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STUDY OF THE CONCENTRATION OF COPPER, NICKEL AND CADMIUM IN VARIOUS TYPES OF SOILS

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Abstract
The concentrations of copper, nickel and cadmium were studied depending on their time of development in various types of soils in the Andijan region. Metal concentrations were determined by atomic absorption analysis on AAS-3.

Keywords: copper, nickel, cadmium, concentration, atomic absorption analysis, soil, environment.

Introduction

Soil protection is a rather acute problem, with which the issues of productivity and food supply are directly related. It is necessary to increase fertility and maintain the stability of the biosphere. Soil analysis for heavy metals is included in the list of measures for environmental monitoring of soils. Heavy metals have a negative impact on plants, animals and soil microflora. Currently, heavy metals are considered one of the main pollutants of the ecosystem. Under conditions of intense anthropogenic influence, their entry into the agro-ecosystem exceeds its protective properties. Soil pollution with heavy metals leads to a decrease in productivity and quality of agricultural products. Heavy metals in arable soils also pose a serious threat to human health, since they enter plants from the soil, and from them into the body.

Soil contamination with heavy metals is a serious problem that significantly reduces the quality of soils, especially in areas near industrial enterprises. Why is it necessary

to analyze the soil for heavy metals, where to do such a study and whether it is possible to reduce the content of heavy metals in the soil [9].

Do not forget that the soil must contain the allowable amount of metals necessary for the proper course of physiological processes in plants.

But it is necessary to control the level of soil contamination with metals, because. an increased concentration has a toxic effect on plants and the human body [10].

We have studied the concentrations of copper, nickel and cadmium in various types of soils and the time of development of the Andijan region.

The technique of sampling and preparation of samples for analysis and the method of atomic absorption analysis are described in detail in our previous works [1-8].

The results of the study on the content of Cu, Ni and Cd in the soils of the Andijan region by atomic absorption are shown in tables 1-3 and figures 1-4.

The content of Cu, Ni and Cd in the soils of the Andijan region depending on the horizons (0-10, 10-30, 30-50 cm) are shown in tables 1-3.

It can be seen from these tables that the concentration of Cu varies within the range of 4.1 to 21.1 mg/kg in some samples, the concentration of copper decreases, while in the remaining samples there is no sharp change.

It should be noted that the concentration of Cu at the points selected from the Ulugnar region is less than in others, this is due to the fact that, firstly, these places are newly developed, little fertilizer has been applied, and secondly, the soils are light loams and sandy, i.e. when watering, they are quickly washed out i.e. passes into the lower part of the soil, then to groundwater.

When comparing the concentration of Ni in soils depending on the horizons, it gave the following picture: 1) the highest content was found in the points of Khodjaobodsky, Altinkulsky and Asaka districts (37.3 and 35.9 mg/kg) where soils have been used for more than 50 years. It is clearly seen here that the concentration of Ni in the COP increases year after year, which leads to environmental pollution.

A lower content was determined for selected samples from the Ulugnar region (13.0 and 16.5 mg/kg).

When determining the content of Ni by horizons, a clear decrease is not observed; Ni varies almost equally across the horizons.

When studying the content of Cd in soils depending on the horizons, it was found that Cd is present in soils in almost the same concentrations. A sharp decrease in these soils was also not observed.

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Table 1 Results of atomic absorption analysis for copper content in soil samples of Andijan region.

№ n/n	Age, soil type of sampling site	Soil layers in cm, Concentration in mg/kg		
		0-10	10-30	30-50
1	**2**	**3**	**4**	**5**
1	Virgin soil, meadow-gray soil Zhalalkuduk district.	16,7	16,9	16,9
2	ND, meadow-serozem	16,7	13,0	12,1
3	NI, meadow-serozem	13,6	12,6	13,4
4	OI, meadow-saz	18,4	16,9	16.2
5	Virgin, typical serozem Khodjaobodsky district.	18,7	15,5	15,9
6	ND, typical gray soils	17,6	15,5	16,5
7	NI, typical gray soils	12,5	12,0	12,2
8	OI, typical gray soils	19,1	20,5	18,9
9	Virgin soil, meadow-saz Altinkul district.	14,7	10,1	11,5
10	ND, meadow-saz	18,9	15,5	16,7
11	NI, meadow gray soils	16,2	18,5	16,5
12	OI, meadow gray soils	15,1	19,4	18,9
13	OI, light sierozems Asaka district.	19,6	21,2	20,1
14	Virgin soil, light gray soil	16,0	17,5	15,8
15	ND, light serozem	18,0	17,5	17,5
16	NI, light serozem	12,6	18,8	15,8
17	ND, light-lugny Ulugnar district.	4,6	5,6	4,6
18	Virgin, light-lugny	4,1	4,6	4,4
19	NI, light-lugny	6,1	6,7	6,5

