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Analysis of Heavy Metals (ISP-OES) in Water (Akbulok, Kli, Tuzkon Lake) by Optical Emission Spectrometric Method

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Abstract
The article provides an optical spectrometric analysis of heavy metals (ISP-OES) in the water of the Akbulak and Kli rivers, which flow into Lake Tuzkon, the Aydar-Arnasay lake system, which is a natural body of water in Uzbekistan.

Keywords: Akbulak; Qli; Tuzkon; Heavy metals; Optical Emission Spectrometric method (ISP-OES)

Introduction
The Aydar-Arnasay lake system, Haydarkol (also known as Haydar Lake and Aydar Lake) is a lake in the northern foothills of the Nurata Range. Lake Haydarkol was formed in the late 1960s mainly by excess water from the Chordara Reservoir in southern Kazakhstan [1-3].

Most of the water entering the Aydar-Arnasay Lake System (AAKT) is collector water. These waters come through the Akbulak, Border Collector, Qli, Jizzakh Main Drain (JBZ) and Longitudinal (PK-6) collector-drains.

Today, the Aydar-Arnasay Lake System (AALS) is one of the newest and largest lake systems in Uzbekistan; it connects Aydarkol, Tuzkon and Upper Arnasay lakes.

Akbulak and Qli rivers are one of the main sources of water in the assessment of the water content of Lake Tuzkon. In these two experimental areas, the contamination of water with heavy metals, their relative distribution, as well as the determined parameters of the water content of AALS were compared [4-6].

Materials and Methods
The most important feature of analytical methodology is the determination of heavy metals with high accuracy up to the trace concentration. Voltammetry, ICP-OES, and UV-visible spectrophotometry are used to detect heavy metals in water. Bonded Plasma Optical Emission Spectrometry (ICP-OES) is one of the most widely used methods. One such method is that the Avio ™ (Avio200) system can perform even the most complex analysis [7-11].

Analysis of heavy metals in the water sample taken from AALS was determined by Avio200 (ISP-OES) optical emission spectrometric method.

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Analysis of heavy metals in the water sample taken from AALS was determined by Avio 200 (ISP-OES) optical emission spectrometric method in the "chemical analysis" department of the experimental biology laboratory of Gulistan state university.

Results and Discussion

For this study, areas of the Akbulak and Qli rivers, which flow into the Aydar-Arnasay lake system into Lake Tuzkan, were selected and water samples were taken. Samples were taken in the spring and fall, and the water content was analyzed after winter-spring precipitation and after summer evaporation [12-14].

The following 10 elements were analyzed using the ICP-OES method. Chromium (Cr), Cobalt (Co), Zinc (zinc) (Zn), Copper (Cu), Vanadium (V), Molybdenum (Mo), Tin (Sn), Lead (Pb), Cadmium (Cd)), Surma (Sb). The Permissible levels (PER) of these heavy metals in the study areas are summarized and discussed. The water samples were directly filtered and analyzed. As a result, no lead (Pb), Cadmium (Cd), Antimony (Sb) was detected.

Water samples from each sampling point were taken in pre-cleaned plastic containers. The analysis of the water content of the sampled areas for the spring autumn season of 2021 by the ICP-OES method is summarized in (Tables 1 and 2).

TABLE 1: **Water analysis (11.04.2021).**

Water sampling areas	**Cr (мg/l)**	**Co (mg/l)**	**Zn (mg/l)**	**Cu (mg/l)**	**V (mg/l)**	**Mo (mg/l)**	**Sn (mg/l)**
Akbulak	0.008	0.0002	0.007	0.0002	0.009	0.019	0
Kli	0.003	0.002	0.005	0.0002	0.007	0.02	0
Tuzkon	0.005	0.003	0.004	0	0.009	0.02	0

TABLE 2: **Water analysis (20.10.2021).**

Water sampling areas	**Cr (mg/l)**	**Co (mg/l)**	**Zn (mg/l)**	**Cu (mg/l)**	**V (mg/l)**	**Mo (mg/l)**	**Sn (mg/l)**
Akbulak	0.003	0	0.002	0	0.013	0.020	0
Kli	0.0004	0.0005	0.0003	0	0.014	0.024	0.002
Tuzkon	0.0004	0.001	0.002	0	0.015	0.027	0

As can be seen from the above tables, Cobalt (Co) and Copper (Cu) were detected from the heavy metals analyzed in the samples taken from the Akbulak area, but not from the autumn analysis. We can see that the amount of Vanadium (V) and Molybdenum (Mo) has increased. However, the amount of other heavy metals has decreased.

We can also see an increase in Vanadium (V) and Molybdenum (Mo) in the Qli River area. While Tin (Sn) was not detected in the spring samples, the autumn analysis found that Tin (Sn) was greater than REM. However, if Copper (Cu) was detected, it was not detected in the fall analysis and we observed a decrease in the amount of remaining heavy metals.

We can also see an increase in Vanadium (V) and Molybdenum (Mo) in the Tuzkan Lake area. However, the amount of other heavy metals has decreased.

How these harmful elements are added to water and their impact on living organisms is assessed as follows
Almost all of the heavy metals found in the analysis can be discharged into ore bodies through ore processing plants, metalworking, electroplating shops, dyeing shops of textile enterprises, mining and chemical industries, according to the analysis of the literature.

The amount in reservoirs for Chromium (Cr) should not exceed PN (Permissible Norm) for Cr (VI)-0.001 mg/dm^3, for Cr (III) - 0.005 mg/dm^3.

- Toxicity limit for Zinc (Zn) (toxic) PN Zn^{2+} -0.01 mg/dm^3

- The PN of Cobalt (Co) is 0.01 mg/dm^3.
- Vanadium (V) is mainly in the dispersed state and is found in iron ores, oils, asphalts, bitumen's, shales, coal and others.
- The limit of toxicity of vanadium (toxicological) PN is 0.001 mg/dm^3.
- The maximum allowable concentration of Molybdenum (Mo) in sanitary water basins is 0.25 mg/dm^3.

Copper (Cu) is one of the most important toxic elements. The main sources of copper in natural waters are aldehyde reagents used in the chemical and metallurgical industries to treat wastewater, mine water and algae. Copper can be formed by corrosion of copper pipes and other structures used in water systems. The maximum allowable concentration of copper in the water of reservoirs for sanitary and domestic use is set at 0.1 mg/dm^3 (maximum amount of damage), in the water of fishery reservoirs - 0.001 mg/dm^3.

Conclusion

Based on the above analysis, control of heavy metals not exceeding REM, assessment of water volume and quality in AALS water sources, forecasting water quantity and achieving water supply stability, improving and maintaining the ecological situation around AALS, development of biological resources and develops practical work aimed at developing the fishing industry in ensuring food security.

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