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ACCUMULATION OF HEAVY METALS IN MEADOW-ALLUVIAL SOIL LAYERS

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Abstract:
This paper was conducted on irrigated soils, and the leaching of accumulated heavy metals into the subsoil under field conditions, and the mobile forms of elements Cu, Zn, Pb, Ni, Cd, Cr, Co were observed. 1.34 → 3.68 → 3.68 → 1.96 → 1,34 → 3,68 → 3,68 → 1,96 → 3,13 → 6,65 → 1,17 times, the highest amount of copper is 218 (664 mg/kg) times of Maximum permissible concentration (MPC) in one kg of soil of the driving layer, and chromium is 22.5 mg/kg (3.75 times more than MPC), ion of zinc has been found to have increased by 3.77-1.46 times. A reduction of mobile heavy metals was observed in the following decreasing order by using soil water for 6 months: Cu → Ni → Cd → Co → Cr → Zn → Pb.

Keywords: Soil, water, rice plant, heavy metals, bioaccumulation

BEGINNING. In order to increase the productivity of irrigated areas, improve land reclamation and water supply, large-scale irrigation and land reclamation measures are being implemented within the framework of state programs. However, as a result of global climate change, periodic water shortages and the failure of the main part of internal irrigation networks in recent years have led to the deterioration of irrigated cropland land reclamation and its disuse for years.

Agricultural land areas are affected by heavy metal contamination of agricultural products, primarily due to the movement of existing toxicants in the trophic chain system "atmosphere → soil → plant → product → animal ↔ human". Toxic heavy metals accumulate in the human body as a result of entering the human body with plant products.

REVIEW OF LITERATURE. Heavy metal toxicity has proven to be a major threat and several health-threatening diseases are associated with it. The toxic effects of these metals, although they do not have any biological role, exist in one form or another and are harmful to the human body and its proper functioning. A few metals, such as aluminum, can be MPCoved by elimination, while some metals accumulate in the body and in the food chain, causing chronic diseases [3]. Heavy metals enter the human body through the gastrointestinal tract, through the skin or by inhalation [4]. Industrial activity in the last century development has increased the level of exposure to heavy metals on humans . Mercury, lead, chromium, cadmium, and lead are the most common heavy metals that cause human poisoning [1].

RESEARCH RESULTS. Irrigated meadow-alluvial soils were selected for field research, and this area is located in the territory of the "Scientific Production Center of Grain and Rice" of the Nukus District of the Republic of Karakalpakstan, "Shortanboy" block (contour #1744).

Analyzes of available heavy metals in the soil was carried out on the basis of the "Methodical manual for the determination of heavy metals in agricultural areas by soil and plant products types", 5 grams of soil passed through 0.25 mm sieves were dissolved in 1 normal HNO 3 acid , prepared aqueous solution It was checked on the AVIO-200 device [2, - 61 p.].

Analysis of heavy metals was carried out in the soil of the field, which was cleared of alfalfa, and it was determined that the element cadmium was present in different amounts. 1.54 mg/kg in the layer up to 200 cm, i.e., the driving layer of section 1 (0-40 cm), is 3.08 times more than the MPC (the MPC of mobile form cadmium is 0.5 mg/kg for soil), 40- 12.1 mg/kg at 70 centimeters, 24.20 times more than MPC, 1.27-1.02 mg/kg towards layers 70-94 and 94-110 cm, 2.54-2.04 times higher than MPC It was determined that it accumulates less than 23.40-30.20

mg/kg in the 30-50 cm layer of sections 2A and 2B, and 2.54 times increase in the driving layer of section 2A (Table 1).

Table 1.
Accumulation of toxic heavy metals in meadow alluvial soils of Shortanboy block, Grain and Rice Research and Production Association, Nukus District, Republic of Karakalpakstan, mg/kg