*-NI newly irrigated
*-ND newly developed
*-OI old irrigated

Table 2
Results of atomic absorption analysis for nickel content in soil samples of Andijan region.

№ n/n	Age, soil type of sampling site	Soil layers in cm, Concentration in mg/kg		
		0-10	10-30	30-50
1	**2**	**3**	**4**	**5**
1	Virgin soil, meadow-gray soil Zhalalkuduk district.	31,1	31,9	33,4
2	ND, meadow-serozem	34,1	26,1	25,2
3	NI, meadow-serozem	27,0	24,1	26,5
4	OI, meadow-saz	33,5	32,9	31,2

5	Virgin, typical serozem Khodjaobodsky district.	35,7	30,9	29,0
6	ND, typical gray soils	34,1	31,5	33,5
7	NI, typical gray soils	27,9	26,5	26,5
8	OI, typical gray soils	37,0	38,0	37,0
9	Virgin soil, meadow-saz Altinkul district.	30,6	25,0	24,7
10	ND, meadow-saz	33,2	26,7	29,9
11	NI, meadow gray soils	27,4	30,4	28,7
12	OI, meadow gray soils	26,2	34,1	32,4
13	OI, light sierozems Asaka district.	33,5	37,7	36,4
14	Virgin soil, light gray soil	33,5	34,1	38,4
15	ND, light serozem	34,4	35,5	36,1
16	NI, light serozem	28,7	29,9	32,1
17	ND, light-lugny Ulugnar district.	32,6	12,9	15,6
18	Virgin, light-lugny	11,7	13,9	13,4
19	NI, light-lugny	16,5	16,5	16,5

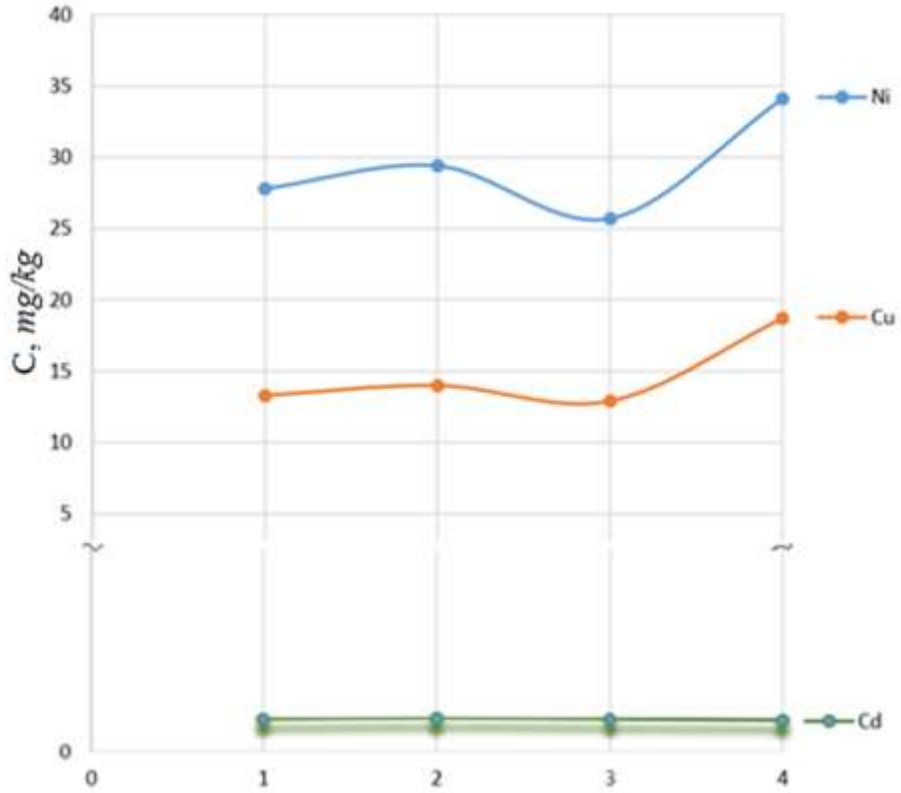
Table - 3
Results of atomic absorption analysis for cadmium content in soil samples of Andijan region.

