



THE COMPOSITION AND CHANGES OF WATER-SOLUBLE SALTS IN THE TERMIZ DISTRICT

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Abstract

We know that in recent years, despite the improvement of land reform in a number of regions of our republics, the salinization of saline soils has been increasing. We see that the supply of easily soluble salts in water and their composition in all cases represent a certain value of salinity. The reserve of salts in direct deposits is the same as that of soil-forming rocks and anthropogenic fastors, and is present in certain quantities in the same soil-forming rocks. On the alluvial slopes, irrigated service-sandy, meadow-meadow and irrigated meadow soils are formed. It can be observed in new and old irrigated areas of I-II surface terraces of Surkhandarya; it differentiates soils even in differentiated areas and in differentiated layers, provided that organic products are differentiated

Keywords: The soils are irrigated desert-sandy, slightly saline, irrigated desert-meadow, moderately saline, irrigated meadow-alluvial soils are highly saline.

Introduction

In the Development Strategy of the Republic of Uzbekistan for 2022–2026, intensive development of agriculture is emphasized, highlighting the significant role of reducing soil salinity levels in obtaining abundant and high-quality yields from each hectare of





arable land. This initiative is crucial for doubling the income of farmers and agricultural producers, achieving an annual growth rate of at least 5% in agriculture, and ensuring the consistent development of agricultural production. Understanding the composition and properties of soils across the country and creating salinity maps based on this knowledge are essential for efficient land use and are of paramount importance for every landowner.

Research results and their discussion

In the "Namuna" massif of the Termiz district, the irrigated desert-sandy soils are characterized by varying levels of salinity, including weak, moderate, and strong salinity. In the plowed layer at a depth of 0–30 cm (Profile 1), the following concentrations were observed: total salts (dry residue) 0.655%, bicarbonate ions 0.031%, chloride ions 0.007%, sulfate ions 0.400%, calcium cations 0.13%, magnesium cations 0.021%, and sodium cations 0.019%.

The amount of water-soluble salts gradually increased with depth along the soil profile, although no significant differences were observed. In the 99–150 cm soil horizon, the concentrations were as follows: bicarbonate ions 1.125%, chloride ions 1.19%, sulfate ions 0.647%, calcium cations 0.225%, magnesium cations 0.027%, and sodium cations 1.39%. Sulfate salinity was observed throughout the soil profile.