Section	Depth, cm	Cd	MPC	Co	MPC	Cr	MPC	Pb	MPC	Ms	MPC
No			0.5		5		6		6		23
1	0-40	1.54	3.08	3.98	-	18.2	3.0	6.54	1.09	<0.1	-
	40-70	12.1	24.2	6.05	1.21	12.3	2.1	9.08	1.51	31.9	1.39
	70-94	1.27	2.54	6.11	1.22	<0.1	-	3.16	-	<0.1	-
	94-110	1.02	2.04	6.02	1.2	<0.1	-	7.83	1.31	42.5	1.85
	110-150	<0.05	-	6.78	1.36	27.6	4.6	7.74	1.29	3.79	0.16
2	0-30	<0.05	-	5.12	1.02	22.5	3.75	<0.3	-	37.4	1.63
	30-50	13.2	26.4	2.55	-	14.2	2.37	5.77	-	26.7	1.16
	50-80	0.75	1.5	4.85	-	<0.1	-	<0.3	-	19.7	-
	80-100	0.76	1.52	3.43	-	<0.1	-	2.44	-	51.2	2.23
	100-150	0.28	-	3.94	-	33.6	5.6	<0.3	-	42.6	1.85
	150-200	0.9	1.8	5.76	1.15	<0.1	-	17.3	2.88	0.033	-
2A	0-30	1.27	2.54	5.96	1.19	<0.1	-	<0.3	-	43.6	1.9
	30-50	11.7	23.4	6.53	1.31	<0.1	-	20.3	3.38	<0.1	-
	50-80	<0.05	-	0.84	-	<0.1	-	17.5	2.92	15.9	-
	80-100	<0.05	-	2.09	-	5.15	-	<0.3	-	114	4.96
2B	0-30	<0.05	-	<0.1	-	<0.1	-	1.69	-	<0.1	-
	30-50	15.1	30.2	2.89	-	<0.1	-	13.5	2.25	75.8	3.3
	50-80	<0.05	-	4.29	-	17.3	2.88	14.6	2.43	86.6	3.77
	80-100	<0.05	-	3.58	-	<0.1	-	<0.3	-	<0.1	-
3	0-30	0.5	1	4.73	-	<0.1	-	18.4	3.07	33.6	1.46
	30-50	1.95	3.9	7.13	1.43	<0.1	-	<0.3	-	<0.1	-
	50-80	2.78	5.56	1.82	-	<0.1	-	7.99	1.33	<0.1	-
	80-100	<0.05	-	4.9	-	<0.1	-	13.6	2.27	47	2.04
	100-150	<0.05	-	2.72	-	<0.1	-	20.6	3.43	<0.1	-
	150-200	<0.05	-	5.67	1.13	<0.1	-	12.1	2.02	7.46	-
3A	0-30	<0.05	-	2.63	-	<0.1	-	<0.3	-	18	-
	30-50	<0.05	-	2.2	-	<0.1	-	3.79	-	18.6	-
	50-80	<0.05	-	5.3	1.06	<0.1	-	11.7	1.95	<0.1	-
	80-100	<0.05	-	7.22	1.44	<0.1	-	<0.3	-	43.8	1.9
3B	0-30	<0.05	-	2.92	-	<0.1	-	12.1	2.02	<0.1	-
	30-50	2.1	4.2	4.02	-	<0.1	-	7.52	1.25	6.12	-
	50-80	1.9	3.8	4.2	-	<0.1	-	22.7	3.78	25.9	1.13
	80-100	2.37	4.74	<0.1	-	<0.1	-	12	2	16.3	-

In the soil samples of the third section 30-50 and 50-80 cm higher than MPC by 3.90-5.56 times, and 2B-section 30-50, 50-80, 80-100 cm higher than MPC by 4.20-3.80-4 It was found to increase by .74 times (Table 1).

Analyzes were compared based on our assumption of the same stratum interval for comparison across strata, i.e. matching samples from genetic soil strata. As a result of the analysis, it was proved that the results of the driving layer correspond to each other. Because it was found that cadmium increased by 24.2 times from MPC in the soil of the plowing layer of 40-70 cm, and cadmium increased by 26.9-23.4-30.2 times from MPC in soil samples taken from 30-50 centimeters, respectively. The MPC for mobile cobalt in the soil is 5 mg/kg, and the beginning of contamination with the element can be observed in the collected soil samples (Table 1).

The highest level of cobalt was found to be 7.13 mg/kg in the 30-50th layer of the 3rd section, which is 1.43 times more than MPC. Towards the lower layers, it increased from MPC to 1.06-1.44 times.

MPCs of chromium, nickel, lead and zinc elements in mobile form in the soil composition are 6 mg/kg, 4 mg/kg, 6 mg/kg, 23 mg/kg.