№ n/n	Age, soil type of sampling site	Soil layers in cm, Concentration in mg/kg		
		0-10	10-30	30-50
1	**2**	**3**	**4**	**5**
1	Virgin soil, meadow-gray soil Zhalalkuduk district.	0,27	0,20	0,23
2	ND, meadow-serozem	0,31	0,29	0,38
3	NI, meadow-serozem	0,25	0,25	0,31
4	OI, meadow-saz	0,20	0,31	0,29
5	Virgin, typical serozem Khodjaobodsky district.	0,31	0,31	0,29
6	ND, typical gray soils	0,25	0,25	0,31
7	NI, typical gray soils	0,34	0,25	0,25
8	OI, typical gray soils	0,29	0,34	0,23
9	Virgin soil, meadow-saz Altinkul district.	0,38	0,38	0,34
10	ND, meadow-saz	0,38	0,18	0,31
11	NI, meadow gray soils	0,29	0,23	0,34
12	OI, meadow gray soils	0,23	0,31	0,23
13	OI, light sierozems Asaka district.	0,25	0,25	0,31
14	Virgin soil, light gray soil	0,18	0,25	0,25
15	ND, light serozem	0,31	0,20	0,14
16	NI, light serozem	0,20	0,20	0,23
17	ND, light-lugny Ulugnar district.	0,38	0,38	0,23
18	Virgin, light-lugny	0,25	0,34	0,29
19	NI, light-lugny	0,34	0,29	0,40

Figures 1-4 show the results of a study on the average content of Cu, Ni and Cd in soils depending on the age and time of development and soil type. From these figures 1-2 it can be seen that the concentration of Cu in soils, depending on age, migrates more in old irrigated soils, where it will be 18.7 mg/kg or 121.5 kg/ha, respectively.

In the virgin lands, the average concentration of Cu is 13.3 mg/kg or 84.4 kg/ha, in NOS 14.0 mg/kg or 91.0 kg/ha. The concentration of Cu in NOR decreases comparatively to 12.9 mg/kg or 83.3 kg/ha. The same picture is observed in the state of Ni in soils. The highest concentration was found in old irrigated soils, where it contains 34.1 mg/kg or 221.6 kg/ha.

In virgin lands, the concentration of Ni is 27.8 mg/kg or 180.7 kg/ha, in NOR 29.4 mg/kg or 191.1 kg/ha. In NOS, the content of Ni will be 25.7 mg/kg or 167.0 kg/ha, respectively. The concentration of Cd in these soils varies within 0.27 mg/kg or 1.7-1.9 kg/ha.



Picture 1. The average concentration of Cu, Ni, Cd depending on the time of development: (1-undeveloped (virgin) 0 years, 2-newly developed (ND) 5-10 years, 3-newly irrigated (NI) 10-50 years, 4-old irrigated (OI) more than 50 years)

