THE AMELIORATIVE STATE OF IRRIGATED LIGHT AND DARK BROWN SOILS IN THE PASTURE AND DESERT OF ZARAFSHAN OASIS

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ABSTRACT

In the number of studies we investigated the rise of groundwater and the occurrence of salinization processes in the light and dark brown gypsum soils in the pasture and desert of Zarafshan oasis under the influence of various natural factors. In the research analysis, we determined the level of nutrient supply (elements) of soil and have developed a number of recommendations to prevent salinization processes, radically improve the reclamation of lands and increase soil fertility.

Keys words: *Amelioration, soil, geomorphology, salinity, humus, phosphorus, light and dark brown, pasture, pasture-desert, lithology, gypsum, agro technical, oasis, groundwater.*

АННОТАЦИЯ

Под влиянием различных природных факторов процессы засоления происходят в серо-буро-луговых гипсовых почвах предгорьях пустынных районов. В данной статье указывается необходимость предотвращения и изучения процессов засоления почв, для того чтобы улучшить мелиорацию земель, повысить плодородие почв и разработать методы их рационального использования.

Ключевые слова: *Мелиоративность, почва, геоморфология, засоленность почвы, гумус, фосфор, серо-буро-луговых, литология, гипс, агротехник, оазис, грунтовые воды.*

АННОТАЦИЯ

Тадқиқотларда Зарафшон ҳавзаси сур тусли қўнғир ўтлоқи ва чўл ўтлоқи гипслашган тупроқларда турли табиий омиллар таъсирида ер ости сувлари кўтарилиши ва тупроқларда шўрланиш жараёнларининг пайдо бўлиши ўрганилди. Тадқиқотлар таҳлилида тупроқларнинг озиқ элементлари билан

таъминланиш даражаси аниқланди. Тупроқлардаги шўрланиш жараёнларининг олдини олиш ва уларни тадқиқ этиш, ерларнинг мелиоратив ҳолатини тубдан яхшилаш, тупроқларнинг унумдорлигини ошириш бўйича, тавсиялар ишлаб чиқилди.

Калит сўзлар: *Мелиорация, тупроқ, геоморфология, шўрланиш, гумус, фосфор, сур тусли қўнғир, ўтлоқи, чўл-ўтлоқи, литология, гипс, агротехник, ҳавза, ер ости суви.*

INTRODUCTION

The area of saline soils in the irrigated lands of the Republic of Uzbekistan is 2 million 48 thousand hectares, 1 million 743.6 thousand hectares of which (72.1%) consists of saline soils of different levels. Particularly, in the total area of 96.8 hectares of irrigated agriculture in Navoi region, 62.4 thousand hectares (64.5%) of saline soils have been affected by various levels of salinization (The state of irrigated lands of the Republic of Uzbekistan and their improvement.- Tashkent: “University”, 2018) [1].

In the resolution of the President of the Republic of Uzbekistan dated February 10, 2014 № PD-2125 “On improving the activities of the Agricultural Research and Production Center of Uzbekistan”, a number of issues such as rational use of land resources, research on irrigated lands, problem solution of existing challenges through science-based methods, improving soil fertility and its reclamation status, increasing the scope and quality of scientific research etc. are identified as top priorities [6]

Studies have shown that hot weather, evaporation of groundwater in alluvial, agro irrigational and lyoss rocks and the accumulation of easily soluble salts in the soil surface layers are one of the main reasons for the development of secondary salinization processes. Also, today in the composition of light and dark brown soil of the pasture and desert of Zarafshan oasis, the level of groundwater has approached the surface of the ground (1-3 m) under the influence of natural anthropogenic factors, and, as the result, their mineralization has exceeded to 3-5 g/l. and accumulated in the upper and middle parts of the soil profile, forming secondary salinization processes [3].

The results of the study will be important for the implementation of the State Land Cadastre and monitoring of land reclamation and fertility in the foothills of the desert.

The main purpose of the research is to develop some recommendations for improving the reclamation of irrigated lands, identification of salinization processes

and their causes, prevention of soil salinization on the basis of the analysis of soil samples obtained during the study.

RESEARCH CONDUCTED AREA AND IMPLEMENTATION METHODS.

The irrigated lands of Konimeh, the district of Navoi region, located in the desert zone of Zarafshan oasis were selected as the object of study.

In the research the salinity level of soil and groundwater was determined on the basis of the results of chemical analysis of groundwater and drainage water samples taken from irrigated soils. The research was carried out on the basis of the standard method adopted in the country [2,3].

RESEARCH RESULTS AND DISCUSSION.