In the conducted soil analysis, it was found that mobile Cr, Ni, Pb and Zn elements are more than MPC, and all elements are more than MPC in the same measure. Chromium element was observed to accumulate from 22.5 mg/kg to 33.6 mg/kg in cutting depths. It was found that it increased 3.75 times from MPC in the 0-30 cm layer, 2.37 times under driving, and 5.6 times in the 100-150 cm layer.

It was found that nickel contamination was uniform in the soil layers of all sections. It was observed that 5.35-6.6-4.47-13.6-8.48-5.4-8.63 mg/kg was accumulated in the soil layers (0-30 cm) (Fig. 1).

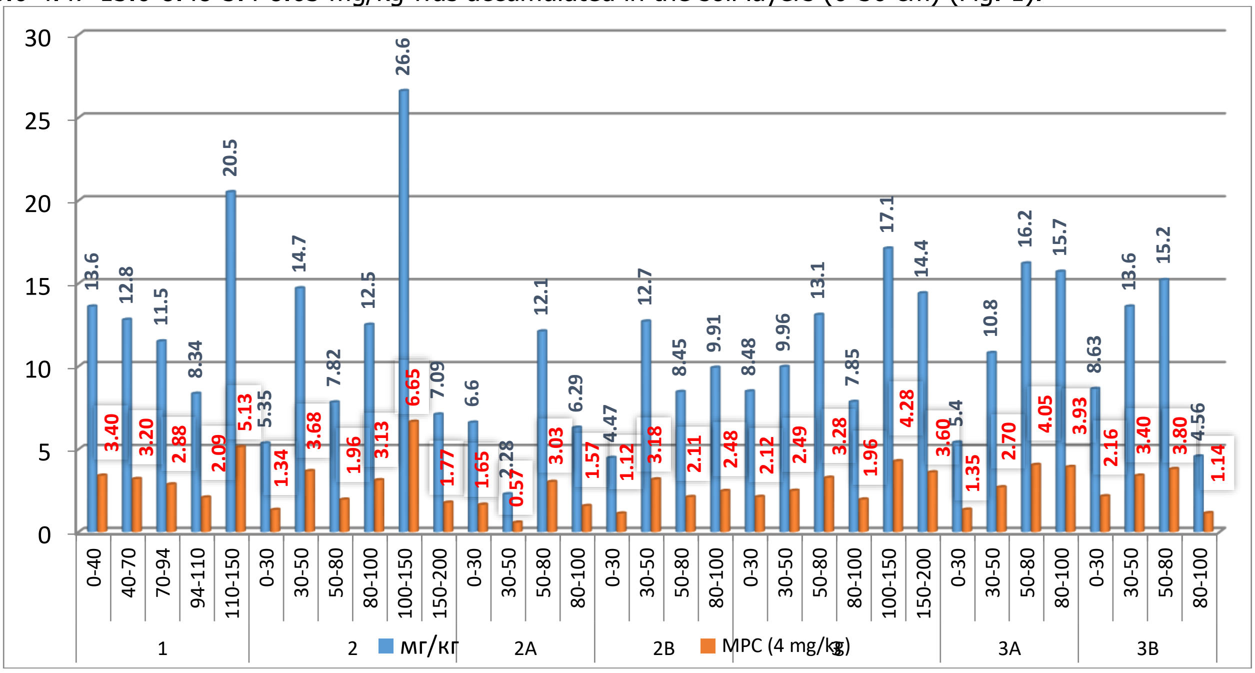

Figure 1. Accumulation of nickel in mobile form in soil layers (in blue) and high accumulation from MPC for soil (in red) are shown.

2.28 mg/kg to 14.7 mg/kg in sub-driving (30-50 cm) soils, 26.6-17.1 mg/kg in 100-150 cm layers, and 6.65-4.28 times from MPC was observed to increase. 1.77-14.4 times more accumulation than MPC was observed towards the bottom 200 cm layer.

The increase in the mobile form of lead from MPC was detected in all cross-sections of the soil samples. Towards the lower 150-200 cm layers of section 2 is 17.3 mg/kg, which is 2.88 times more than MPC. An increase of 2.25-3.38 times from MPC was observed towards the lower layers of sections 2A and 2B. 18.04 mg/kg to 22.7 mg/kg were accumulated in the soil samples taken from section 3 and auxiliary sections.

