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СОВРЕМЕННОЕ СОСТОЯНИЕ ПРОБЛЕМЫ ПО УТИЛИЗАЦИИ ДОННЫХ ОСАДКОВ ВОДОХРАНИЛИЩ ЮЖНО-КАЗАХСТАНСКОЙ ОБЛАСТИ

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В статье рассмотрены существующее положение многих экологических проблемах, в свою очередь оказывающее негативное влияние на окружающую среду и человечеству. Регулярное использование минеральных удобрений в сельскомхозяйстве приводят обеднению почв ипотери плодородия. Поэтому в исследовательской работе изучена свойства донных отложений как перспективное удобрение для сельскохозяйственных культур. В данной исследовательской работе изучались пробы вод, донных осадков и растений окрестности водохранилищ. В статье дано экологическая характеристика водохранилищ. Определено гумусовой состав донных осадков. Показано перспективное использование утилизации донных отложений с помощью вермитехнологией. Изучались тяжелые металлы (Zn, Pb) в донных отложениях водохранилищ. В результате исследовательских работ повышенное содержание тяжелых металлов определено на втором образце (Ермак-Узен Zn 50,1±0,1 мг/кг, Pb 14,5±1,7 мг/кг). По сравнению с другими образцами, самый низкий уровень содержание тяжелых металлов составило в водохранилище Шерт (Zn) 27,1±1,1 мг/кг, (Pb) 9,9±1,2 мг/кг.

Ключевые слова. донные отложения, вермитехнология, удобрение, водохранилище, элементы, растения, тяжелые металлы, органика, микробиота

MODERN CONDITION OF THE PROBLEM ON THE RECYCLING OF THE DENIAL SEDIMENTS OF THE RESERVOIRS OF THE SOUTH KAZAKHSTAN REGION

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In general, many environmental issues around the world are intensifying, and they are also affecting on the environment and people. Fertilizers used in agriculture are causing damage to soil ecosystems and agricultural products. Therefore, it is crucial to obtain a new compositionally-made organic fertilizer that is harmless to agriculture by processing vertically-treated sediments from the reservoirs. Based on the research, chemical analysis was carried out on water taken from reservoirs, plant and bottom sediment content. The article describes the general ecological situation in reservoirs. Dimensions of humus occur in sediments. It is examined the possibility of using the sediments that accumulate at the bottom of water reservoirs through the vermitechnology process. Heavy metals' sizes were determined in the bottom sediments. The result of the study defined the highest sediment content of the Ermakozen water reservoir (Zn size 50.1 ± 0.1 mg / kg, Pb14.5 ± 1.7 mg / kg). The lowest content of heavy metals was in the Shert reservoir (Zn), zinc size was 27.1 ± 1.1 mg / kg, lead size (Pb) was 9.9 ± 1.2 mg / kg.

Keywords: bottom sediments, reservoirs, vermitechnology, fertilizers, reservoirs, elements, plants, heavy metals, organics, microbiotics

Water reservoir is one of the most polluted objects in the environment. The accumulation of sediments is one of the main problems in today's water ecosystem. They are often polluted by anthropogenic. And polluted water and bottom sediments affect on the local ecosystem. In addition, sediment residues that emerge from water objects, water treatment facilities, dams, and reservoirs occupy large amount of land. In addition, the toxicological microorganisms contained in bottom sediments are the source of many diseases. These bottom sediments are often not recycled. In this regard, further process of formed sediment residues is not systematized. . However, mineral and organic substances that are contained in bottom sediments can be used as fertilizers. In foreign countries, bottom sediments of water reservoirs and formed wastewater sediments are used in agriculture up to 10 – 90 % [1–3]. Bottom sediments are formed mainly due to the removal of sedimentary matter by rivers from the continents (85–90 % of the total), the actual oceanic sedimentation and volcanic activity. On a smaller scale, they are supplied by glaciers, associated with sea erosion and wind activity. Annually in the World Ocean comes 27.1 billion tons of substance (about 18 km3). According to other estimates (Lisitsyn, 1988), only the annual river runoff is 23.92 billion tons. In addition, in the waters of the ocean in the form of suspended matter up to 1 370 billion tons of substance. The bulk of the sediments is delayed to a depth of 3 km. Only 7.8 % of the sediment flow penetrates the pelagic zone. The total amount of precipitation at the bottom of the pelagic regions of the World Ocean is approximately 133 million km3. In the oceans, there is a kind of cycle of sedimentary matter: it comes from the continents, forming a sedimentary layer, which later along with the lithospheric plates is dragged into the absorption zone (subduction), where it is melted and returned to the surface in the form of igneous material in island arcs. Weathered, it again descends into the ocean. According to genesis, bottom sediments are divided into terrigenous, biogenic, volcanogenic (pyroclastic), polygenic and authigenic (AP Lisitsyna, 1974). Terrigenous (clastic) deposits are the result of erosion activity on the continent or in the marine basin. The largest sources of sediment are rivers. Wash products are carried throughout the ocean by various transportation processes, including gravity flows, landslides and landslides, wind, in high latitudes by ice and icebergs, as well as in the form of eolian dust. Once in the ocean, the terrigenous material is transferred to the deep-water basins, passing through a series of intermediate reservoirs on continental shelves, in lagoons and estuaries. Terrigenous deposits are characteristic mainly for coastal zones and outlying continents. In agriculture, sapropel is used as a fertilizer (after freezing, water is separated, the structure is a loose state). It is especially effective for use on acid and light sandy and sandy loamy soils, as well as to increase the humus content in soils, (the dose for grain crops is 30–40 t / ha, for vegetable, potatoes and fodder roots 60–70 t / ha), for cooking compost.

