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METHODS OF SOIL IMPROVEMENT IN SUMGAYIT-SIYAZAN MASSIVE

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The article describes a present state, salinization reasons, and location depth of the subsoil water and change of the salt quantity of the irrigated soil in the Siyazan-Sumqayit massive. The long researches carried out in the massive were compared with our investigations and it was determined that more salt gathered in the top and bottom layer of soil and this creates a condition for soil salinization. According to the results obtained that the salt quantity formed 0.22-3.11 % (for dry residue). As a result of the research, it was determined that the soils of the experimental site were unsalinized, poor, mean and strongly salinized.

Keywords: *irrigation, salinization, salt, fertility, ameliorative state.*
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INTRODUCTION

One of the actual problems of the modern period is increase of productivity of the agricultural plants. It is known that there is significant importance of correct management in terms of preserving the ameliorative state of soil because the plant crops are obtained from irrigated soil. At present the soil cover undergo to serious changes as a result of the continuing negative processes and this was reflected in loss of resourses and fertility of soil, in complicating of the structure of soil cover. A danger of the secondary salinization of the ameliorated soil occur in the condition with the incorrect irrigation. Salinization and solonetzification of the soil is a characteric indication for the plain soil.

Reduction of the soil fertility as a result salinization, solonetzification,eroding of soil in some agricultural zones of our republic caused decrease of productivity of the agricultural plants. Salinization and solonetzification - environmental problems associated with the ground water-soil- water-plant-atmosphere continuum associated with water potential in the growth medium, which causes decreased transpiration and net photosynthetic rates (the osmotic effect, salinity degree), reduced capacity of plants to transform energy to biomass, and accumulation of specific toxic ions (Cl^-, Na^+) to levels exceeding the tolerance limits of plants (salinity stress, specific ion effect); ionic disequilibrium and imbalance of nutrients in the plant, thus harming seed germination, plant stomatal conductance, density and growth, and biomass partitioning between shoots and roots; and deterioration of soil structure (soil disaggregation and clay dispersion) and hydraulic characteristics (solution and air flow) due to high content of exchangeable Na^+, Mg^{2+}, or K^+ when soil electrolyte concentration is below a ”threefold” level [4].

The ameliorative state of the soil strongly changed because of unfitness of some available irrigative systems including collector-drainage networks in the irrigatrd soil as a result of thriftlessness occured in agriculture until the implementation of agrarian reforms [5, p. 32-36]. From this point of view study of the present state of the soil in the Siyazan-Sumgayit massive and improvement ways of of the soil was an actual problem and it assumes a practical importance. Aim of the research was to improve an amoliaritive state of the soil of the experimental area selected in the Siyazan-Sumqayit massive.

MATERIAL AND METHODS

The salinized soils have been taken as a research object in the Siyazan-Sumgayit. For this purpose, three (3) soil sections have been applied in the character places of the virgin soils in the Shurabad village of the Khizi district. The soil samples have been taken indicating coordinates on genetic layers in order to study an ameliorative state of the same soils. The necessary chemical analyses have been realized according to the widely used method in the republic [18, p. 392-394].

The additional sections were applied to study a change of salt quantity in the experimental area and compile a zone map. During the research it was determined that the salt amount was various in the soils of the experimental area and the soils exposed to unsalinized, weak, moderate and strong degree according to the obtained consequences.

RESULTS AND DISCUSSION

The investigations indicate that the hydrogeological-amelioration state of the irrigated soil in our republic has improved noticeably in recent years, and this is a result of purposeful amelioration measures. The decisions in connection with the fight against degradation and desertification and improvement of the soil amelioration state which was added to" The measures Plan on provision of rational use of the water resources" approved by Decree No.2340 of the President of the Azerbaijan Republic dated December 2020 are accomplishing. Recently, conduction of the reforms show that attitude of the land users to soil is different and sometimes they do not use the soil properly for its intended purpose. The carried out researches indicate that some ecological changes happened in the soil as a result of the anthropogenic effects. The salt quantity, mineralization of the subsoil water, modern state of the collector-drainage systems must be firstly determined to study ameliorative state of the soil used under agricultural plants. The role of the chemical composition and the degree of mineralization of groundwater in the salinization of irrigated areas and the formation of soil types is great [13, 14].

As it is known that Siyazan-Sumqayit massive is included in plain zone of the republic. The heavy grey soil of the massive forms a large zone of the coastal region. A role of the climate is great in formation of the natural solonchaks. According to some researches' experiments the extramurally of the ameliorative state of the massive soil show itself in the low background of the natural water permeability of the heavy soil, and this makes impossible the soil desalination under natural climatic factors [17, p. 238]. The climate changes firstly affect agriculture that is one of the manufacturing areas. Climate change primarily affects agriculture, which is one of the manufacturing sectors [6, p. 139-142, 16, p. 45]. An area of the Siyazan-Sumgayit massive is nearly 60.000 hectares. The massive is a plain, which has a plane weak inclination stretching from north-west to south-east [15, p. 47-54]. The Caspian lowland where Siyazan-Sumgayit massif is located is 5-6 km wide in the southeast, and 13 km wide with the formation of the Gilazi in the northwest. Sumgayit that is located from low flow of the river to north and stretches from the coastal line to north is a valley-plain. According to the long information, an average annual quantity of the atmospheric precipitations is 160-353 mm. The snow cover is not observed in the massive. The atmospheric precipitations are unequal. According to the information of the meteorological stations, a quantity of the atmospheric precipitations in the Siyazan-Sumgait massif is maximum in autumn-winter, but minimum in summer [1, p. 16].

