THE IMPACT OF ENVIRONMENTAL FACTORS ON HEAVY METALS DELTA ECOSYSTEMS

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Abstract: *The main topic addressed in this paper is related to the problems and damage to ecosystems due to heavy metals and toxic pollution effects of which are developed both directly and indirectly.*

In an aquatic ecosystem metal toxicity can be influenced by variations of abiotic environmental factors such as oxygen, water hardness, pH and transparency.

The temperature, in particular, is an important factor influencing metal toxicity, because most aquatic organisms are poikilothermic.

Although hardness is widely recognized that affect the aquatic toxicity of metals, pH is often the biggest effect on metal toxicity.

To assess the influence of physical-chemical factors on the distribution of heavy metals in aquatic ecosystems were taken into account the following physico-chemical parameters: water temperature, water pH, electro-conductivity, dissolved oxygen content and total content of salts. The heavy metals have selected cadmium, chromium, nickel, lead, manganese and zinc.

Increasing water temperature increases metal concentrations in water and sediment. pH affects the toxicity of heavy metal salts, at a low level (at the upside of heavy metal toxicity).

Keywords: *environmental factors, heavy metals, temperature, aquatic ecosystems, sediments*

1.Introduction

In this paper special attention is given to conservation of sampling and water samples, sediments, plankton and plant material, specific methods for the determination of heavy metals and physical-chemical indicators , specific methods for quality assurance of chemical analysis metals and physical-chemical indicators , specific methods for quality assurance of chemical analysis. Recognized to the influence of micro-pollutants, heavy metals represented on the ecological status of surface waters, including delta ecosystems, the paper aims to study the impact of environmental factors (temperature, pH, electro-conductivity, total salt content, dissolved oxygen content) the presence of heavy metals in aquatic ecosystems of the Danube Delta Biosphere Reserve [1-5]. It presents a wide range of data on the concentration levels of heavy metals, both in terms of spatial distribution, and bioaccumulation in water samples, sediments, plankton and morphological parts of species that characterize Reserve aquatic ecosystems Danube Delta Biosphere, in terms of the levels and effects of heavy metal pollution. The practical value and theoretical significance of the results and conclusions arising from the work on the impact of environmental factors on heavy metals delta ecosystems [6,7]. To assess the influence of physical-chemical factors on the distribution of heavy metals in aquatic ecosystems were taken into account the following physico-chemical parameters: water temperature, water pH, electro-conductivity, dissolved oxygen content and total content of salts. The heavy metals have selected cadmium, chromium, nickel, lead, manganese and zinc [8-11].

Physico-chemical analyzes were performed in the chemistry laboratory of the National Institute for Research and Development Danube Delta, laboratory accredited to EN ISO / IEC 17025: 2005 by the Accreditation Association of Romania, RENAR .

2.Experimental

Determining pollution gradient and degree of accumulation of inorganic pollutants on substrates (water, mineral, vegetable) and for the purposes set out in this paper, we consider the aquatic complex Holbina- Dunavat, representative of the Danube Delta Biosphere Reserve.

Water samples were collected quarterly in 2013-2016. Sediment samples were collected annually in 2013-2016. Aquatic vegetation samples were collected quarterly in 2013-2016. He samples were mineralized in the microwave Anton Paar. Step mineralization is performed differently depending on the type of sample, in compliance with applicable standards and recommendations suggested by Anton Paar oven manufacturer. The types of samples are: samples of surface water, sediment samples, samples of plant material (Phragmites australis (reed) Typha angustifolia (rush).

Atomic absorption may be used to determine very low concentrations of ions in solution. This method is widely applied in biological samples, metallurgical, geological or to determine pollution.

Values with concentrations in the control charts are determined to be valid measurements, respectively in Xm +/- 2 S, (mean +/- standard deviation of all measurements). Figure 1 diagrams represented cadmium control indicator.