According to chemical analysis, the copper element (MPC 3 mg/kg) is in high amounts only in the soil samples of the 2nd section, it was observed that the copper element in one kilogram of soil increases from 799 milligrams in the driving layer of 0-30 cm to 358 milligrams towards the lower layers. This shows that it is 266.3-119.3 times higher than MPC. We can say that the increase of the copper element is the excessive use of copper sulfate against plant diseases (Fig. 2).

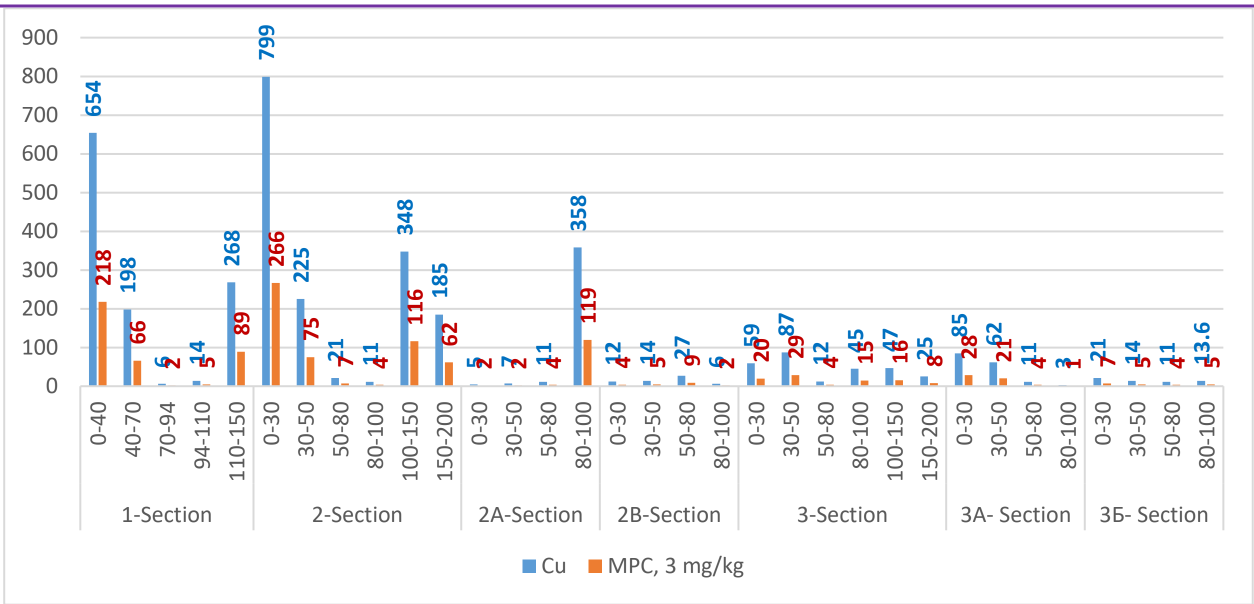

Figure 2. The difference in the amount of copper in the mobile form in the soil composition and MPCs

In the first year (2021) of the research, repeated sections were taken from the sections where the soil samples were taken previously after the harvest in the fields planted with rice, and chemical analysis was carried out.

Heavy metals was similar to the leaching of salts to the lower layers. A reduction of heavy metals in the soil layers was observed, and a reduction in the amount of toxic heavy metals was determined.

Table 2
Leaching of elements to the lower layers of the soil in reducing the amount of toxic elements in rice fields, mg/kg