**Sourcing content of soils in the "Namuna" massif of Termiz district,%
Table**

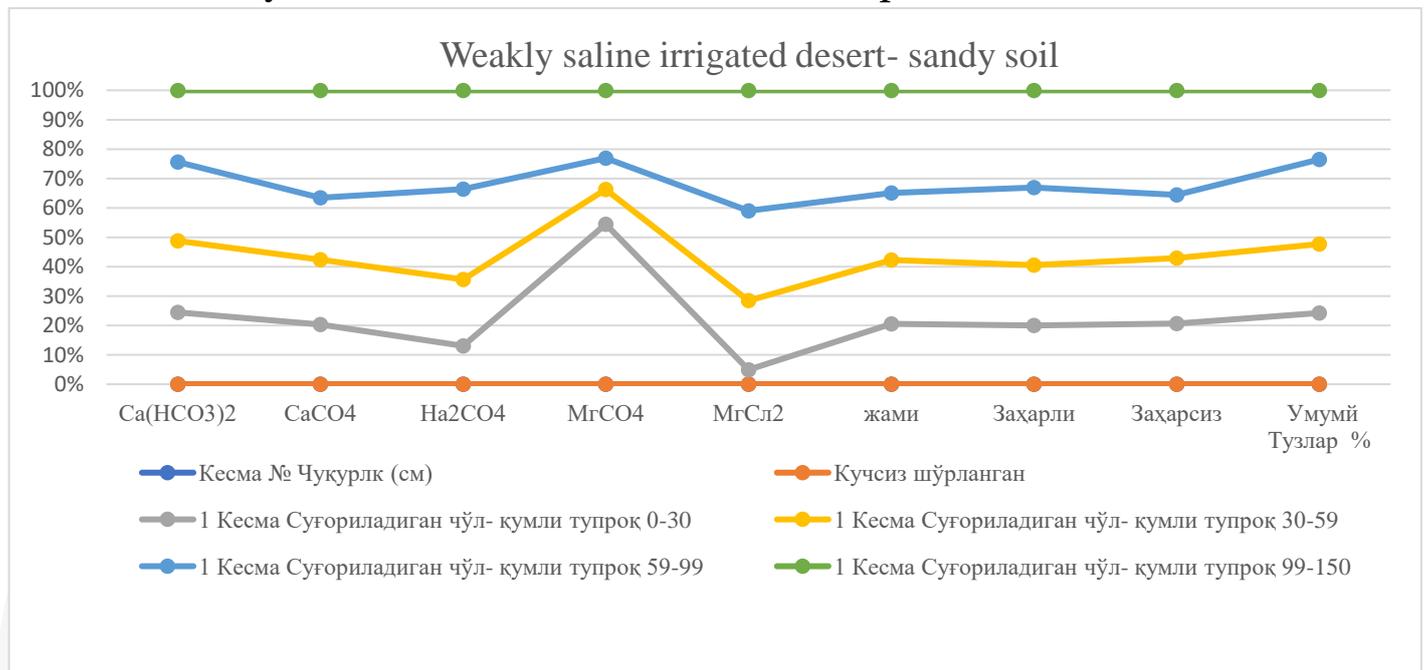
Section №	Depth (cm)	Dry residue, %	HCO ₃	Cl	SO ₄	Ca	Mg	Na	Anion-cation	The sum of the components	Type	Degree
Low salinity irrigated desert soils												
1	0-30	0,655	0,031	0,007	0,4	0,13	0,021	0,019	9,03	0,608	C	Weak
			0,51	0,20	8,32	6,49	1,73	0,82	9,03			
	30-59	0,695	0,031	0,032	0,395	0,14	0,015	0,032	9,631	0,645	C	Weak
			0,51	0,90	8,22	6,99	1,23	1,41	9,63			
	59-99	0,72	0,034	0,042	0,403	0,135	0,018	0,044	10,129	0,676	C	Weak
			0,56	1,19	8,39	6,74	1,48	1,91	10,13			
	99-150	1,125	0,031	0,056	0,647	0,225	0,027	0,048	15,552	1,39	C	Medium
			0,51	1,58	13,46	11,23	2,22	2,10	15,55			

In the soil layers of the Termiz district, the reserves and composition of water-soluble salts indicate varying degrees of salinity across all layers. The salt reserves are directly related to the parent rock materials forming the soil and anthropogenic factors. Parent rocks inherently contain certain amounts of salts. In the irrigated desert-sandy soils, the composition of water-soluble salts includes chlorides, bicarbonates, and sulfates.



In Profile 1, within the 0–30 cm layer of irrigated desert-sandy soils, the total salt content was 0.608%, of which 0.159% were toxic salts, and 0.448% were non-toxic salts. Toxic salts accounted for 26.162% of the total salt content. As highlighted earlier, the degree of salinity increased with depth, particularly in the lower parent rock layers. In the 99–150 cm soil layer, the total salt content was 1.034%, with toxic salts at 0.263% and non-toxic salts at 0.771%. The proportion of toxic salts relative to the total salt content reached its highest level in the 59–99 cm layer, at 31.067%.

Reserve of easily soluble salts in water and their composition



In the irrigated desert-meadow soils, which are sparsely stabilized with vegetation and formed in sandy massifs, the genetic horizons within the soil profile are weakly stratified. In Profile 19, the 0–32 cm plowed layer primarily consists of non-saline soil. The following concentrations were observed in this layer: dry residue 0.357%, bicarbonate ions 0.046%, chloride ions 0.011%, sulfate ions 0.052%, calcium cations 0.02%, magnesium cations 0.006%, and sodium cations 0.015%.