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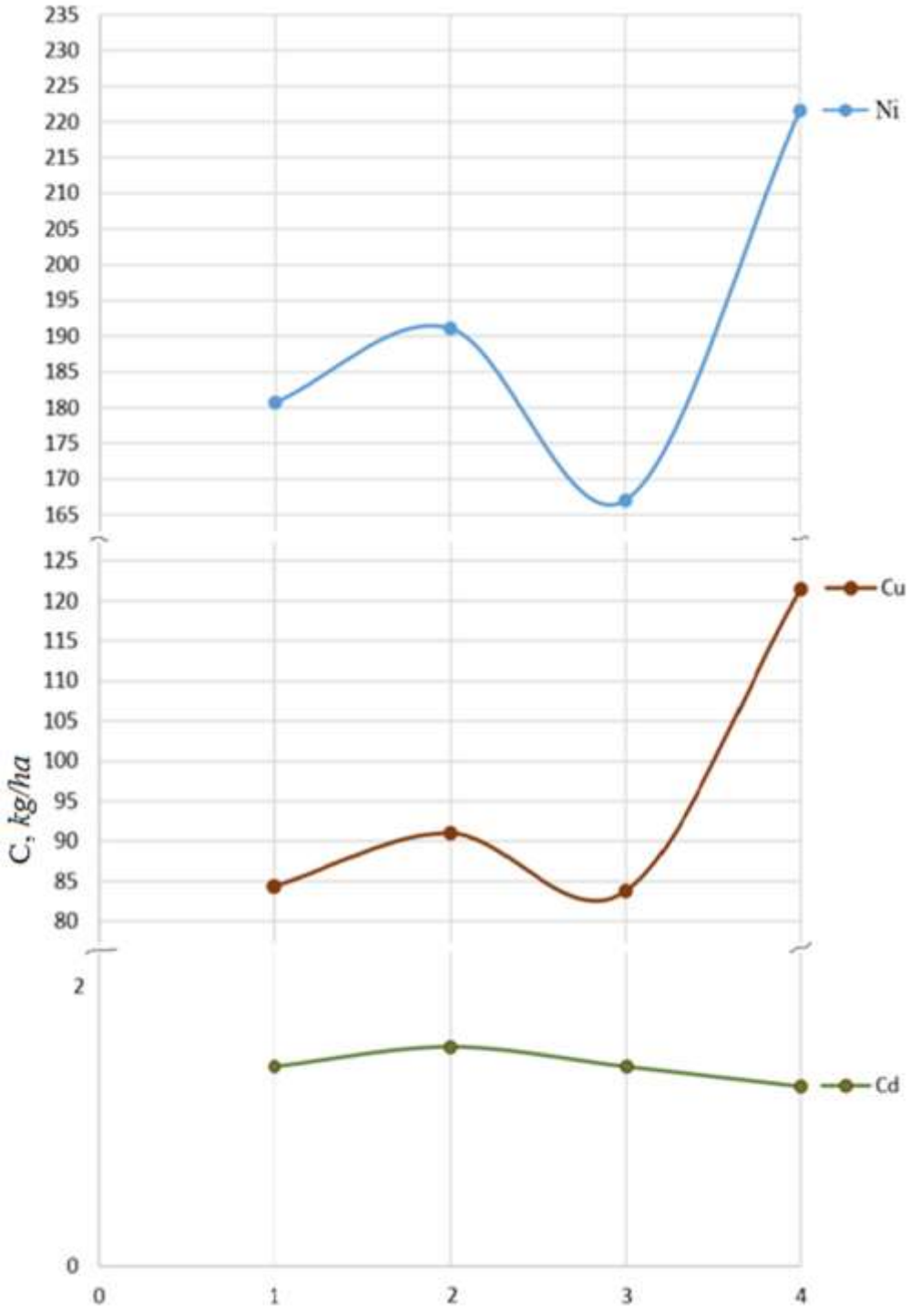

Figure-2. The average concentration of Cu, Ni, Cd depending on the time of development: (1-undeveloped (virgin) 0 years, 2-newly developed (ND) 5-10 years, 3-newly irrigated (NI) 10-50 years, 4-old irrigated (OI) more than 50 years)

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The migration of Cu, Ni and Cd in soils depending on their type is shown in Figures 3-4.

From these figures it can be seen that the highest content of Cu, Ni and Cd was found in soils of the light gray soil type, where it will be 17.5 mg/kg or 113.7 kg/ha for Cu, 35.9 mg/kg for Ni, or 222.1 kg/ha, and Cd-0.32 mg/kg or 2.1 kg/ha was found in light loamy soils. Conversely, in light loamy soils, the concentrations of Cu and Ni are minimal. This is due to the physical, reclamation and agrochemical conditions of soils.