Section, no	Soil layer, cm	Cd	MPC 0.5	Co	MPC 5	Cr	MPC 6	Cu	MPC 3	Ni	MPC 4	Ms	MPC 23
1	0-40	<0.05		2.9	0.58	2.77	0.46	3.97	1.32		1.00	7.73	0.34
	40-70	0.06	0.12	2.72	0.544	2.12	0.35	3.18	1.06	3.4	0.85	6.83	0.30
	70-94	<0.05		3.07	0.614	2.78	0.46	5.17	1.72	4.33	1.08	7.4	0.32
	94-110	0.01	0.02	3.64	0.728	2.92	0.49	12.2	4.07	6.39	1.60	9.46	0.41
	110-150	<0.05		1.48	0.296	2.22	0.37	1.97	0.66	2.35	0.59	5.1	0.22
	150-200	0.68	1.36	3.63	0.726	2.64	0.44	7.39	2.46	5.36	1.34	6.83	0.30
2	0-30	<0.05		2.93	0.586	2.69	0.45	3.51	1.17	5.14	1.29	9.3	0.40
	30-50	<0.05		2.32	0.464	2.01	0.34	<0.3		4.27	1.07	7.36	0.32
	50-80	0.37	0.74	2.18	0.436	2.35	0.39	<0.3		3.04	0.76	6.04	0.26
	80-100	1.82	3.64	4.06	0.812	3.22	0.54	9.07	3.02	6.38	1.60	9.35	0.41
	100-150	<0.05		2.13	0.426	1.4	0.23	<0.3		2.65	0.66	5.26	0.23
	150-200	<0.05		3.87	0.774	2.98	0.50	1.63	0.54	4.61	1.15	6.16	0.27
2A	0-30	0.04	0.08	3.22	0.644	2.58	0.43	1.63	0.54	5.12	1.28	8.06	0.35
	30-50	<0.05		2.48	0.496	2.13	0.36	1.09	0.36	3.09	0.77	5.58	0.24
	50-80	0.01	0.02	2.16	0.432	2.24	0.37	<0.3		2.67	0.67	5.11	0.22
	80-100	0.03	0.06	3.58	0.716	3.04	0.51	9.44	3.15	5.5	1.38	11.04	0.48
2B	0-30	0.03	0.06	2.34	0.468	3.25	0.54	5.24	1.75	4.47	1.12	8.1	0.35
	30-50	<0.05		1.46	0.292	2.82	0.47	<0.3		3.05	0.76	5.51	0.24
	50-80	<0.05		2.53	0.506	2.49	0.42	<0.3		4.07	1.02	4.76	0.21
	80-100	<0.05		4.16	0.832	3.31	0.55	13,21	4.40	5.19	1.30	10.81	0.47
3	0-30	<0.05		3.52	0.704	2.61	0.44	7.62	2.54	3.33	0.83	6.33	0.28

	30-50	0.04	0.08	3.62	0.724	0.94	0.16	42.84	14.28	4.83	1.21	8.21	0.36
	50-80	<0.05		4.32	0.864	2.23	0.37	43,21	14.40	6.45	1.61	11.59	0.50
	80-100	<0.05		3.48	0.696	2.31	0.39	46.06	15.35	5.31	1.33	11.92	0.52
	100-150	0.26	0.52	3.41	0.682	2.32	0.39	38.86	12.95	4.54	1.14	11.92	0.52
	150-200	0.18	0.36	3.05	0.61	2.27	0.38	41.38	13.79	5.24	1.31	11,12	0.48
3A	0-30	0.07	0.14	3.27	0.654	2.14	0.36	28.94	9.65	6.22	1.56	10.8	0.47
	30-50	0.04	0.08	4.25	0.85	3.04	0.51	14.94	4.98	6.01	1.50	11.92	0.52
	50-80	0.28	0.56	3.43	0.686	2.16	0.36	33.04	11.01	5.58	1.40	10.38	0.45
	80-100	0.37	0.74	3.36	0.672	1.71	0.29	40.5	13.50	5.2	1.30	4.54	0.20
3B	0-30	<0.05		4.07	0.814	2.9	0.48	43,18	14.39	6.33	1.58	14.48	0.63
	30-50	<0.05		3.21	0.642	2.69	0.45	33.87	11.29	4.57	1.14	11.25	0.49
	50-80	<0.05		2.46	0.492	1.57	0.26	16.7	5.57	2.82	0.71	4.8	0.21
	80-100	<0.05		3.43	0.686	2.51	0.42	28.6	9.53	4.26	1.07	9.85	0.43

In terms of leaching of elements, only low leaching of copper element was observed in cross section 3, which MPCained from 2.0 times to 12 times higher than MPC (Table 2).

In conclusion, in the soil samples taken from the area planted with alfalfa during the last few years, the element cadmium was around 23.40-30.20 mg/kg in the soil layers under plowing, and the accumulation of norms exceeding MPC, chromium, nickel, lead and zinc elements were 2-4 above MPC. times, and the copper element has been found to accumulate in soil layers more than other elements, up to 200 times higher than all elements. It is possible to observe the beginning of the boorization process after MPC in only cobalt element soil layers.

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