Moving downward along the soil profile, the non-saline nature of the soil was maintained in the lower horizons, with dry residue measuring 0.322%, bicarbonate ions 0.046%, chloride ions 0.01%, sulfate ions 0.064%, calcium cations 0.03%, magnesium cations 0.003%, and sodium cations 0.017%.

At depths of 49–70 cm, weak salinity was observed, whereas the 70–110 cm layers were identified as non-saline, with a sulfate-chloride type of salinity. This gradual variation in salinity highlights the low accumulation of salts in deeper layers, which



could be attributed to the soil's sandy composition and minimal salt retention capacity.

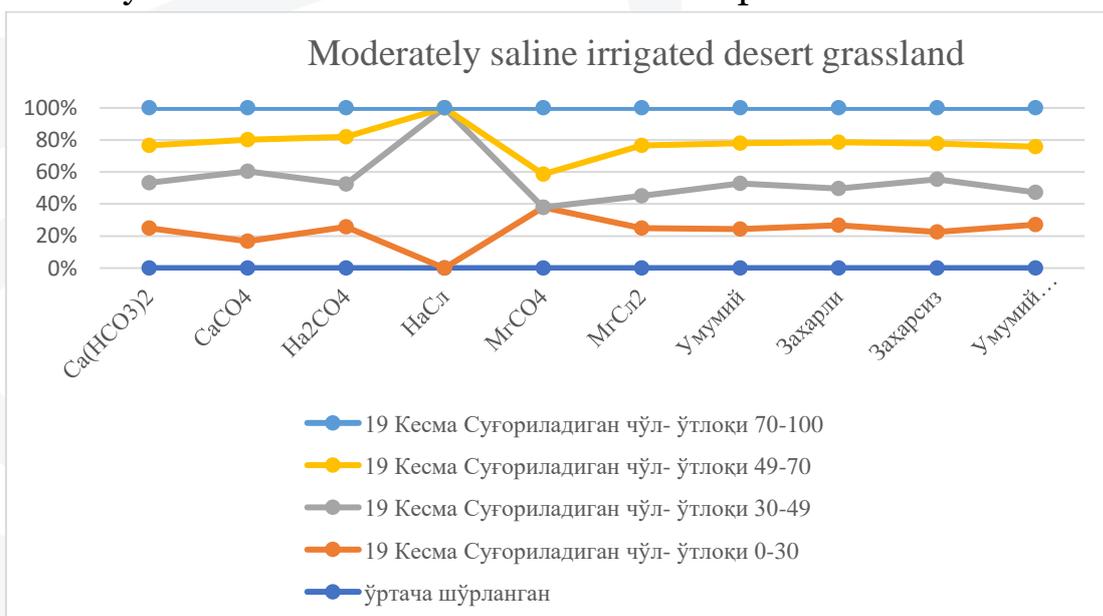
**Sourcing content of soils in the "Namuna" massif of Termiz district, %
Table**

Section №	Depth (cm)	Dry residue, %	HCO ₃	Cl	SO ₄	Ca	Mg	Na	Anion-cation	The sum of the components	Type	Degree
Moderately saline irrigated desert-meadow soil												
19	0-30	0,357	0,046	0,011	0,052	0,02	0,006	0,015	2,146	0,15	X-C	Medium
			0,75	0,31	1,08	1,00	0,49	0,66	2,15			
	30-49	0,322	0,052	0,01	0,064	0,03	0,003	0,017	2,466	0,176	X-C	Medium
			0,85	0,28	1,33	1,50	0,25	0,72	2,47			
	49-70	0,297	0,043	0,014	0,055	0,02	0,006	0,017	2,244	0,155	X-C	Weak
			0,71	0,40	1,15	1,00	0,49	0,75	2,24			
	70-100	0,301	0,043	0,0105	0,046	0,02	0,006	0,011	1,958	0,136	X-C	Medium
			0,71	0,30	0,96	1,00	0,49	0,47	1,96			

In the moderately saline irrigated desert-meadow soils studied, the salt content in the 0–30 cm layer was as follows: total salts 0.155%, toxic salts 0.073%, and non-toxic salts 0.078%. Toxic salts accounted for 48.653% of the total salt content.

