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Research Paper

Determination of Heavy Metals in the Lumbardhi River, Prizren - Kosovo

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Abstract - This paper elaborates the monitoring of surface water pollution in the River Lumbardhi of Prizren town, from the source of the river to the discharge into the other river known as Drini i Bardhë, monitoring the flow of the river both in rural and urban areas. The biggest problem in environmental protection is the quality of surface water. A number of chemical-physical parameters and some heavy metals have been analysed. Heavy metals analysis was done through the technique known as FAAS (Flame Atomic Absorption Spectroscopy), and the results show that concentration is within the permissible levels and as such do not pose a risk in the future for human health.

Keywords: *FAAS, Copper (Cu), Iron (Fe), Zinc (Zn), Nickel (Ni), Chromium (Cr)*

Introduction

The natural concentration of metals in raw water which has not been treated or purified varies from state to state, country to country. It depends on many factors such as geological structures, the soil, the acidity of the water and the particulate matter concentration. Most metal species in natural fresh water occur in organic compounds, organic complexes or colloids (Nalatambi, 2009). Major industrial sources include surface treatment processes with elements such as Cd, Pb, Mn, Cu, Zn, Cr, Hg, As, Fe and Ni, as well as industrial products that, at the end of their life, are discharged in wastes (Baysal *et al*., 2012). Therefore, World Health Organization (WHO) and European Community recommend controlling toxic metal ions in food sources in order to guarantee food safety and Flame Atomic Absorption Spectrometry (FAAS) is widely used and preferred for determination of toxic elements (Alpdoğan *et al,* 2016).

The Lumbardhi River emanates into the Sharri Mountains and flows into the White Drini. It runs through the middle of the city of Prizren (Abdullahu Sh., 1979). There are discharges of rural and urban waters without any prior treatment. Urban discharge waters originate from households, municipal services, industrial discharges, anthropogenic factors, agricultural waste, *etc*. (Çullaj, 2011). Unlike the municipal wastewater, whose composition is known, it is difficult to know the origin of discharge waters from different industries, pollutants and their specific components. Based on the samples taken in the field and the analyses carried out in the laboratory, the quality of surface water in the Lumbardhi River was assessed by pollutants, concentrations of some heavy metals, for the period February-March 2019. The aim of monitoring the quality of the Lumbardhi River surface water is to analyse its quality, the dynamics of change during water flows (melting of snow, rains, etc.). This is especially important in the Lumbardhi River where industrial, urban discharges take place, because pollution has a great impact on the quality of surface water and the environment.

Material and Methods

Physical and chemical parameter analyses have been done at the Laboratory of the Department of Food Science and Biotechnology at UBT Prishtina, in order to evaluate the real situation of the Lumbardhi River. Research has been carried out in six sampling points: Lumbardhi source - Prevalla (L1); Sredska (L2), Andrra (L3), City Park (L4), Vlashnje (L5), Drini i Bardhë (L6).

During the study, we have monitored the entire Lumbardhi River flow from its source to its joining with the River Drini i Bardhë. We think that there are still no measures taken by the municipal bodies for wastewater treatment, industrial ones and other recipients to make our river cleaner. The waterfall as an element of particular importance varies from season to season. This also causes the

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change of contaminants during the seasons of the year. The following physicochemical parameters are presented, as shown in the following tables as well as heavy metals: Copper, Iron, Zinc, Nickel and Chromium data are collected and recorded according to standardized methods. The above-mentioned metal concentration has been analysed using the analytical technique known as Flame Atomic Absorption Spectroscopy (FAAS) - Model Perkin Elmer AA300.

Sampling and sample preparation

The taking of Samples was done in the intervals of time: February, March 2019, in six sampling points. Taking the water sample for laboratory analysis is done according to the known standards, concretely according to the standard methods based on ISO 5667-5 of 2006, for standard sampling rules. Nitric acid (HNO_3) is added in water samples for heavy metal analysis during the sampling of water. For each metal we have prepared a series of standards with known concentrations from stock solutions with a concentration of 1000 mg/l (ppm) and then constructed calibration curves for each of them. Sampling points for monitoring the pollution of Lumbardhi are shown in Figure 1.

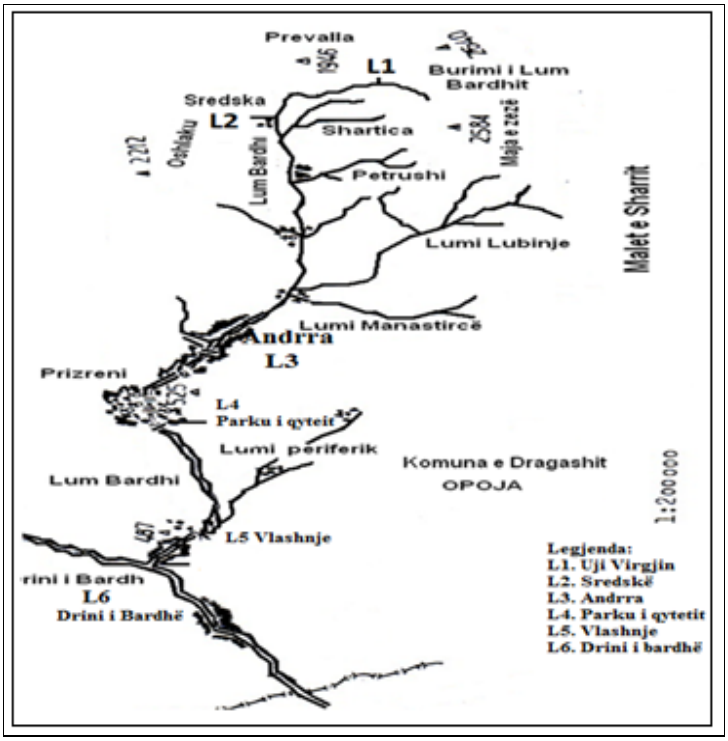

Figure 1. Sampling points map (Shukri, 1979)

Results and Discussion

Table 1. Some physico-chemical parameters in the Lumbardhi River for the period February - March 2019.

