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RESEARCH ARTICLE

Determination of Water Quality For Irrigation At the Entrance of Radoniqi Accumulation With Physicochemical And Bacteriological Parameters For the Period of Spring 2021

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ABSTRACT

Water quality research for irrigation at the inlet of Radoniqi reservoir with physicochemical, heavy metals and bacteriological parameters was conducted in the spring quarter period 2021, focusing on two sampling points: at the entrance of the derivation canal (Lumbardhi River of Deçan) and at the exit of derivative canal (near the Lake) as the main supply point. In order to know the degree of its quality, the identification of polluting sources has been performed, which in turn will enable the necessary steps to be taken by the management of RWC 'Gjakova' for their isolation. Also, to complete the study, research was done on heavy metals and other nutrients, in all sampling sites, and especially where there are significant sources of surface water pollution, as a result of human activity and discharge of untreated urban waters. So, the focus or purpose of the research is to reflect the situation as realistically as possible and this was done by determining the bacteria by the membrane filter method by counting the colonies in Petri dishes with VRB-agar, M-Endo Agar Less, CCA.

Keywords: Bacteriological examination; Diversion canal; Heavy metals; Irrigation water

INTRODUCTION

It is known that water is the main factor for the existence of life on our planet. Also, water is an essential substance necessary for the existence of the living world. Studies have shown that water was created on earth long before life was created. It is assumed that the process of organizing living matter and the evolution of the simplest forms of life took place in the liquid phase, in the seas. (Bajraktari, et all, 2019).

Although the amount of water in the soil is the same, it is increasingly polluted by different pollutants. So, the presence of water is of basic importance, while the research of the influence of the composition and structure of water, especially water in liquid aggregate state, is part of the field of contemporary life research at a higher level (Korca, 2003). Rivers are probably the most harmonious aquatic systems when it comes to transporting and interacting with micronutrients, especially heavy metals. Due to the rapid flow of river water, the interactions with rocks and the sedimentary surface of the river bed are very intense, therefore, each part of the river flow brings more or less changes in the content of the river (Polic, et al, 1999). The entry of contaminants into the environment due to human and natural activities is one of the most important issues facing today's communities.

Nowadays heavy metal pollution is a main problem in many developing countries like Kosovo. While the tendency for revival of the economy, relying on the activation of old inherited technologies, financial inability to introduce modern technology, outdated water infrastructure in urban areas, lack of wastewater treatment, disposal of industrial and urban waste in inadequate places, it is a source of water pollution. (Bajraktari, et all, 2008). The importance of water resources, particularly surface waters (lakes), in meeting the water needs of humans, animals and industries indicates the essential need to protect them against contamination.

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Fig 1. Photos from the field work at the sampling sites designated for the study (two derivative channels of accumulation).

Fig 2. Presentation of Radoniqi accumulation.

The catchment area for the filling of Lake Radoniq is 120 km^2 and it lies at an altitude of 600-1200m, which is a clear indication that the catchment area is far from settlements and sources of pollution. (KEPA, 2021).

Lake Radoniq was located in a surface area of 580 ha, at an altitude of 400-456 m. The main supplier of the lake is Lumëbardhi of Deçan and stream of Ratisha. Lumëbardhi Deçanit has an average flow during the year 5 m^3/s and summarizes water mainly from nearby springs. The water from Bistrica e Deçanit is brought to the lakes by means of a return structure which turns the water into an open concrete channel with a length of 7.2 km. The carrying capacity of the canal is 14 m^3/s, respectively 50400 m^3/hour. The lake has a volume capacity of 117.8 m^3 of water, is 5.2 km long and maximum width is 2.5 km, covers an area of almost 7.5 km^2 and has a depth of 52 m. (KEPA, 2021).

To arrive the needs for drinking water, irrigation, fishing, tourism and electricity generation, as in many places dams have been built to collect water from streams and rivers, during the high flow seasons to use it during the seasons when the rainfall is very small (Summer) in Kosovo this accumulation is built.