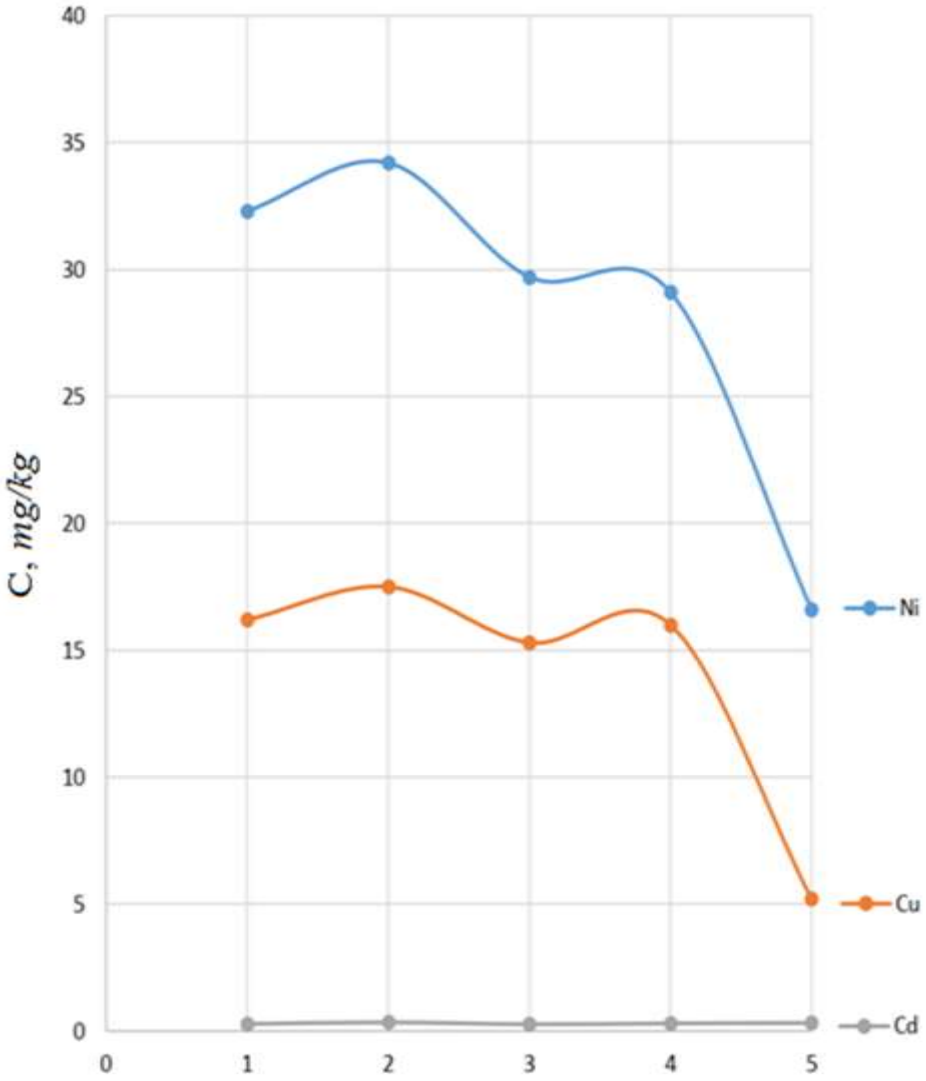

Figure-3. The average concentration of Cu, Ni, Cd depending on the time of development: Virgin, ND, NI, OI* and soil type (1- typical sierozem, 2- light sierozem, 3-meadow sierozem, 4-meadow-saz, 5- light loam)

