00	4,50
120-300	2,58	3,87	201-250	3,02	4,56
Section 2			Section 5		

0-20	3,44	5,16	0-25	3,66	5,49
20-54	3,14	4,71	25-38	4.36	6,54
54-84	3,11	4,66	38-72	5,19	7,79
84-113	3,02	4,53	72-105	5,72	8,58
113-330	3,01	4,51	105-149	5,25	7,88
330-	2,50	3,84	149-250	5,09	7,63
Section 3			Section 6		
0-20	3,92	5,85	0-17	4,37	6,55
20-44	3,99	5,90	17-33	3,63	5,45
44-64	3,67	5,50	33-65	4,56	6,84
64-82	3,52	5,28	65-114	4,97	7,46
82-117	3,20	4,80	114-133	4,44	6,66
117-165	2,28	3,42	133-158	3,94	5,91
165-230	2,64	3,96	158-187	2,78	3,67
Section 7			**Section 8**		
0-11	4,21	6,32	0-7	5,55	8,33
11-38	5,51	8,27	7-24	5,00	7,50
38-56	4,52	6,78	24-45	6,08	9,12
56-86	4,91	7,37	45-84	6,77	10,16
86-111	6,69	10,04	84-120	5,93	8,90
111-136	7,79	11,69	120-190	5,82	8,73
136-165	5,06	7,59			
165-180	4,42	6,63			

In our research, the moisture content in rainfed soils was found to be:

- In section 1, the upper layer: 4.54-8.55%, lower layers: 3.87-5.45%
- In section 2, the upper layer: 4.71-5.16%, lower layer: 3.84-4.51%
- In section 3, the upper layer: 5.85-5.90%, lower layer: 3.42-3.96%
- In section 4, the upper layer: 5.16-7.74%, lower layer: 4.50-4.56%
- In section 5, the upper layer: 5.49-6.54%, lower layer: 7.63-7.88%
- In section 6, the upper layer: 5.45-6.55%, lower layer: 3.67-5.91%
- In section 7, the upper layer: 6.32-8.27%, lower layer: 6.63-7.59%
- In section 8, the upper layer: 7.50-8.33%, lower layer: 8.73-8.90%

The same trend in moisture content was repeated in sections 1, 4, 7, and 8, with high indicators observed (Table 1).

It is known that the particles in the aggregates formed under natural conditions, specific and bulk density, formation of soil porosity, maximum molecular and field moisture capacity, and available moisture reserves determine their mechanical composition. Scientific studies conducted on rainfed soils in Zomin district show that the plow underlayer of all soils from the sampled areas is highly compacted.

The physical indicators of soil serve as a scientific basis for all agrotechnical measures aimed at increasing soil fertility, including tillage, fertilization, erosion or degradation prevention measures, and others. It should be noted that without considering the physical properties of the soil, the use of mineral or organic fertilizers, even the main plowing (tillage), will not be effective. Furthermore, the planting of agricultural crops also depends on the physical properties of the soil. In increasing, managing, and protecting the fertility of rainfed soils, their physical properties are of great importance.

CONCLUSION

In conclusion, to improve the water-physical properties of the studied rainfed soils, it is advisable to apply crop rotation, manure application, enrichment of soil with organic matter, deep plowing and loosening, lightening heavy mechanical soils, and strengthening lighter soils.

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