Sampling points	pH	Temp.	Saturation with O_2 (%)	O_2 mg/l (ppm)	Conductivity (µs/cm)	Time of sampling
L1. Virgin (Prizren)	8.26	13.3	88	8.4	173.6	11:00
L2. Streckë (Above Reqan)	8.44	8.5	88	9.1	223	12:05
L3. Andrra	8.24	9.1	89.2	9.2	218	12:50
L4. City Park	8.2	10.6	82.5	8.5	255	13:15
L5. Vlashnje	8.2	9.9	76.6	7.7	303	13:5o
L6. Vërmicë (Drini i Bardhë)	8.58	13.8	93.5	9.0	433	15:00

Table 2. Concentrations of some heavy metals in the Lumbardhi River for the period February - March 2019.

Sampling points	Cu (mg/L)	Fe (mg/L)	Zn (mg/L)	Ni (mg/L)	Cr (mg/L)
L1. Virgin (Prizren)	0.024	< LOD	< LOD	0	< LOD
L2. Streckë (Above Reqan)	0.093	<LOD	< LOD	0.01	< LOD
L3. Andrra	0.185	< LOD	< LOD	0.012	< LOD
L4. City Park	0.107	0.01	0.083	0.015	< LOD
L5. Vlashnje	0.234	0.015	< LOD	0.017	< LOD
L6. Vërmicë (Drini i Bardhë)	0.490	0.137	0.723	0.015	< LOD

LOD- Limit of Detection

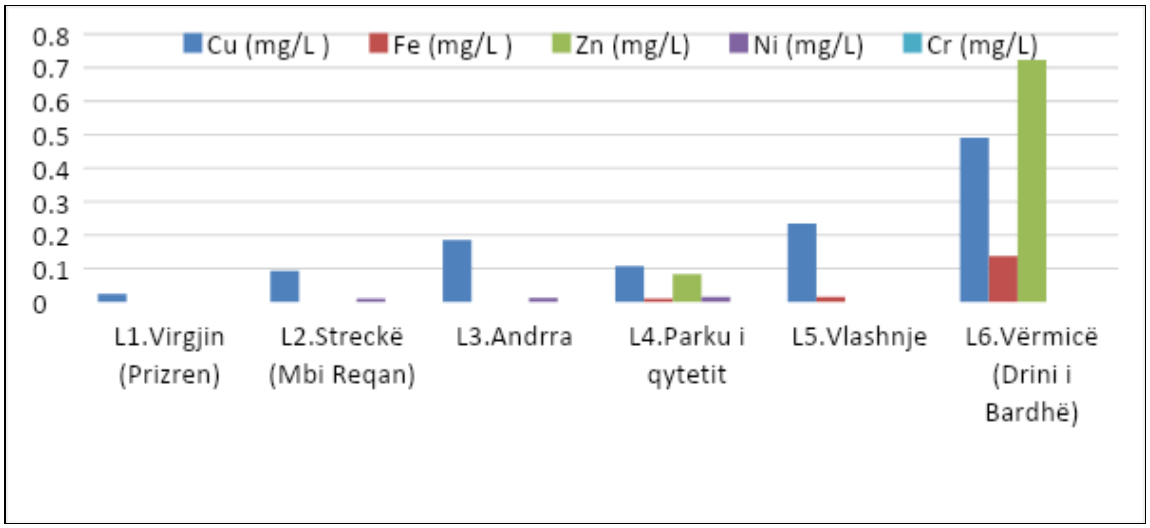

Figure 2. Graphic presentation of some heavy metals of the River Lumbardhi for the period February - March 2019.

Discussion

From tab. 2 and fig. 2 we can see that some heavy metals are present in the analysed water, but within permissible levels set by EU, WHO and FAO. Based on the methodology of the study we think that we have managed to qualitatively analyse the pollution of the Lumbardhi River in six locations during the interval February-March 2019. During the physical-chemical analysis of the surface water quality, the samples taken at the sampling points have variations regarding the concentrations of Copper (Cu.), Iron (Fe), Zinc (Zn) and Nickel (Ni). From the table 2 we can see that in all the analysed samples we have the presence of Cu though within permissible levels. From the sampling points regarding the Fe concentration, we can see that in three of them we have detected the presence of Fe, even though like with other metals the Fe concentration it was within the permissible levels. Zinc is detected only in the two analysed samples, although in one of them this metal exhibits higher values compared to other metals, probably as a result of the slightly larger pollution at this sampling point. According to the Ni concentration, we can see that almost in all analysed samples we have detected this heavy metal, and it is believed that this comes as a result that this heavy metal (mineral) is present in our region, given these that have been introduced since the eighties (Pula Xh. & Beqiri L., 1985). From the obtained results we can see that in all the analysed samples the concentration of Cr was not detected.

Conclusions

Based on the data presented in this article we can conclude that concentrations of analysed heavy metals in the water of Lumbardhi River are within the permissible levels and as such these heavy metals do not pose a risk to human health in the future.

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