The soil cover of the Siyazan-Sumgayit massive is rather various and it is mainly grey-cinnamonic (*Calcic Gypsisols*), grey (*Haplic Calcisols*), takir and saline. A structure and characters of the grey-cinnamonic (*Calcic Cypsisols*) soil are defined with the soilforming features which deve-

lop in the condition of th strong drought climate and xerophylephemer plant cover. Here, the plant cover intensively develop in a short spring period. The plant residues are completely mineralized during a season. Therefore humus is less here. The weak structure is characteristic for grey-cinnamonic soil and the humidity supply is not great. The salinization indications are seen in the grey-cinnamonic soil beginning from 30-40 cm depth and salinization reflects itself from 50 m. This soil belongs to chloride-sulphatic type [7, p. 19].

It was determined on the basis of the researches that the groundwater widespread in the area. A chemical composition of the groundwater is sulphate-chlorine-natrium, chlorine-sulphate-natrium in the Khizi and Siyazan regions [3, p. 334-342]. The climate indications, plant cover, the zone relief, the different humid condition (surface water) affect the formation and distribution of the soil. The heavy granulometric structure on soil profile is observed.

A quantity of physical clay is 72-90% in the soil profile, and this indicates systematical collection of the small fractions brought by surface flows. Salinization of this soil is high. Great salt collection is observed on the top and low layer (1.3-2.6). The salinization process occurs as a result of development of the salt migration in different conditions, mainly, in the accumulative plains, debris cones of the rivers, in the deluvial foothill plains. The alluvial salinized soil is distinguished with the widespread of the great dynamicity of the water-salt regime and secondary salinization event [10]. Collection of the salt in the soil rises density of soil solution, decreases water-permeability of the soil and rises an osmotic pressure of solution. Consequently, provision of plants with water destroys, one part of the nutrient combinations become non-mastered state. The annual experiments show that productivity of the agricultural plants is 20% in the weak salinized soil, 50% in the average salinized soil, 70% in the strong salinized soil, 90% in the very strong salinized soil in connection with non-salinized soil [8, p. 151-167].

It is known that irrigations are quickly reflected in the water regime of the zone. Removing the salt from irrigation areas rises water mineralization and change their chemical composition. The salt entering the zone from the low layers by the irrigated water causes secondary salinization of soil in the non-drained area for a short time. Y.B.Cheshnokov and others note that the ameliorative drainage system was not realized in the zone without black soil in Russia Federation and the project norm and climate change weren't paid attention during the covering drainage construction for last 30 years [2, p. 24].

The soil researches in the massive were performed by V.M.Smirnov-Loginov (Absheron, 1927, 1928, 1935, 1942), N.A.Kachinsky (Strait,1937), I.A.Shulga (Strait,1938), E.M.Salayev (along the Samur-Davachi canal ,1941), M.R.Abduyev (in the massive deluvial plain,1941), R.G.Mammadov (1965, 1969) and others. The researches indicated that a reason of the factors complicating amelioration work is weak development of the irrigation system, smoothing of the area, building of the channels in the soil conduit and open form, non- compliance of irrigation norm and technology, excessive flowing of irrigation water into depressions, negative effect of the economic factors on ameliorative condition [9, p. 221-222]. The last researches indicated that the soil degraded under the influence of salinity, irrigation erosion, and aridity and so on. An amount of the salt in the soil samples taken from the research zone was fixed and the consequences were given on the table.

Table 1.