In these soils, the distribution of salts along the genetic layers showed an inverse trend, with salts accumulating towards the surface rather than in the parent material. This pattern is directly linked to anthropogenic factors and was clearly observed. In the 30–49 cm and 70–100 cm layers, the salt content ranged as follows: total salts 0.176–0.136%, toxic salts 0.063–0.059%, and non-toxic salts 0.113–0.077%. The proportion of toxic salts relative to the total salt content reached its highest level in the 49–70 cm layer, accounting for 50.849%.

Reserve of easily soluble salts in water and their composition





(section 20). The total amount of water-soluble salts, i.e., dry residue, increased sharply, which was not observed in all horizons of the soil profile. 0.035 %, magnesium cation 0.018 %, and It was observed that the amount of sodium cations was 0.138%, the total amount of water-soluble salts in the 35-64 cm horizon of the soil was 1.17%, the amount of hydrocarbonate ions was 0.027%, the amount of chloride ion was 0.01%, the amount of sulfate ion was 0.766%, the amount of calcium cation was 0.255%. magnesium cation 0.045%, sodium content It was observed to be 0.005% and it was observed in the average salinity level. At 64-85-85-126 cm, the amount of salts is low, that is, it is weakly saline, according to the type of salinity, it belongs to the type of sulfate salinity.

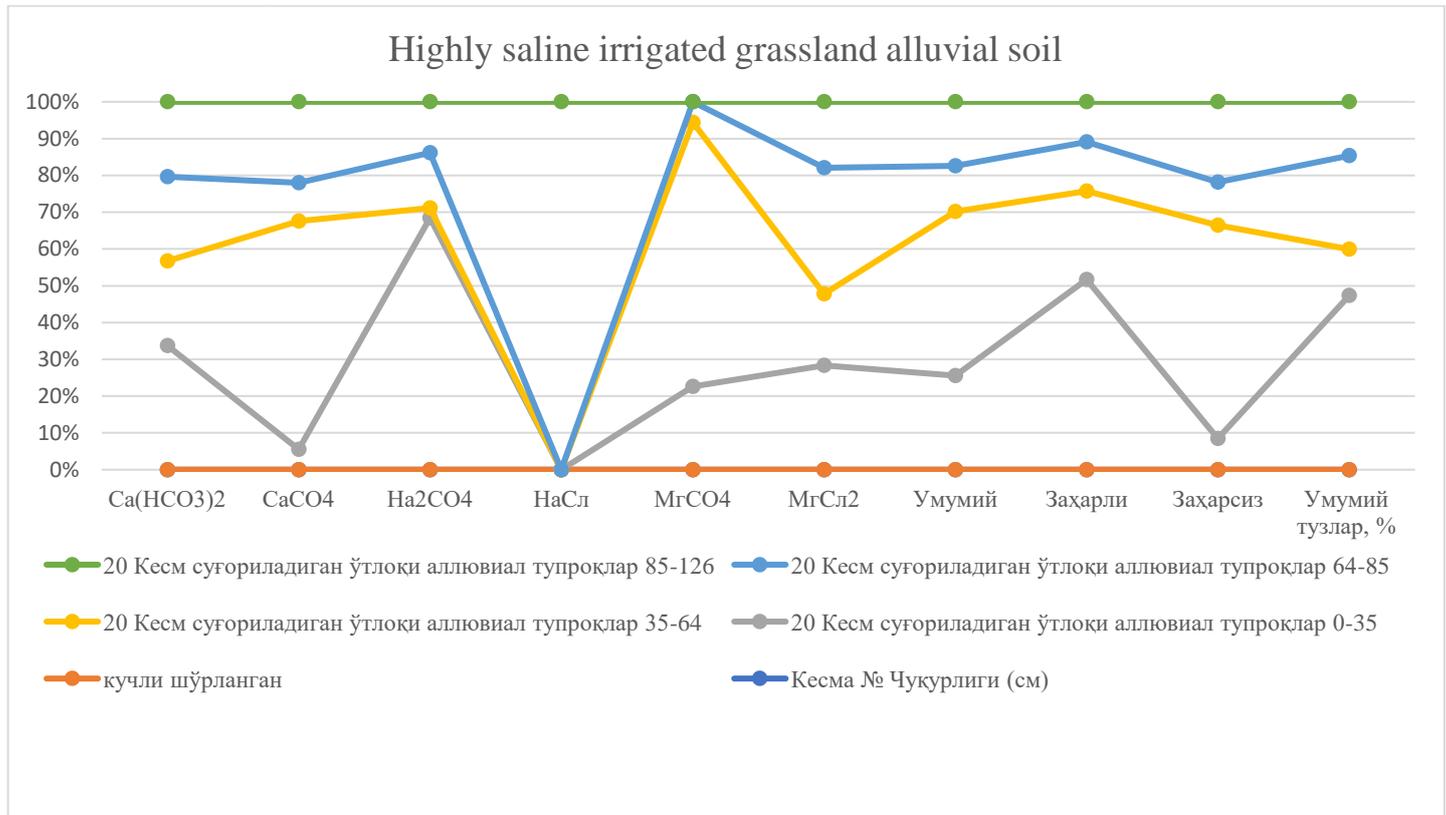
**Sourcing content of soils in the "Namuna" massif of Termiz district,%
Table**