The total irrigated area of Konimeh, located in Zarafshan oasis is 4827.0 hectares. According to its geographical location, it belongs to the arid continental climate region of Central Asia. The soils of irrigated lands are distributed in the geomorphological region of the foothills, consisting of alluvial and proluvial deposits of the subtropical desert and semi-desert zone, and they have been developed in different lithological, hydrogeological and soil-climatic conditions [3,4].

The climate in this territory is characterized by a sharp continental aridity, a decrease in air temperature, especially in hypsometric foothills, solar radiation, daily, monthly, annual and seasonal fluctuations in temperature, and uneven distribution of atmospheric precipitation throughout the year [3].

The region consists of wide undulating plains, and from a geomorphological point of view it descends to the south in the foothill plains formed by lyoss and alluvial-proluvial deposits of the Nurata mountain ranges. The area is located 400-550 m above the sea level [5].

The soils of this area mainly consist of irrigated light and dark brown desert-pasture soils. On the base of our observations we can say that the soil of this area is prone to wind and water erosion and salinization. Also the amount of humus and other nutrients is low, the level of groundwater is high and there is moderate mineralization of soils in the area.

The soil of this territory consists of light mechanical composition and the amount of physical clay fractions (<0.01mm) equals to 22–28%. The average amount of humus in the topsoil is 0.82-1.05%, the average amount of mobile phosphorus is 15.3-35.8 mg / kg and the exchangeable potassium is 157-249 mg / kg. These soils form a group of soils with low humus, low and moderate amounts of mobile

phosphorus, and low, sometimes moderately supplied soils in terms of exchangeable potassium.

According to the results of water absorption, the soils are sorted out into two groups: unsalted and weakly saline, so the total amount of water-soluble salts in weakly saline soils is 0.342-0.549% on average, and in moderately saline soils it is 1.224-1.865%. According to the chemistry behaviour of salinity, it consists of sulfate, and in some cases chloride-sulfate salinity types.

The role of groundwater in the process of soil formation is enormous and it has a multifaceted effect on the formation of saline soils. In the soil profile, groundwater is usually observed at different depths in the soils of the region, for example, in the upper parts of dry streams it reaches 5-6 m, in the middle it is usually at 3-4 m and in the lower parts it is observed at 2-3 m, and even 1-1.5 m. According to the data analysis of laboratory-analytical studies, they belong to the groups of weak (1-3 g/l) and moderate (3-10 g/l) mineralized groundwater according to their salinity. Gypsum layers appear 30, 50, 70, 100 cm in different depths, but some soil separations can be seen in the depth of 120 cm.

The total amount of easily soluble salts in the groundwater of district farms consists of 2,525-6,480 g/l, of which chloride ion comprises 0.161-0.780 g/l, and sulfates (SO_4) equal to 1.390-3.270 g/l (Table 1). According to salinity chemistry behaviour, the groundwater consists of chloride-sulfate and sulfate salinity types. Consistent with the chemical (qualitative) composition of salts, $Ca(HCO_3)_2$, Na_2SO_4, $MgSO_4$, $CaSO_4$ salts occupy the leading position in sulphate and some chloride-sulphate salinity types of water, while in water with relatively high chlorine ions (0.490-0.780 g/l). $MgCl_2$ and NaCl salts predominate in the water samples.

Table 1

Depth, mineralization and salinity chemistry of groundwater, ditches and irrigation water in the irrigated lands of Konimeh located in Zarafshan oasis

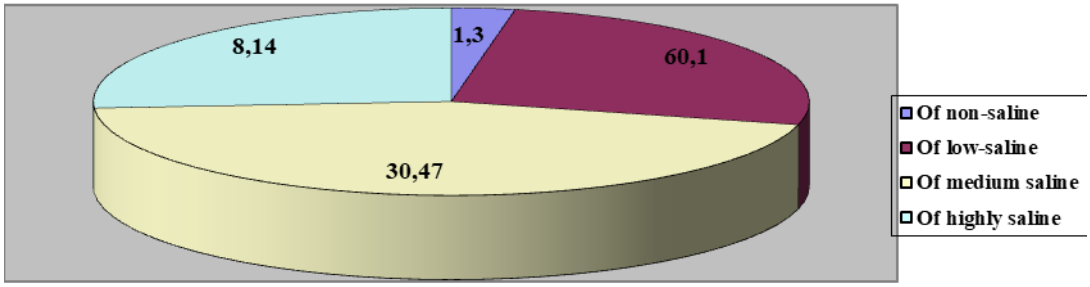
Sample №	Depth, cm	Salts (ions)				Salinization	
		Dry elements	HCO_3	Cl	SO_4	Level	Type
“Shurkul” massif							
18	120	4,440	0,244	0,280	2,386	on average	Ch-S
39	170	5,570	0,305	0,700	2,796	on average	Ch-S
77	170	3,640	0,366	0,420	1,958	on average	Ch-S