Change of the salt quantity in the soil of the experimental area

	Depth, cm	Mg.ekv/%							Total of salt	Dry residue, %
		CO_3	HCO_3	Cl	SO_4	Ca	Mg	Na+k		
N1	0-23		0,40	24,2	24,48	10,25	3,25	35,58	3,11	3,66
		No	0,024	0,847	1,176	0,205	0,039	0,818		
N 40^{0}50.341"	23-61		0,40	11,2	5,996	2,00	3,25	12,34	1,07	1,07
E 049^{0}20.411			0,024	0,392	0,288	0,040	0,039	0,284		
	61-112		0,60	3,80	1,998	4,50	0,25	1,648	0,39	1,31
			0,036	0,133	0,096	0,090	0,003	0,038		
	112-178		0,40	10,8	11,99	5,25	2,00	15,94	1,47	2,08
			0,024	0,378	0,576	0,105	0,024	0,366		
N2	0-35		0,40	1,00	7,745	2,25	0,50	6,395	0,63	1,13
		No	0,024	0,035	0,372	0,045	0,006	0,147		
	35-68		0,40	23,4	21,74	7,75	0,25	37,54	2,86	2,84
N40^{0}50.430"			0,024	0,819	1,044	0,155	0,003	0,817		
E 049^{0}20.127	68-91		0,40	31,2	10,49	6,00	2,75	33,34	2,54	2,75
			0,024	1,092	0,504	0,120	0,033	0,766		
	91-182		0,40	6,40	22,24	7,75	1,50	19,79	1,94	1,93
			0,024	0,224	1,068	0,155	0,018	0,455		
	0-30	No	0,80	1,40	5,246	2,00	2,25	3,196	0,49	0,41
N3			0,048	0,049	0,252	0,040	0,027	0,074		
	30-60		0,60	0,60	5,996	1,00	2,50	3,696	0,48	0,28
N 40^{0}49.905"			0,036	0,021	0,288	0,020	0,030	0,085		
E049^{0}20.215"	60-90		0,80	0,60	1,998	1,25	2,00	0,148	0,22	0,21
			0,048	0,021	0,096	0,025	0,024	0,003		

As it is seen on the table, CO_3 ion wasn't observed in salt anion content in the soil of the experimental area, a quantity of HCO_3 was 0,024-0,048% on genetic layers, an amount of Cl ion was 0,021-0,847 %, but a quantity of SO_4 was 0,096-1,176 %. Ca quantity in cation content of the salt was 0,020-0,205 %, Mg was 0,018-0,039 %, but an amount of Na+k was 0,003-0,818. The salt quantity formed 0,22-3,11 % (for dry residue) (Table 1). This indicates that the soil in the experimental area was unsalinized, poor, mean and strongly salinized. Change of the salt quantity reflects on the diagram. pH was studied in the soil of the research zone and it was determined that its value was 7,8-8,8 in 2017, 7,4-8,8 in 2018, 7,5-8,8 in 2019. In addition, this approved that the soil is salinized to a weak, mean and strong degree [11, 12]. The soil type was determined in the soil of the research area and they were belonged to sulphate and chlorine-sulphate type.

CONCLUSION

1. The carried out researches indicated that a quantity of the salt in the grey-cinnamonic soil in the selected zone of the Siyazan-Sumqayit massif was 0,22-3,11%. This shows that the same soil is unsalinized, poor, mean and strong salinized.

2. It is important to fulfil agromeliorative measures for improvement of the ameliorative state of this soil (deep plough, to clean the soil from salt by applying showing water to the places where the saltness is higher (2500-3000m^3/ha), to dig temporary drains in the salinized places, applying mineral and organic fertilizers depending on plant kind, planting of salt-tolerant plants and so on). A condition is created for both fertility and improvement ameliorative state by applying all the mentioned to the same soil.

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SİYƏZƏN-SUMQAYIT MASSİVİ TORPAQLARININ YAXŞILAŞDIRILMASI YOLLARI

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Məqalədə Siyəzən-Sumqayıt massivində suvarılan torpraqların hazırkı vəziyyəti, onların şorlaşma səbəbləri, qrunt sularının yerləşmə dərinliyi və torpaqda olan duzların miqdarının dəyişməsi haqqında məlumat verilmişdir. Massivdə aparılan uzun müddətli tədqiqatlarla bizim tədqiqatlar müqayisə olunmuş və müəyyən edilmişdir ki, torpağın üst və alt qatlarında böyük miqdarda duz toplanır ki, bu da həmin torpaqların şorlamasına şərait yaradır. Əldə edilən nəticələrə əsasən duzların miqdarı 0,22-3,11% (quru qalığa görə) təşkil etmişdir. Aparılan tədqiqatlar nəticəsində təcrübə sahəsi torpaqlarının şorlaşmamış, zəif, orta və şiddətli dərəcədə şorlaşmaya məruz qaldığı müəyyən edilmişdir.

Açar sözlər: *suvarma,şorlaşma, duzlar, münbitlik, meliorativ vəziyyət*

МЕТОДЫ УЛУЧШЕНИЯ ПОЧВ СУМГАИТ-СИЯЗАНСКОГО МАССИВА

Н.З. Мехдиева

В статье описаны современное состояние, причины засоления, глубина залегания грунтовых вод и изменение количества солей орошаемой почвы в Сиязано-Сумгайытском массиве. Многолетные исследования, проведенные в массиве, сопоставили с нашими исследованиями и определили, что в верхнем и нижнем слое почвы скапливается больше солей, что создает условия для засоления почвы. По полученным результатам количество солей составило 0,22-3,11% (в пересчете на сухой остаток). В результате проведенных исследований установлено, что почвы опытного участка не засолены, слабо, средне и сильно подвержены засолению.

Ключевые слова: *орошение, засоление, соли, плодородие, мелиоративное состояние*