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Geoenergetic Features of Microelements of Irrigated Soils of the Central Fergana

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ABSTRACT

The paper presents the geoenergetic and geochemical features of some microelements inirrigated meadow saz pedolitical soils of Central Fergana, also gives the dependence of the accumulation and migration of trace elements from their atomic weights and geoenergy properties. The content, Clark concentration of trace elements in the studied soils and their genetic horizons, was determined, the background number of trace elements for these soils was calculated. The obtained data for the contents of microelements in irrigated soils of the Central Fergana it can be used in determination of regional background content heavy metals and control of soils of these territories.

Keywords: Geochemistry; Geo-Energy; Microelement; Migration; Accumulation; Pedolite; Cartleg Potential; Arzyk; Shokh

Introduction

Currently, in the world, thousands of hectares of land fall out of agricultural use as a result of the soil degradation of cultivated areas, desolation and waterlogging, water and wind erosion, salinization and pollution. At the same time, the study of chemical and geochemical features from the pedogeochemical point of view of saline soils with poor water and air permeability is one of the urgent problems of agricultural practice in irrigated areas. The irrigated, saline, formed in Central Fergana, having arzyk-shokhovye, shokh-arzykovy horizons of soil at different depths, require a systematic study from a pedogeochemical point of view. At one time, M. Pankov [1] drew attention to the genetic-geographical patterns of distribution and morphological features of saline soils in the Fergana Valley, which pointed to carbonate horizons in these soils. P.N.Besedin, K.Sh.Shadmanov and others [2] exploring the genetic horizons of the soils of the Fergana Valley indicated that sodium and calcium sulfate salts accumulate in the genetic horizons of the hydromorphic soils of Central Ferghana, besides, he also indicated that the place of arzyk-carbonate-gypsum soils is difficult to agree with. The maximum concentration of Cu, Zn, Mn is observed in the arzyk-shokh layers, therefore, in the arzyk-shokh horizons of the hydromorphic soils Cu, Zn, Mn accumulate [3].

In modern scientific literature, the origins and properties of the soil in other regions provides an analysis of the cenopopulation and tissuese element composition of the medicinal caper plant Capparis spinosa L. distributed in Calcisols formed on eroded alluvial-proluvial rock-gravel rocks in the south of the Fergana Valley and other soils are discussed. Most of the microelements are characterized by a slight differentiation up the profiles of soils and the increase in their content in the lower horizons [4-6]. Methods and object of research. The morphogenetic, comparative-

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geographical method of V.V. Dokuchaev was used as the main method, besides the basis pedagogical methods of M.A. Glazovskaya [7], A.I. Perelman [8] were used as the basis of our research. Soil chemical analyzes were carried out according to the description of "Methods of agrochemical, agrophysical and microbiological studies in irrigated areas" and "Guidelines for chemical analysis of soils". Elemental analysis of the soil conducted by the neutron activation method. The object of the research is newly developed, newly watered, old-irrigated meadow sazovy soils of Central Fergana formed on alluvial, alluvial-proluvial sediments, saline, having arzyk-shokhovye, shokh-arzykovy horizons at different depths. Research results. We have studied the chemical elemental composition and their associations in soils and individual horizons, which can hardly be called soil. The arzyk-shokh and shokh-arzyk horizons lack a number of soil properties, such as humus, structure, animal world, etc.

In addition, these horizons cannot perform the functions of soil and soil cover, they almost turned into a natural ecosystem complex. In some cases, it is investigated as non-soil bodies. According to I.P. Gerasimov [9], these horizons can be called pedoliths. one of the difficult questions of the study of micro and macro is the correct diagnosis of real traces of migration, depending on the properties of soils and elements. For example, the migration of trace elements depends on a number of their geochemical properties (Table 1) [10]. As can be seen from the table, with an increase in the ordinal numbers of the elements, their atomic mass increases. However, their valence in most cases ranges from +1 to +3. Their appearance is reflected in the ionic radii and potential of Cartling. A number of geochemical and energy features of these elements are also associated with their valence and ionic radii. As it is known, elements participate in the formation of a certain amount of energy in the process of mineralization, and this energy controls their mobility to a certain extent. In our example (Table 1), the lowest energy of chromium, cobalt and nickel falls on a valence of +2 and is, respectively, 1993.4; 2014.9; 2036.3 kJ. energy. (Figure 1) The greatest amount of energy accounted for: Cr^{+6}, Ta^{+5}, W^{+6}. Depending on the amount of Cartridge's potential, chemical elements can be divided into the following groups.