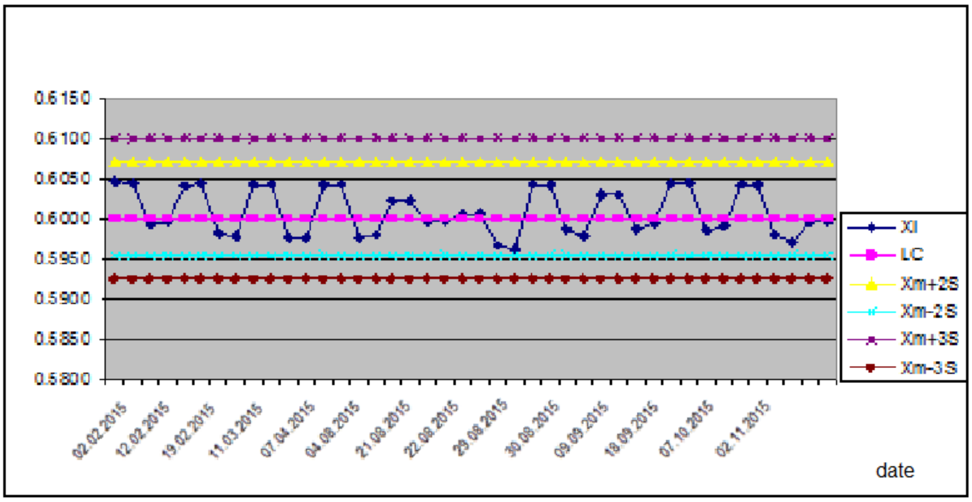

Figure. 1. *Diagram of control indicator cadmiu*

For comparative tests extraction and analysis, the same type of sample, we have established two systems of extraction and analysis:1. Mineralizorul Skalar and atomic absorption spectrometer VARIAN AA100 and 2. Anton Paar microwave oven and mass spectrometer with inductively coupled plasma ICP-MS Elan DRC is. Samples of water, sediment and reed treated by both methods were taken starting from 2015 in aquatic complex Holbina- Dunavat .

The temperature, in particular, is an important factor influencing metal toxicity, because most aquatic organisms are poikilothermic. Although hardness is widely recognized that affect the aquatic toxicity of metals, pH is often the biggest effect on metal toxicity. Some studies show that low levels of pH in water reduces the toxicity of cadmium in seaweed and fish. It has also been suggested that the toxicity is low due to the competition between ions H + and metal cations free transport mechanism. Other factors that may play a role are: organic matter, carbon dioxide, metabolic activity, period (time) of halving the metal, suspended solids, total organic carbon (TOC), the interaction between pollutants, stage of development and changes bodies intraspecific the susceptibility of metals. The influence of these factors on the distribution of physical-chemical, metal, occurs either through direct action on the physiological activity of the body's metabolic processes changing intensity or acting on the microclimate by changing the physico-chemical or pollutant concentration.

Result and discussions

The results show significant differences in metal concentrations obtained in terms of the type of aquatic vegetation.

The data presented are indispensable information to compare studies related to the environment. Therefore, these studies should become an integral part of sustainable development of ecosystems and pollution assessment programs.

Aquatic macrophytes have been shown to be potential sources of accumulation of heavy metals from water and moist areas. Of all aquatic macrophytes studied Ceratophyllum demersum showed the greatest potential for accumulation of heavy metals, followed by Typha angustifolia, Potamogeton pectinatus, Ceratophyllum submersum, Phragmites australis, Salvinia natans, Stratiotes aloides, figure 2 .

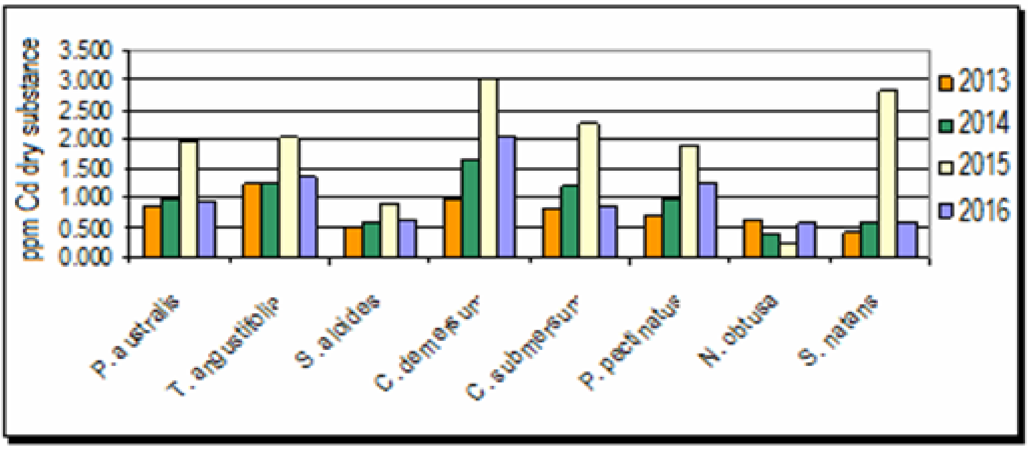

Figure.2. *Dynamic accumulation of cadmium in aquatic macrophytes complex Holbina-Dunavăţ*

To assess concentrations of metals, we considered the mean concentrations of cadmium determined in 2015 the aquatic complex Holbina- Dunavat .

