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CHANGES IN THE MELIORATIVE STATUS OF LIGHT SEROZEMS IRRIGATED IN THE MIDDLE REACHES OF THE ZARAVSHAN RIVER DEPENDING ON THE GRANULAMETRIC COMPOSITION

Аннатотсия: *Мақолада тупроқ физик ва мелиоратив ҳолатини ўзгаришига унинг грануламетрик таркиби ва гумус билан боғлиқлиги ҳақида фикр юритилган. Оғир механик таркибли тупроқларда тупроқни сув кўтариш қобилияти, сув ўтказувчанлиги паст кўрсаткичга эга бўлиши, енгил механик тупроқларда эса аксинчалиги аниқланди. Гумус миқдорини ортиши енгил механик таркибли тупроқларнинг ҳам, оғир механик таркибли тупроқларнинг ҳам физик, умум-физик, сув-физик хоссаларини яхшилайди. Шунингдек, тупроқнинг мелиоратив ҳолатини ижобий томонга ўзгариши грануламетрик таркиб ва гумус миқдорига боғлиқ бўлиб, унинг ҳолатини муқобиллаштиради.*

Аннотация: *В статье рассматривается связь гранулометрического состава почвы и гумуса с изменением физического и мелиоративного состояния почвы. Установлено, что почвы тяжелого механического состава имеют низкую водоёмкость и водопроницаемость, а для лёгких механических грунтов всё наоборот. Увеличение количества гумуса улучшает физические, общефизические и водно-физические свойства как почв легкого механического состава, так и почв тяжелого механического состава. Также улучшение мелиоративного состояния земель в положительную сторону зависит от гранулометрического состава и количества гумуса, что делает их состояние альтернативным.*

Abstract. *The article discusses the relationship between the soil's granulometric composition and humus on changes in the physical and meliorative condition of the soil. It was found that soils with a heavy mechanical composition have low water carrying capacity and water permeability, and the opposite is true for light mechanical soils. Increasing the amount of humus improves the physical, general-physical, and water-physical properties of both soils with a light mechanical composition and soils with a heavy mechanical composition. Also, the improvement of the land reclamation condition in a positive direction depends on the granulometric composition and the amount of humus, which makes its condition alternative.*

Калит сўзлари: *Зарафшон дарёси, тупроқ, сугориш, шўрланиш, сувли сўрим, оч тусли бўз, механик таркибига, таҳлил.*

Ключевые слова: *река Зеравшан, почва, орошение, засоление, водопоглощение, светло-серый, механический состав, анализ.*

Key words: *Zarafshan River, soil, irrigation, salinization, water absorption, light serozems, mechanical composition, analysis.*

Introduction

Enter. Today, according to FAO-UNESCO data, the world population has increased by 3 billion during the last half century. from 6.4 billion It is not difficult to understand how valuable these lands are to mankind, despite the increase of 8%. Therefore, it is important to organize rational and effective use

of land and water resources, especially agricultural land, to protect them, to improve their ecological and meliorative status, to maintain and increase their productivity. More than half of the irrigated lands in Uzbekistan have varying degrees of salinity. If it is not prevented in time, the yield can be reduced to 70-80 percent in highly saline lands. December 5 was declared by the UN as World Soil Day. 4,3 million hectares of land are being meliorated by the Ministry of Water Resources. The Ministry has a concept of water management development for 2020-2030 in years. In this concept, saline land is indicated as 44,7%. Meanwhile, the Senate of the Oliy Majlis approved the draft law "On soil protection and increasing its productivity". The level of salinity is 53 percent compared to irrigated lands. But according to research, salinity levels are decreasing as a result of the activities we are doing. Salinity has a significant impact on the economy through agriculture. It has been reported in many sources that if we do not carry out salt washing measures, 15% of the crop can be lost in weakly saline land, 30% in medium salinity land, and 70-80% in strong saline land.