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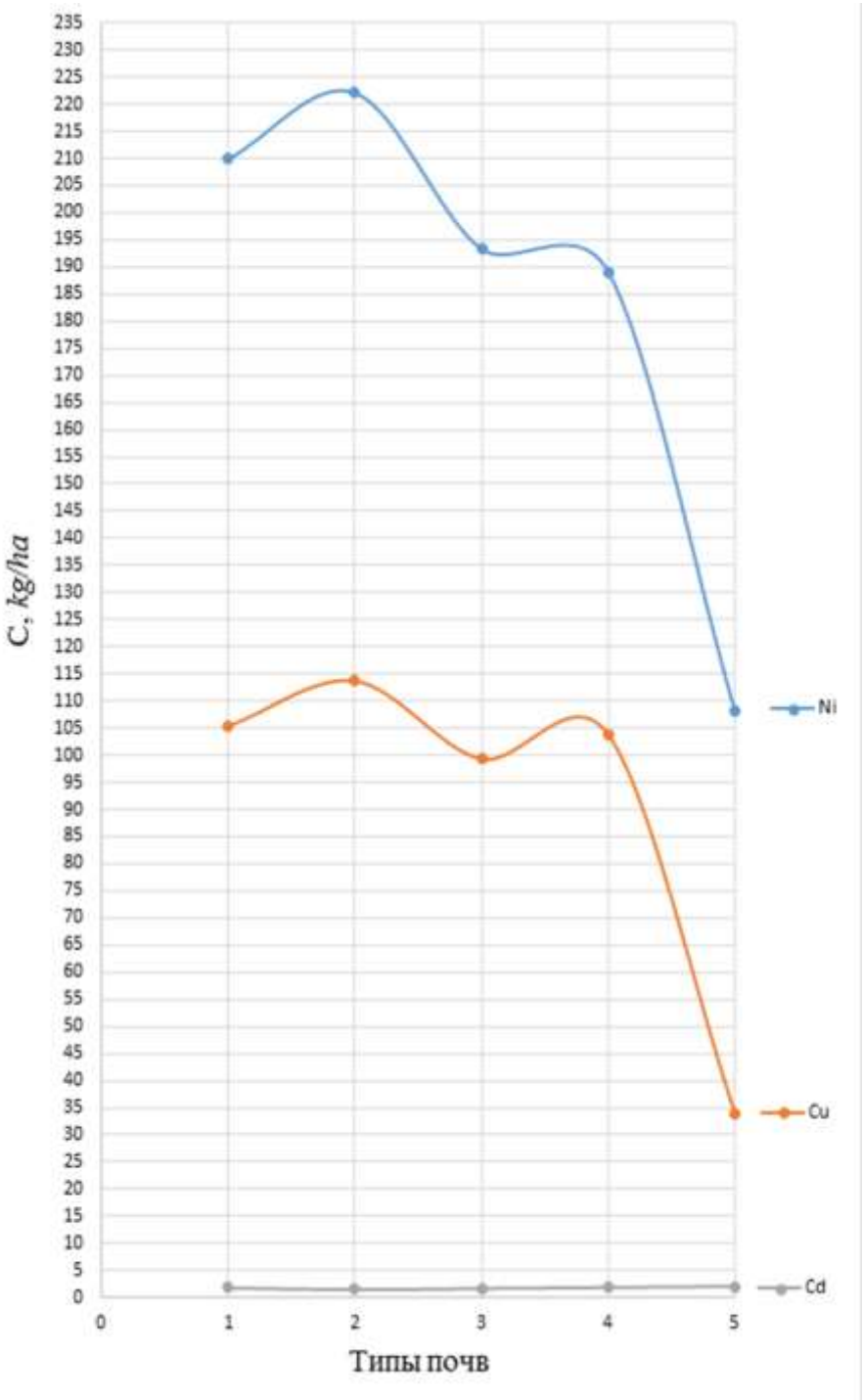

Figure-4. The average concentration of Cu, Ni, Cd depending on the time of development: Virgin, ND, NI, OI* and soil type (1- typical sierozem, 2- light sierozem, 3-meadow sierozem, 4-meadow-saz, 5- light loam)

Conclusion

1. The ecological state of various types of soils in the Andijan region was studied for the contamination of copper, nickel and cadmium, which are necessary for solving practical problems of improving the environment.
2. It has been established that the concentration of Cu, Ni in old irrigated soil types increases. The source is, in our opinion, long-term applied fertilizers.
3. The concentration of cadmium in all the studied soils of the region is distributed evenly.

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