Studying the ability to accumulate heavy metals in aquatic complex Holbina- Dunavat was concluded that Ceratophyllum demersum is the best "battery" of heavy metals with a high coverage of phytoremediation.

In relation to national quality standards for lake bottom sediment, most samples investigated in the period 2013-2016, had levels of manganese and zinc limits. Cadmium was the item that recorded the highest percentage of exceedances of the standard for quality, as shown in Figure 3.

To calculate bioaccumulation factors were taken into account the average annual values of concentrations of heavy metals in water and helofile two species, Phragmites australis and Typha angustifolia, Table 1.

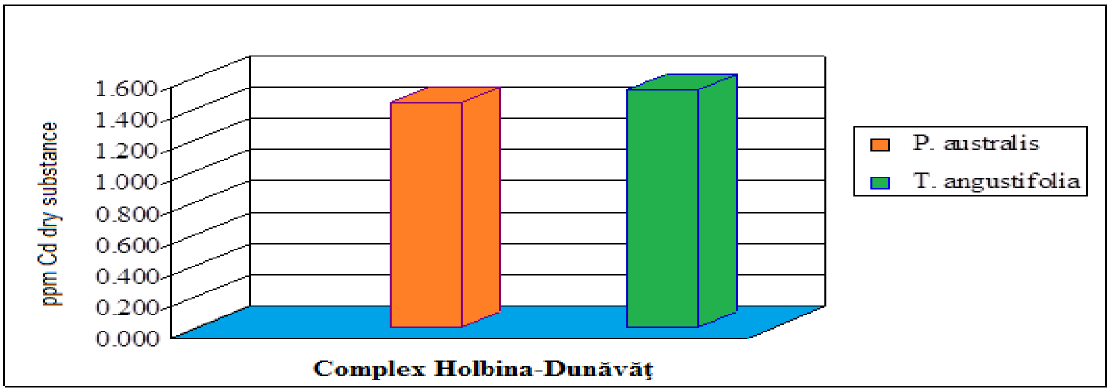

Figure. 3. *Dynamics of cadmium concentrations in samples Phragmites australis and Typha angustifolia, aquatic complex Holbina- Dunavat .*

Table 1. *Values factors bioaccumulation of heavy metals in aquatic vegetation in Holbina- Dunavat .*

Complex aquatic	**Vegetation aquatic**	**BCF Cd** [L/kg]	**BCF Cr** [L/kg]	**BCF Ni** [L/kg]	**BCF Pb** [L/kg]	**BCF Mn** [L/kg]	**BCF Zn** [L/kg]
Holbina - -Dunavat	P. australis	71.212	67.603	126.327	14.288	33.251	106.696
	T.angustifolia	91.692	85.427	135.518	1.000	41.955	188.235

Analyzing large amounts of bioaccumulation factors obtained for these two species studied macrophytes in aquatic complex, we conclude that both species have shown great potential for bioaccumulation of heavy metals. In general, the order growth factors bioaccumulation of heavy metals in the two species studied helofile the pool complex is as follows:

BCF Pb < BCF Mn< BCF Cr < BCF Cd < BCF Zn < BCF Ni.

Plankton is sensitive to the presence of a wide spectrum of pollutants and, therefore, the diversity of species, and / or abundance can be used as an indicator of water quality. Chemical analysis of plankton could give indications of the level of pollutants such as heavy metals. Given the advantages that the knowledge of the distribution of heavy metals (cadmium, chromium, nickel, lead, manganese and zinc) in plankton, we considered the average annual values of metal concentrations determined in the period 2013-2016, the aquatic complex Holbina - Dunavat.

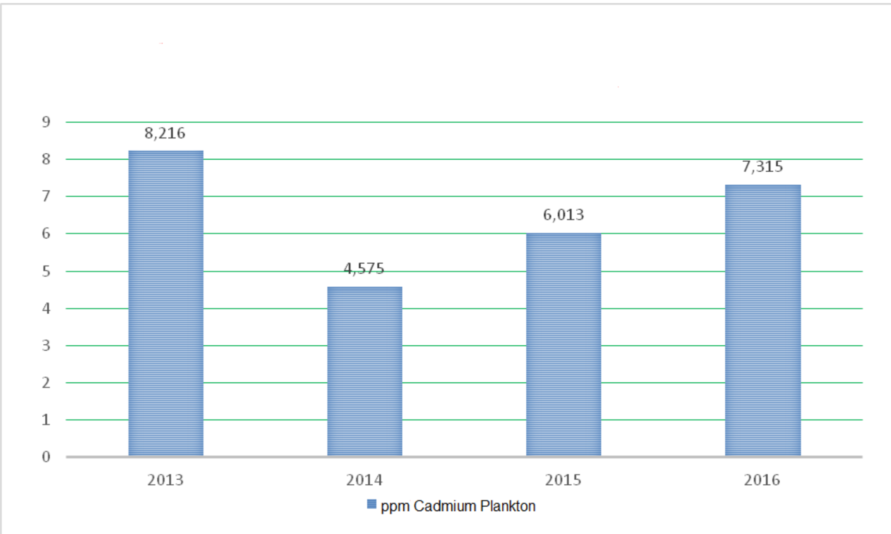

Figure. 4. *Chart accumulation of cadmium in plankton taken from pool complex Holbina- Dunavat*