“Qaraq-ata”massif							
2	180	6,135	0,311	0,780	3,004	on average	Ch-S
“Choradara” massif							
8	80	6,480	0,500	0,378	3,270	on average	Ch
23	120	4,570	0,306	0,202	2,386	on average	Ch
33	160	4,780	0,324	0,266	2,406	on average	Ch
Kh. Olimjon massif							
12	130	1,335	0,372	0,105	0,564	weak	Ch-S
76	210	2,525	0,329	0,161	1,390	weak	Ch-S
80	170	2,785	0,439	0,210	1,485	weak	
90	200	3,085	0,256	0,238	1,765	on average	S
96	120	2,890	0,421	0,259	1,497	weak	Ch-S
Ditches[x)]							
47		2,525	0,329	0,161	1,390	weak	S
97		2,650	0,354	0,182	1,456	weak	S
33		4,050	0,274	0,140	2,020	on average	S
98		3,725	0,256	0,490	1,686	on average	Ch-S
Irrigation water[xx)]							
1[а]		2,905	0,144	0,560	1,128	weak	Ch-S
1[б]		4,115	0,488	0,870	1,428	on average	CH-S
1[в]		3,625	0,335	0,560	1,786	on average	Ch-S

Note: Ch-S - chloride-sulfate; S - sulfate. [x]) - Drainage water is taken from the indicated samples. [xx]) - Irrigation water was obtained from artesian wells in the Madaniyat (1[a]), Qaraq-ata (1[b]) and Konimeh (1[v]) massifs.

Relatively highly mineralized groundwater (4.440-6.480 g /l) is observed in the irrigated soils of Shurkul, Qaraq-ota and Chordara farms, while weakly mineralized (1-3 g/l) groundwater is observed in Kh. Olimjon farm lands.

As a result of dynamic changes of the hydrogeological conditions of the region throughout the year and irrigation-related measures, various levels of salinization processes have occurred in the area. There are 4,827.0 hectares of irrigated agricultural land in the region, including 392.7 hectares of non-saline soils which comprises 8.14% of irrigated land. Low-salinity area in the region comprises 2900.8 hectares which makes up 60.10% of the total area. Average saline area is 1470.9 hectares, which is 30.47% of the total area and strong saline area consists of 62.6 hectares (1.3%) (Figure 1). On the basis of this fact it can be claimed that the reclamation condition of the soil in this area is not so good, i.e. it needs thorough investigation, saline leaching processes and also systematic reclamation measures etc.



The areas of irrigated lands in Konimeh according to the degree of salinity (in percentage)

In summer, when groundwater evaporates through soil capillaries, the salts are retained in the upper layers and the surface of the ground, in autumn and winter, the salts in the upper layers melt under the influence of atmospheric precipitation and reach the lower layers that is the groundwater, as a result of the recurrence of seasonal evaporation over many years, the accumulation of salts increases in the upper layers of the soil. Also natural processes such as irrigation, reclamation and agro technics greatly influence in the course of such salinity genesis and salt migration.

According to the chemistry behavoiur the light and dark brown soils of pasture and desert of the studied area consist of chloride-sulphate and sulphate salinity types. On the whole, studies have shown that the condition of groundwater in the region's irrigated lands is seasonal. It was proved that with the end of the vegetation period all irrigated areas fall to 2.5-3.0 meters; however, during the vegetation irrigation period it is usually 1-2 meters.

CONCLUSION

The irrigated lands of Konimeh, a district in Zarafshan oasis consist of different levels of salinity, and the state of soil reclamation is more severe than in a number of other desert areas. There is a great demand to develop a number of measures to solve several problems in the area such as prevention of salinization process and increase of soil fertility to combat soil salinity in the main irrigated areas, reduce of groundwater levels, increase crop yields etc.

1) in order to prevent the rise of groundwater and secondary salinization processes in the area, we have to take into account the correct use of irrigation water, the determination of moderate use of irrigation water, soil and climatic conditions, crop type, growing season, depth of groundwater and other factors to determine irrigation times, number and norms of irrigation correctly;

2) we have to ensure the operation of the existing collector-drainage network system, and also change hydromorphic water regime (groundwater at 1.5-2.5 m), to semi-hydromorphic water regime (at 2.5-3.0 m), taking into account the forms of salinity accumulation in soils transfer; [6]

3) we have to keep the groundwater level below the “critical depth” (2.5-3.0 m);

4) it is expedient to strengthen research and various practical activities to determine the timing and norms of saline leaching, depending on the parent rock, its mechanical composition, gypsum and layer thickness, as well as the depth and the level of mineralization of saline soils of Zarafshan oasis.