From the samples analyzed at specific locations along the two sampling sites, some of the heavy metals were analyzed; Pb, Cu, Ni, Cd, Fe, Zn, Mn, Cr, Co and Ni. Ca, Mg, Na and K ions and some other physicochemical and macro-pollutant parameters such as: dissolved oxygen (OT), ammonia, nitrites, and bacteria (coliform, fecal and living) were also analyzed. Although some of these metals are essential as micronutrients, their high concentration in the food chain can cause toxicity and environmental impacts and endanger aquatic ecosystems and their users.

MATERIAL AND METHOD

Apparatus and reagents

All the chemicals necessary for the determination of physical-chemical parameters, micro-pollutants, macro-pollutants and bacteriological ones during the analysis of surface water samples in two places of accumulation, have been of chemical purity "pro analysis" (p.a.). For measuring heavy metals was used AAS Beijing-Elmer analyst 400, Spectrophotometer UV & VIS secoman, Photometer PF-11 nanocolor-visocolor, conductivity type conductor/TDS Mettler Toledo NC126, pH meter consort C830, turbidimeter Aqua NU NTU/mineralizer (microwave) Ethos D Milestone. Also, the filtration of the samples was done with filters of the type:

(Millipore Millex-FH) Hydrophobic PTFE 0.45 m. While microbiological indicators: Coliform bacteria, bacteria of fecal origin and, live bacteria, in accordance with international standard ISO methods.

Working methods

The methods used to determine the parameters have been standard and instrumental methods of analysis. The apparatus used were those provided for the determination of the given parameter according to the given methods. (Standard Methods, 18th Edition, 1992).

While microbiological indicators: Coliform bacteria, bacteria of fecal origin and, live bacteria, in accordance with international standard methods ISO 9308-1: 2014; ISO 7899-2: 2000 and ISO 6222: 1999. Whereas, sampling and laboratory tests for physico-chemical parameters were performed in accordance with the following standards: ISO 5667-5: 2006; ISO 7150-1: 1984; ISO 6777: 1984.

Table 1: Evaluation of water quality for irrigation according to irrigation coefficient "k".

Irrigation coefficients "k"	Water assessment	Water use conditions
>18	Good	Can be used without measures against the deposition of harmful salts in the soil
18 - 6	Satisfactory	Special measures are needed to prevent the deposition of salts and salinization of the soil, except in well-drained soil
5,6 – 1,2	Inappropriate	Artificial drainage should be provided almost every time
< 1,2	Bad	It is not for irrigation

Table 2: Classification according to US Salinity Laboratory.

Class I - C_1	Water can be used for irrigation in all lands and for all crops.
Class II - C_2	The water can be used for irrigation of soils with good permeability (penetration) and for plants more tolerant to salts.
Class III - C_3	Water can not be used to irrigate lands that have no drainage; special measures must be taken to prevent salts, while it can be used for plants that tolerate the highest concentration of salts in water.
Class IV – C_4	Water is not suitable for irrigation if the soil is not permeable to water, if drainage is not built, and if plants that tolerate high salt concentrations are not cultivated.

Samples

Sampling is based on a preliminary study in such a way that water sampling sites, have a certain distance and appropriate, to see their change in flow water quality. Special equipment provided according to the standards were used for sampling. (Standard Methods, 18th Edition, 1992).

The accuracy of the laboratory analytical results has been verified by the General Association of Environmental Analysis Laboratories AGLAE. Test code: 08M1A3, in which 136 laboratories participated. According to this association, the results given by the reference samples were acceptable.

Scope of study

The objective of our study was to investigate the impact in agricultural areas. Because, these waters are used for irrigation in agriculture, and it is possible that these metals will accumulate in the lands where these plants grow and their use by humans and animals will negatively affect health. (Bajraktari N., et al, JEE 2019).

Table 3: Classification of irrigation waters according to Neugebauer.