The plankton taken from pool complex Holbina-Dunavăţ was evident a considerable variation in the distribution of heavy metals. Figure 4 presents the results of the comparative assessment of the levels of heavy metals in aquatic complex plankton taken from Holbina-Dunavăţ.

The chemical composition reflects the composition of the soil and plant the plant surface contamination indicates the presence of contaminants harmful to the environment, in the air. In order to assess the accumulation of heavy metals in parts morphology of the species Phragmites australis, respectively, stalk, rhizomes and leaves, aquatic plant samples were collected at the stage of developing their most complex Holbina-Dunavat water in the summer of 2015. Analyzing the percentage values of the concentrations of heavy metals we observed that all the metals analyzed, namely cadmium, chromium, nickel, lead, manganese and zinc, accumulates mostly in the rhizomes samples Phragmites australis (between 37% and 75%), figure 5.

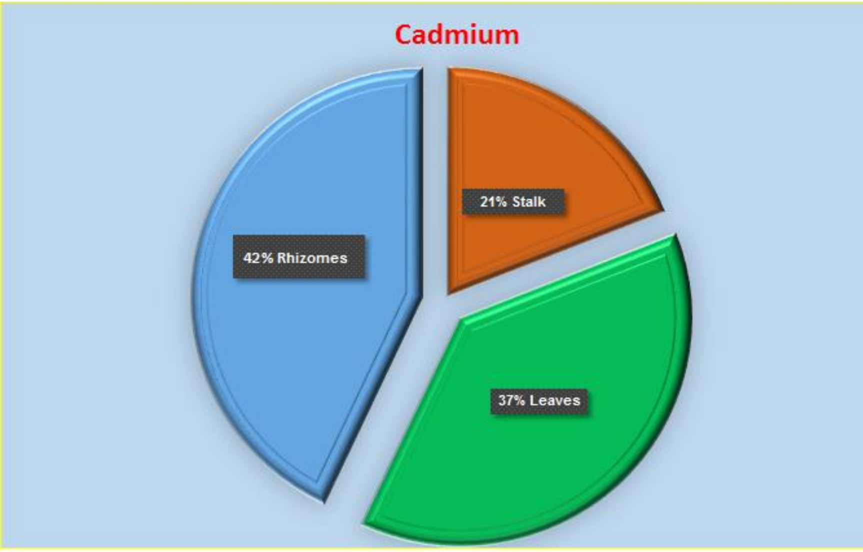

Figure.5. *Distribution of cadmium in shares of morphological species of Phragmites australis pool complex Holbina-Dunavăţ*

Heavy metals enter into ciclulul biological aquatic plants through the roots and leaves. They can directly affect plant growth, excessive intake of such elements in plants can also be dangerous for human and animal health.

In conclusion species of aquatic macrophytes selected Phragmites australis, Typha angustifolia, so take heavy metals from water and sediment (by-rhizome root system, highly developed) in studying aquatic complex.

Investigations on the use of aquatic macrophytes as bioaccumulate heavy metals as well as their ability to be used in modern techniques of cleaning a water body could be very useful for environmental monitoring and health check of the water body.

3.Conclusions

Chemical analyzes were performed by standard methods.

Analyzing the influence of physical-chemical factors (water temperature, water pH, electro-conductivity, dissolved oxygen content and total content of salts) on the distribution of heavy metals (cadmium, chromium, nickel, lead, manganese and zinc) in lake complex Holbina- Dunavat found that the influence of these factors acting on the microclimate manifests itself by changing its physico-chemical properties.

Increase water temperature increases metal concentrations in water and sediment, with certain exceptions; pH affects the toxicity of heavy metal salts, at a low level (at the upside of heavy metal toxicitye microclimate manifests itself by changing its physico-chemical properties.

Cadmium aquatic vegetation has resulted from a normal distribution.

Aquatic macrophytes having the ability to absorb and accumulate large amounts of heavy metals, have an important role as biofilters, bio-accumulate and bio-indicators. Similar trends accumulation of heavy metals in the analyzed samples show the universal importance of these aquatic macrophytes in environmental clean living.

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