REFERENCES

1. *O’zbekiston sug’oriladigan yerlarining meliorativ holati va ularni yaxshilash* (Reclamation of irrigated lands of Uzbekistan and their improvement) –Tashkent: “Universitet”, 2018. p 89.

2. *O’zbekiston Respublikasi Yer resurslari, geodeziya, kartografiya va davlat kadastri davlat qo’mitasi // Sug’riladigan yerlarda xaritalashtirish ishlarini utkazish, shurlangan tuproqlarni khisobga olish va shur yuvish me’yorlarini aniqlash buyicha uslubiy kursatmalar* (State Committee of the Republic of Uzbekistan for Land Resources, Geodesy, Cartography and State Cadastre // Guidelines for mapping of irrigated lands, accounting of saline soils and determination of standards for saline leaching).

3. O.K. Komilov, A.U. Akhmedov. *Tuproq shurlanganligi darajasini tuz zakhiralari miqdori buyicha aniqlash va bakholash klassifikatsiyasi* (Classification for determining and estimating the level of soil salinity by the amount of salt reserves)

Pochvi Khorezmskoy oblasti (Soils of Khorezm region) Book 1 and 2. – Tashkent: «IPA AN RUz» Publication House 1998. – p 108 – 103.

4. Kh.T. Artikova. *Pochvi Bukharskogo oazisa i izmeneniye pod vliyaniyem orosheniya* (Soils of Bukhara oasis and its change under the influence of irrigation) Abstract of dissertation of candidate of biological science – Tashkent: GosNIIPA, 2005. – p 25.

5. A.J. Kushakov. *Malikchul tog oldi tekisliklarining sugoriladigan sur tusli qungir tuproqlaridagi shurlanish jarayonlari va shakllari* (Processes and forms of salinization in irrigated light and dark brown soils of the Malikchol foothills). Abstract of dissertation of candidate of biological science – Tashkent: TAITDI, 2007. – p 28.

6. A.J. Kushakov. *Uzbekiston Respublikasi chul zonasi sur tusli qungir tuproqlarining shurlanish jarayonlari va shakllari* (Processes and forms of salinization of light and dark brown soils of the desert zone of the Republic of Uzbekistan) Monograph -Navoi: NSPI, 2017. – p 136.

7. Kushakov, A. (2022). NUROTA TOGVA TOGOLDI TEKSILIKLARI TUPROQLARINING QIYOSIY TAVSIFI. *Ozbekiston zamini*.

8. Shomurodov, H. F., Saribaeva, S. U., Abduraimov, O. S., Khayitov, R. S., & Sayfullaev, A. F. (2021). The Current State of Iris Hippolyti's (Vved.) Kamelin Population in Uzbekistan. *Annals of the Romanian Society for Cell Biology*, 6589-6597.

9. Sayfullayev, A. (2020). MICROALGAE AND CYAN BACTERIA AS BIO FERTILIZERS. *SCIENCE, RESEARCH, DEVELOPMENT# 26*.

10. Sayfullayev, A. (2021). UZLUKSIZ TALIM VOSITASIDA EKOLOGIK MUAMMOLARNI HAL ETISH TEXNOLOGIYASI. *Uzluksiz talim*.

11. Altievich, K. S., Khudargonovich, Y. M., Farhod ogli, S. A., & Komiljonovna, U. G. (2022). ADVANTAGES OF PREPARATION AND USE OF BIOFERTILIZERS FROM BIOMASS OF HIGHER AQUATIC PLANTS. *EPRA International Journal of Multidisciplinary Research (IJMR)*, *8*(1), 21-25.

12. Shamsidinova, G. D., Sayfullaev, A. F., Achilova, N. R., & Baratov, U. D. (2021). Prospects for the development of" Education for sustainable ecological development" on the basis of the declaration of Uzbekistan. *Asian Journal of Multidimensional Research (AJMR)*, *10*(3), 144-149.

13. Хужжиев, С. (2022). ФИТОРЕМЕДИАЦИЯ ПОЧВ, ЗАГРЯЗНЁННЫХ ТЯЖЁЛЫМИ МЕТАЛЛАМИ. *ЭКОЛОГИЯ (БИОЛОГИЧЕСКИЕ НАУКИ)*.