Changing the granulometric composition of the light light serozems of the middle reaches of the Zarafshon River under the influence of irrigation, determining the dynamics of changes in the level of accumulation of salts in the soil layers, improving the ecological and meliorative condition, and conducting scientific research aimed at increasing soil productivity is considered one of the urgent issues.

Analysis of literature on the topic. Soil fertility plays an important role in obtaining high yields from agricultural crops. It is a difficult issue to increase crop yield to optimal indicators even at the expense of high agrotechnologies in low soil fertility. Therefore, it is an urgent issue to alter soil properties, regimes and indicators and to implement this before planting crops. The agrophysical properties of the soil also play a role in this [1; 2; 3; 4; 5]. One of the factors determining soil fertility is its water properties. Conducting irrigation works on a scientific basis allows determining agrotechnical measures such as irrigation rate, irrigation technique, duration of irrigation in optimal parameters. These properties have a significant impact on the granulometric composition of the soil and its meliorative condition [1; 2]. Changes in soil granulometric composition have different effects on soil water properties. A high level of humus in the soil has a positive effect on water properties. Therefore, it is important to study the meliorative condition of the soil in connection with its granulometric composition and humus condition. In the newly irrigated desert-sandy soils of the Zarafshan river delta, the carbonates and silt particles contained in the irrigation water created favorable conditions for the good wetting and aeration processes, and agroirrigated soil formation is accelerated. Under the influence of irrigation, the xerothermic water-salt regime of desert-sandy soils turns into an irrigation-washed regime. In some areas, the level of groundwater approaches the surface of the earth (1-3 m), and as a result of the change of the soil in the process of automorphic soil formation to hydromorphic soil formation, the soil undergoes strong salinization [9, 10]. According to the information of Krosnodar, the ecological condition of the soil around the reservoir was studied, in which the salinity of the soil under the influence of the reservoir, changes in heavy metals and acidity were studied, and it was also determined that the population's health is high in the vicinity of this reservoir. Soils contain some harmful salts: sodium carbonate (Na_2CO_3), chlorides (NaCl, $MgCl_2$, $CaCl_2$) and sodium sulfate (Na_2SO_4) and other easily soluble salts. The increase in salt ion concentration in the soil solution affected the deterioration of soil fertility and ecological condition. As a result of the rise in the level of underground water, the risk to the health of the population in the surrounding area is increasing [11].

In order to preserve and increase soil fertility, irrigation and salt washing norms are determined taking into account its agrophysical properties, based on the scientific data of the agrochemical, agrophysical and meliorative conditions of the irrigated soils of the Jizzakh desert. Mechanical composition of soil cover and salinity maps were created [12; 13; 14; 15].

Summarizing the above, the Zarafshan river basin can be divided into two parts that are sharply different from each other in terms of flow formation. The first of them, i.e., the main part of the Zarafshan river flow is formed in the upper part of the mountain. The flow of rivers and streams in the second, lower part of the basin is formed on the slopes of low mountains. The soils of the middle reaches of the Zarafshan River develop on the river beds, the water regime is related to the water level of the river, and the river flow plays a decisive role in the change of their properties [16;17], therefore, the conditions of salinity under the influence of irrigation of the light light serozemsof the middle reaches of the Zarafshan River is one of the determining factors, and its study is one of the urgent issues of today.

Based on the analysis presented in the literature, it can be concluded that the changes of the soils of Uzbekistan, including the irrigated soils formed in the middle reaches of the Zarafshan River, in recent years under the influence of irrigation, the decrease in soil fertility and its increase, and the decrease in crop productivity have not been sufficiently studied.

2. Matreials and Methods

The analysis of the field, laboratory and chamber work is generally accepted in soil science according to the standard methods "Metody agrokhimicheskih, agrofizicheskikh i mikroobilochicheskih issledovaniy v polivnyx pochvax khlopkovyx rayonakh" and "Methods of conducting field experiments" developed at UzPITI and "Rukovodstva k proveveniyu khimicheskix i agrofizicheskih" developed at TAITI it was carried out on the basis of methodological manuals entitled "Instructions for carrying out soil surveys and drawing up soil maps for the maintenance of the state land cadastre" by R. Ko'ziev and others.