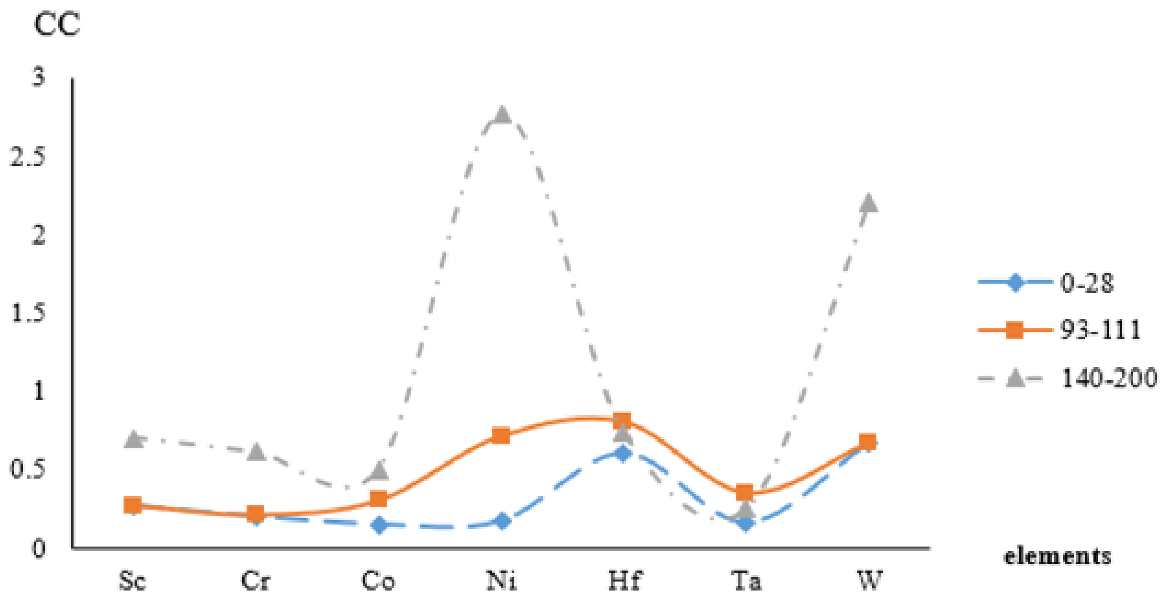

Figure 1: Geochemical spectrum of microelements.

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Table 1: Chemical and geochemical features of microelements.

Properties	Sc	Cr	Co	Ni	Hf	Ta	W
Serial number	21	24	27	28	72	73	74
Atomic mass	45	52	60	59	178	181	184
Valence	+3	+2 +3 +6	+2 +3	+2	+4	+5	+4 +6
Radius of ion, A °	0,83	0,84 0,64 0,35	0,78 0,64	0,74	0,78	0,66	1,37
Potential Cartlegja	3,61	2,38 4,68 17,14	2,56 4,69	2,70	5,13	7,58	5,88 9,23
Energy constants	4,17	1,86 4,43 21,21	1,88 4,43	1,90	6,68	12,21	7,76 17,65
Energy share in the crystal lattice, kJh	4469,2	1993,4 4747,8 22731,6	2014,9 4747,8	2036,3	7159,2	13085,9	8316,7

Table 2: The number of trace elements, mg / kg.

Section No.	Depth, cm.	Sc	Cr	Co	Ni	As	Br	Sb	Cs	Hf	Ta	W
2A - newly developed soil	0-22	2,7	16,8	2,7	10	3,0	3,3	1,1	2,2	1,8	0,31	1,0
	22-32	3,0	19,4	3,0	10	3,3	5,2	1,1	2,2	0,94	0,45	1,0
	32-55	0,8	5,69	0,94	10	1,0	4,7	0,27	0,69	0,48	0,13	1,0
	55-80	2,7	17,6	3,4	41	3,7	3,5	1,20	2,2	1,4	0,30	1,0
	80-140	6,0	35,2	6,6	120	8,1	2,8	2,50	5,6	2,9	0,61	6,3
	140-180	7,0	51,0	9,0	160	10,4	3,9	2,30	6,0	2,2	0,50	3,3
	The average	3,7	24,3	4,3	58,5	4,9	3,9	1,4	3,15	1,6	0,38	2,27
10A - Newly irrigated soil	0-34	7,8	44,1	8,5	86	13,5	3,4	2,1	6,9	4,3	0,90	1,0
	34-47	7,9	43,3	8,2	220	14,9	3,0	2,2	4,7	3,6	0,77	1,0
	47-82	6,1	28,3	4,6	10	6,5	1,0	0,83	4,5	2,0	0,64	1,0
	82-150	5,3	51,5	5,0	110	15,3	2,0	1,7	4,2	3,1	0,73	1,0
	150-187	5,3	38,4	6,2	10	17,5	3,9	2,9	4,9	2,9	0,59	1,0
	The average	6,48	41,12	6,5	87,2	13,54	2,66	1,95	5,04	3,18	0,73	1,0