Results of studying the formation of landscape features of bottom sediments are shown in researches of scientists like V.A. Alabishev, R.S. Berg, V.G. Glushkov, M.D. Grodzinsky, and S.V. Kostrikov [4–5].

Water sediments play a significant role in the functioning of the aquatic ecosystems and the hydrochemical regime of water masses as a complex multi-structure system. They are involved in the substance and energy circulation in the water, and many benthos are the habitat for animal organisms. The correct sediment residues are used as fertilizers to increase soil fertility and increase agricultural production. The presence of organic matter in the soil increases the ability of plants to absorb nutrients. In the UK, the use of sediment residues for agricultural purposes is about 1.5 %. Putting the bottom sediments into the field, it is possible to cover the needs of phosphorus, nitrogen, and potassium in agriculture. The obtained organometallic fertilizers on the basis of water sediments should have some requirements: In the first place, there should be no chemicals, toxicity xenobiotics, heavy metals, pathogenic-microbiots.

The object and method of research

The object of scientific research is water reservoirs of South region like the Koshkorgan, Ermakozen (Shashtobe) and Shert reservoirs, located in Turkestan area.

Works on identification of chemical and organic composition of water and bottom sediments in Koshkorgan, Ermakozen, Shert reservoirs were carried out in the Laboratory of Ecological Control and Chemical Analysis of Ecology. Methods of chemical analysis were used on the basis of State standard in scientific research. Detection of organic matter in the sediment was carried out in accordance with GOST 26213–91. In the determination of heavy metals, the T-Lab inversion wave formometric analyzer was used.

Results and discussion

The detected amounts of heavy metals found in bottom sediments and water, vegetation in the water reservoirs are shown below in the table №1.

Table 1

Experiment №	The amount of heavy metals					
	Zn			Pb		
	Bottom sediment, coastal soil, мg/кg	Plant, мg/кg	Water, мg/l	Bottom sediment, coastal soil , мg/кg	Plant, мg/кg	Water, мg/l
Koshkorgan						
1	37,2±0,5	77,5±0,5	0,42±0,02	9,72±0,3	12,8±1,5	0,19±0,02
Ermakozen						
2	50,1±0,1	36,9±0,7	1,05±0,1	14,5±1,7	1,75±0,5	0,39±0,01
Shert						
3	27,1±1,1	28,6±1,1	1,14±0,4	9,9±1,2	-	0,43±0,02

Table 2

Chemical composition of water reservoirs

Components description	Water reservoirs		
	Koshkorgan	Ermakozen	Shert
Dry esidue,mg/l	525,0±0,1	198,0±0,2	379,0±0,1
Sulfate, mg/l	132,8±0,5	37,6±0,01	76,0±0,03
Solidity, mol/l	12,0±0,2	5,0±0,1	6,0±0,5
Nitrate, mg/l	1,8±0,2	1,4±0,1	0,9±0,02
Chloride, mg/l	28,4±0,1	21,3±0,2	24,8±0,4
Hydrocarbonate, mmol / l	4,0±0,05	3,0±0,03	3,0±0,01
Nitrite, mg / l	0,0395±0,002	0,066±0,003	0,069±0,001
Ammonium, mg / l	6,8±0,2	8,9±0,5	14,0±0,4
pH	6,7–7,3	6,8–7,1	6,9–7,2

Table 3

Humus content of bottom sediments in the water reservoirs, %

№	Bottom sediment extracted from water reservoirs	Humus, %
1	Koshkorgan,0–10 cm	1,39
2	Koshkorgan, 10–30 cm	0,61
3	Ermakozen, 0–10 cm	0,21
4	Ermakozen, 10–30 cm	0,01
5	Shert,0–20 cm	2,21

The study showed that bottom sediments of Ermakozen reservoir are heavily polluted by heavy metals. And the amount of zinc in the vegetable composition on the coast of the Koshkorgan reservoir is higher than that of other samples. The transboundary quantity is directly related to the amount of soil. The amount of zinc and lead contained in Shert water reservoir is 2.5 times higher than in that Koshkorgan reservoir. Compared with the total water content in the reservoirs, it can be assumed that the sulfate in the water is caused by the reaction of chloride ions into lead and insoluble compounds. The amount of sulfate contained in the Koshkorgan water reservoir was 132.8 mg / L, Yermakozen – 37.6 mg / L, Shert – 76.0 mg / l (Table 2).

Depending on the amount of zinc and lead in the water, water reservoirs can be placed in the following line: Shert>Ermakozen>Koshkorgan. Comparing this information and the total water content, the low content of zinc and lead in the Koshkorgan can be explained by the high amount of humus (see Table 3), as well as the formation of insoluble or weakly soluble salts. Because humus compounds form humus, which is not soluble by heavy metals, the bottom is reduced.There are algae on the surface of Ermakozen and Shert reservoirs, and on the surface of the Koshkorgan water reservoir there are no algae.Heavy metals found in Shert and Ermakozen's algae, and the amount is not low than in threshold concentration.

Conclusion

Fertilizer properties of bottom sediments are used as fertilizers for water tinctures and it is estimated according to the state standard to GOST R 17.4.3.07–2001. The quantities of detected zinc and lead metals in the bottom sediments of water reservoirs are at the level of the standard requirements. In this regard, bottom sediments can be used directly as fertilizers.

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