Description of water	Kasa	Quantity of dry matter mg/l	Ion concentration in meq/l and Report
Water without remark	I_a	< 700	Ca+Mg/Na+K > 3
	I_b	< 700	Ca+Mg/Na >3
Good water	II	< 700	Ca+Mg/Na >1
Water to be analyzed	III_a	700 – 3000	Ca+Mg/Na >3
	III_b	700 – 3000	Ca+Mg/Na >1
Unsuitable water for irrigation	IV_a	< 700	Ca+Mg/Na <1
	IV_b	700 – 3000	Ca+Mg/Na <1
	$IV_{c,d,e}$	>3000	regardless of the ion concentration

Table 4: Orientation values of physicochemical elements of river quality according to the Instruction.

Type	Status	pH	O_2 dissolved mg/l	BOD_5 mg/l	COD mg/l	NH_4- mg/l	Nitrites mg/l	N-total mg/l	PO_4- mg/l	P-total mg/l
T1	L	7,0-8,6	>8,0	<1,50	<4,0	<0.10	<1.50	<2.0	<0.05	<0.09
	M	<7,0;>9,0	8,0-7,0	1,50-5,00	4,0-7,0	0.10-0.20	1.5-3.0	2.0-3.5	0.05-0.10	0.09-0.15
	Md	<7,0;>9,0	7,0-5,0	5,00-6,00	7.0-12	0.20-0.80	3.0-6.0	3.5-10	0.10-0.20	0.15-0.30
T2	L	7,0-8,6	>7,0	<4.0	<4.0	<0.10	<1.00	<1.5	<0.05	<0.10
	M	<7,0;>9,0	7.0-6.0	4.0-6.0	4.0-7.0	0.10-0.25	1.00-2.00	1.5-3.0	0.05-0.10	0.10-0.20
	Md	<7,0;>9,0	6.0-5.0	6.0-8.0	7.0-12.0	0.25-0.70	2.00-5.00	3.0-10.0	0.10-0.20	0.20-0.40

Table 5: Physicochemical parameters and heavy metals.

Results for three sampling periods with physicochemical parameters and heavy metals							
Settings	Units	First Period		Second Period		Third Period	
		I-Input	II-Exit	I-Input	II-Exit	I-Input	II-Exit
Time	t	10:57	10:22	9:45	9:35	10:27	10:45
Weather	/	Cloudy-before rain	Cloudy-before rain	Sunny	Sunny	Rainy	Rainy
Color	/	Colorless	Colorless	Slight turbulence	Slight turbulence	Slight turbulence	Slight turbulence
Odor	/	Odorless	odorless	Odorless	Odorless	Odorless	Odorless
T. H_2O	°C	7.5°C	11.2°C	8.6°C	9.2°C	7,4°C	7,1°C
T. air	°C	18°C	18°C	16°C	16°C	14°C	14°C
pH	/	7.95	7.95	7,75	7,95	7,14	8,24
Turbidity	NTU	1.30	1.45	21,1	19,1	17,8	19,8
Electrical conductivity	µS/cm	174,6	194,9	110,7	113,2	118,1	218,1
O_2 dissolved	mg/l	11.3	11.5	11,2	12,1	11,5	11,2
KM_nO_4	mg/l	1.08	1.0	2,51	2,83	0,75	0,75
Total hardness	°G	7,28	7,28	5,88	6,16	7,28	5,88
NH_4^+	mg/l	0.092	0.10	0,17	0,19	0,083	0,074
NO_2	mg/l	0.13	0.11	0,14	0,12	0,048	0,056
Ca	mEq/l	21.05	20.04	20,04	20,03	28,05	20,04
Cl	mEq/l	4,96	7,79	4,90	4,00	4,25	38,9
K	mg/l	0,722	0,075	0,887	0,901	0,990	1,077
Na	mg/l	6,833	0,722	7,837	8,123	9,007	9,690
Mg	mg/l	4.9	5,1	5.4	5,8	7.2	7,7
Fe	mg/l	0.21	0.31	0,28	0,25	0,07	0,11
Mn	mg/l	0,036	0,031	0,050	0,051	0,086	0,091
Zn	mg/l	0,042	0,041	0,071	0,047	0,055	0,066
Cu	mg/l	0,022	0,026	0,012	0,032	0,028	0,033
Cd	mg/l	0.003	0,028	0.022	0,030	0.004	0,006
Pb	mg/l	0.051	0,062	0.076	0,072	0.088	0,111
Co	mg/l	0,001	0,001	0,006	0,005	0,005	0,005
Ni	mg/l	0,001	0,001	0,003	0,006	0,008	0,012

Table 6: Microbiological parameters.