At each physical point of observation, soil sections were lowered to a depth of 1,5-2,0 m to seeps, and field research was carried out. The morphological details of the genetic layers of the soil were recorded, and soil samples were taken for analysis in laboratory conditions, including soil samples taken from the research facility according to the granulometric composition of the soil - based on N.A. Kachinsky's pipette, N.I. Savvinov's methods [8];

According to meliorational analysis: the amount of salts was analyzed according to the water absorption analysis, the salinity level was analyzed according to S.V. Astapov's classification; The amount of water-soluble salts in the water and soil was determined by preparing aqueous surim (HCO_3^- total alkalinity, Cl^- and SO_4^{2-} ions, Sa^{++}, Mg^{++}, and K^++Na^+ cations) [6;7].

3. Results and Discussion

Irrigated light gray soils, Zarafshon massif, Narpay district, Samarkand province, plot No. 45 in the farm "Ismat Sarkarda" is old irrigated light gray soils. It developed on the third terrace of Zarafshan.

Comparative analysis of changes of old irrigated pale light serozemsdistributed in the middle reaches of the Zarafshan River under the influence of irrigation and treatments. According to the mechanical composition of these old irrigated pale gray soils, it is mainly heavy sand, the amount of physical clay particles (<0.01 mm) in the driving layer is 47,04 – 47,64%, coarse dust (0,05 - 0, 01mm) particles are 33,55-34,09% and average dust (0,01-0,005mm) particles are 12,21-18,99%.

Fine dust particles (0,005 – 0,001 mm) make up 19,69 – 118,99%, and fine dust particles make up 15,14 – 15,36%, and it was observed that their amounts decrease as they go to the lower

layers (Table 1). In physical sand, on the contrary, it was observed that their amount increased in the lower layers compared to the driving layers. We believe that this is definitely related to its mechanical composition. Fine dust particles (0,005 – 0,001 mm) make up 19,69 – 118,99%, and fine dust particles make up 15,14 – 15,36%, and it was observed that their amounts decrease as they go to the lower layers (Table 1). In physical sand, on the contrary, it was observed that their amount increased in the lower layers compared to the driving layers. We believe that this is definitely related to its mechanical composition.

Table 1.

Granulometric of old irrigated light serozems change in composition, %

Incision	Depth, cm	Amount of fraction, % and particle size, mm							physical clay, < 0,01	Names of soils according to their mechanical composition
		sand			dust			silt		
		>0,25	0,25-0,1	0,1-0,05	0,05-0,01	0,01-0,005	0,005-0,001	<0,001		
Light serozem (1963, data by Kh.M. Abdukadirov)										
238	0 – 20	2	7,3	16,7	39,6	9,7	13,1	11,6	34,4	Sandy loam medium
	20 – 28	1,3	2,6	12,1	43,4	12,2	15,8	12,6	40,6	Sandy loam medium
	28 – 52	1,7	4,2	14,9	45,3	10,8	12,4	10,7	33,9	Sandy loam medium
	52 – 69	0,6	6	29,8	42,4	6,6	7,7	6,9	21,1	Light sandy loam
	69 – 110	1,6	6	29,8	42,4	6,6	7,7	7,9	21,1	Sandy loam medium
Light serozem 2020, data from Tursunkulova A.B.)										
7	0 – 24	1,13	3,09	15,19	33,55	12,21	19,69	15,14	47,04	Sandy loam is heavy
	24 – 32	0,89	2,19	15,19	34,09	13,29	18,99	15,36	47,64	Sandy loam is heavy
	32 – 55	1,29	2,39	15,39	35,27	12,49	18,59	14,58	45,66	Sandy loam medium
	55 – 71	1,54	4,58	14,25	35,69	13,49	18,55	11,90	43,94	Sandy loam medium
	71 – 110	1,62	6,59	26,09	38,49	7,23	11,89	8,09	27,21	Light sandy loam

The influence of the change of the granulometric composition of the soil of the old irrigated pale light serozems on the change of the salinity level of the soil was studied and analyzed in the section of the layers based on the classification.