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5A - old-irrigated soil	0-28	7,6	47,6	7,8	120	11,8	5,8	2,0	6,8	3,7	0,80	10,1
	28-36	7,1	45,6	7,1	170	10,9	8,4	2,1	6,6	3,5	0,87	2,7
	36-93	7,0	42,8	7,0	120	11,5	5,8	2,2	6,3	4,3	0,88	1,0
	93-111	5,8	35,8	4,9	71	7,8	1,6	2,7	5,5	3,4	0,65	5,2
	111-130	5,7	29,6	5,4	10	15,6	1,5	1,8	5,3	3,0	1,1	1,0
	130-200	6,0	35,6	6,7	140	13,3	2,2	2,8	6,2	2,7	0,63	1,0
	The average	6,5	39,5	6,48	105,2	11,8	4,2	2,26	6,1	3,4	0,82	3,5
The average		5,5	34,6	5,71	83,4	9,88	3,6	1,87	4,75	2,7	0,64	2,33
Clark Vinogradov		10	80,3	18	58	1,70	2,1	0,2	1,0	3,0	2,0	1,5

1. Elements that have these potentials in the PC group <3 easily transfer to water and migrate in ionic form they do not form complex complex compounds such as Cr^{+2}, Co^{+2}, Ni^{+2}.
2. Elements included in PC 3-12 form poorly soluble hydrolyzed compounds that move poorly. This group includes Sc^{+3}, Cr^{+3}, Co^{+3} and others.
3. Elements of PK> 12, which are included in this group, due to the combination with oxygen, are soluble and form complex compounds, which, i.e., migrate as complex compounds. This group includes Cr^{+6}.

As mentioned above, the processes of accumulation, differentiation and migration, the elements in the composition of the soil are related to the properties of the soil. This can be seen, in certain cases, on the genetic horizons of the soil, especially in the pedolithic horizons, are shown in (Table 2). If we take into account the number of trace elements in irrigated soils in the pedolith horizons, one can observe a significant difference between their quantitative indicators and their close proximity. When differentiating according to the genetic layers of the soil, this difference is also palpable. For example, the element of scandium varies between $0.8*10^{-4}$ – $5.8*10^{-4}$ % between the arable horizon and the parent breeds (Table 2), while in the pedolith horizons no leaching or accumulation and its potential of Kartledge look (3.61) characterizes it. According to Table 2, the elements of Sc, Co, Hf and Ta are relatively small compared to the genetic layers of other sections in the arable and subsurface layers of the newly developed soils, especially in the arzyk-shokh layers 2 A (32-35 cm). If we pay attention to the element Cr, its amount varies between $5.69*10^{-4}$ - $51.5*10^{-4}$ % and only in newly developed soils did the lowest ($5.69*10^{-4}$ %) amount appear than in other horizons.

An interesting phenomenon is observed here, that is, the amount of Cr in the arable horizons of the soil is located in the following sequence. Newly mastered soils Newly irrigated soils Old-irrigated soils. And with the differentiation of the number of As, Br, Sb, Cs horizons in the contact of groundwater is not observed at a high degree, the accumulation process. In general cases, with the exception of 2A (32-55 cm) cut, quantitative indicators are greater than the clarke index. Nickel values also indicate accumulation in gley layers. In general cases, its quantity is higher than the clarke value. When considering the element Cr, its quantity is 15.69 · 10-4-51.0 · 10^{-4}% and is less than the amount of clarity in newly developed soils and in other cases less than the clarity. Here, an interesting phenomenon occurs, that is, the soil in the genetic layers of the soil, according to the amount of Cr in the following sequence. Newly soiled soils are newly irrigated soils with irrigated soils. The coagulation rate is noticeably high in the layers of the pedal and the horizon in contact with the water, which is very high. Total quantitative indicators are less than Clark. Nickel performance also shows the accumulation in the glaze layer. In general, old pedestrian layers of 7A cuttings, which are irrigated, are less than $10 \cdot 10^{-4}$, except for the pedocyte and its substrates. In other cases, its quantity is higher than clarity.

For the studied elements, this soil was considered as a background, and they were as follows. Background,

$$\frac{Ni}{144,12} > \frac{Cr}{46,5} > \frac{C0}{8,25} > \frac{Sc}{7,3} > \frac{Hf}{3,8} > \frac{W}{2,98} > \frac{Ta}{0,92}$$

mg/kg.

The concentrations of these elements are shown in Table 3 by the number of elements such as Sc, Cr, Co, Ni, Hf, Ta, W according to these parameters, ie the quantities in the investigated soils and their pedolyte layers are less than the lithosphere. In some layers, the CC of these elements are 1.0-1.1. Interestingly, these elements are not accumulated in the pedestrian layers. For example, pedicles (93-111 cm) in the mother's trousers are 2.2-4.2 Cd in the 7A cut.

Conclusion

The processes of accumulation, migration, and differentiation of chemical elements in soil and pedolith horizons and soil-forming rocks occur with the joint participation of pedogenic, exogenous, endopedogenic, and technogenic factors. These streams of elements in turn affect the nature of the substrate, i.e. soil, pedolity and soil-forming rocks. In increasing the fertility of pedolithic soils, their chemical elemental composition, migration and accumulation of the latter should be studied first. In the series indicated above, the destruction of pedolith horizons, which serve as a pedogeochemical barrier in these soils, is necessary.

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