Section №	Depth (cm)	Dry residue, %	HCO ₃	Cl	SO ₄	Ca	Mg	Na	Anion-cation	The sum of the components _Σ	Type	Degree
Highly saline irrigated grassland alluvial soils												
20	0-35	2,675	0,04	0,014	0,392	0,035	0,018	0,138	9,208	0,637	C	Strong
			0,66	0,40	8,16	1,75	1,48	5,98	9,21			
	35-64	1,17	0,027	0,01	0,766	0,255	0,045	0,005	16,665	1,108	C	Medium
			0,44	0,28	15,94	12,72	3,70	0,24	16,67			
	64-85	0,33	0,027	0,017	0,174	0,05	0,009	0,03	4,543	0,307	C	Weak
			0,44	0,48	3,62	2,50	0,74	1,31	4,54			
	85-126	0,48	0,024	0,014	0,267	0,095	0,003	0,031	6,345	0,434	C	Weak
			0,39	0,40	5,56	4,74	0,25	1,36	6,35			

Irrigated meadow alluvial soils are formed on alluvial deposits, are also present in the new and old irrigated desert-sandy-desert-meadow types on the I-II overburden terraces of Surkhandarya. In these lands, meadow soils were formed in the saz-irrigation mode of ground water.



Reserve of easily soluble salts in water and their composition



The formation of meadow alluvial soils on the lower river terraces was formed in the mode of alluvial-irrigation moistening. In this case, groundwater is located closer to the irrigated desert-meadow soils, that is, at a depth of 2-2.5 m. In highly saline irrigated meadow alluvial soils, the amount of salts in 20 cross-sections in the 35-64 cm layer is 1.109% of total, toxic 0.236%, non-toxic 0.872%. %, organized.

Conclusion

During our research, it was thoroughly studied that the formation of soil cover in the investigated areas corresponds entirely to alluvial deposits in irrigated land plots. In the soils of the Termiz district, particularly in the irrigated desert-sandy layers, the composition of water-soluble salts, including sulfates, significantly reduces the mobility of nutrients. This reduction can lead to a deficiency in the amount of plant-accessible mobile nutrients, potentially lowering the soil's fertility.

In moderately saline irrigated desert-meadow soils, the reserves and composition of water-soluble salts are distinct, with chloride and sulfate dominance. The moderate salinity in these soils indicates a tendency towards weak salinity if water-soluble salts and nutrients are not leached. However, in heavily saline irrigated meadow-alluvial soils, the reserves and composition of water-soluble salts are significantly pronounced



compared to other soil types. This phenomenon is primarily attributed to the relatively shallow depth of groundwater, located at approximately 2–2.5 meters.

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