The results of the analysis of water absorption show that the amount of dry residue in these soils is somewhat higher in the driving layer compared to the data of 1963, that is, by 0,014 – 0,0128% and in the lower layers by 0,061 – 0,073%, the amount of Cl^- in the driving layer is 0,001%; The amount of SO_4^{2-} increased by 0,003-0,020%, and Cl^- increased by 0,001-0,004% and SO_4^{2-} by 0,0024-0,011% in the lower layers. One of the main reasons for the increase in the amount of dry residue, Cl^- and SO_4^{2-} is explained by the increase in the amount of co-concentration in the solution under the influence of irrigation, their interaction with divalent cations, and their increase due to the slow movement of seepage water in the soil. However, no signs of salinity were observed in all soil layers when dry residue, Cl^- and SO_4^{2-} amounts were compared to the classification (Table 2).

According to the results of the analysis of water absorption, it was found that the amount of Mg^{++} is higher in the upper layers of the soil compared to the lower layers, and Ca^{++} prevails over Mg^{++} in the upper and lower layers. It was observed that the amount of Na^+ in the upper layers is significant, and its amount is close to Mg^{++} in the surface layers (Table 2).

Table 2.

Water absorption content of previously irrigated pale light serozems, (abs. in % of dry soil weight)

Incision	Depth, cm	Dense residue	Alkalinity		Cl	SO_4	Ca	Mg	Na	Anion	Cation
			$CO_{3,\%}$	General $HCO_{3,\%}$							
Light serozem (1963, data by Kh.M. Abdukadirov)											
238	0 – 20	0,190	no	0,027	0,01	0,013	-	-	-	-	-
	20 – 28	0,052	no	0,036	0,01	0,03	-	-	-	-	-
	28 – 52	0,076	no	0,028	0,01	0,028	-	-	-	-	-
	52 – 69	0,076	no	0,028	0,01	0,028					
	69 – 110	0,064	no	0,039	0,007	0,021	-	-	-	-	-

Light serozem (2020, data from Tursunkulova A.B.)											
7	0 – 24	0,204	no	0,045	0,009	0,033	0,088	0,029	0,03	0,087	0,117
	24 – 32	0,180	no	0,04	0,009	0,033	0,067	0,03	0,015	0,082	0,097
	32 – 55	0,139	no	0,03	0,008	0,032	0,050	0,026	0,006	0,07	0,076
	55 – 71	0,137	no	0,03	0,006	0,032	0,047	0,022	0,001	0,068	0,069
	71 – 110	0,137	no	0,023	0,006	0,033	0,052	0,022	0,012	0,062	0,074

4.Conclusion

1. According to the mechanical composition of all soil types (light-colored) located on terraces I - II - III of the Zarafshan oasis, they are mainly medium and heavy loam, physical clay (less than 0.01 mm) and large dust (0,05 – 0,01 mm), medium dust (0.01 - 0.005 mm), fine dust (0,005 – 0,001 mm) and silt particles due to irrigation for many years (60 years) sand particles decreased and the amount of dust and silt particles increased in all layers of the soil. It is explained by the accumulation of dust and silt particles in the upper layers of the soil under the influence of irrigation, and certain parts are washed to the lower layers of the soil.

2. For many years (60 years) under the influence of irrigation, sand particles decreased and the amount of dust and silt particles increased in all layers of the soil, but the amount of humus increased by 0,37-0,55% in the plow layer and 0,18-0,18% in the lower layers. By 32%, and the humus stock increased by 38,9 t/ha in the cross-section of the layers caused the formation of structural aggregates due to the interconnection of small dust particles. As a result, no signs of salinity were observed when the amounts of dry residue, Cl^- and SO_4^{2-} were analyzed in cross sections based on the classification of soil salinity in all soil types. Also, in the upper and lower layers of the soil, Ca^{++} dominates over Mg^{++}, and the amount of Na+ increases compared to Mg^{++} in the section of the layers.

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