Results for three sampling periods with microbiological parameters							
Settings	Units	First Period		Second Period		Third Period	
		I-Input	II-Exit	I-Input	II-Exit	I-Input	II-Exit
Time	t	12:17	12:17	10:30	10:30	11:50	11:50
Air humidity	/	24%	24%	27%	27%	42%	42%
Laboratory air temperature	°C	25.9	25.9	23.9°C	23.9°C	21.5°C	21.5°C
Coliform bacteria	/	over 100 colonies	over 100 colonies	over 100 colonies	over 100 colonies	over 500 colonies	over 300 colonies
Bacteria of fecal origin	/	over 200 colonies	over 200 colonies	over 100 colonies	over 100 colonies	over 500 colonies	over 300 colonies
Living bacteria	/	over 100 bacteria	over 200 bacteria	over 100 bacteria	over 200 bacteria	over 150 bacteria	over 150 bacteria

RESULTS AND DISCUSSIONS

During this study, physicochemical parameters such as: temperature, pH, conductivity, dissolved oxygen, turbidity, potassium permanganate, chlorides, total hardness in German, ammonia, nitrite, magnesium, sodium and calcium were analyzed. Micronutrients such as; Fe, Mn, Zn, Cu, Cd, Pb, Co and Ni. In order to have a more complete condition, microbiological indicators such as: coliform bacteria, fecal bacteria and live bacteria were also researched. Although there are many classifications of irrigation waters, only those that are more in use will be considered; Based on the values of the irrigation coefficient, based on the US Salinity Laboratory and Prof. Neugebauer.

Irrigation coefficient according to Stabler, is determined based on the amount of sodium ion (Na^+), chlorine (Cl^-) and sulfate (SO_4^{2-}). Derived as a result of the evidence of the impact of salts on various plants given as a coefficient (k), to assess the quality of water for irrigation. The number of ions is expressed in milligrams equivalent, calculated according to the formula: Meq = $\frac{M}{n}$, while the irrigation coefficient is determined by the relation: $k = \frac{288}{5r \quad * (Cl^-)}$

Classification according to the US Salinity Laboratory - with this classification, the assessment of the suitability of water for irrigation is done on two bases: salinization and soil alkalization. For this purpose, a monogram has been drafted for the classification of irrigation waters. It relies on electrical conductivity values, as an indicator of salt concentration and SAR (Sodium Adsorption Ration) values, as an indicator of the relative activity of sodium in exchange reactions with soil, respectively, indicators of potential sodium adsorption.

On the other hand, to determine the risk of alkalization, the absolute and relative amount (content) of cations must be determined. If the sodium content is high, then the risk of alkalization is also high and vice versa, if calcium and magnesium predominate, then the risk is low. For this reason, knowing the relative ratio of sodium to other cations in irrigation water is of paramount importance. Sodium adsorption coefficient (SAR), is calculated according to the given formula: SAR = $\frac{Na^+}{\sqrt{\frac{Ca^{++} + Mg^{++}}{2}}}$.

Classification of irrigation waters according to Neugebauer. Neugebauer has given a special classification of waters for irrigation. In it, he gave special importance to the report; Ca+Mg: Na. The classification is based on the amounts of salts in water, dry matter (after drying) and the relationship between the concentration of Ca, Mg, Na and K.

The results which will be presented below belong to two sampling points: at the entrance of the derivation canal (Lumbardhi Deçanit) and at the exit of the derivation canal (Before entering the Lakes) during the Spring period, 2021. During this research period were taken 12 samples, once a month at two sampling points. “In situ” measurements were performed through mobile devices for measuring pH (pH meter), temperature and conductivity. Turbidity was measured using Turb.430 IR/T. While other analyzes for determination of ammonium ion, nitrites, bacteria and heavy metals were performed in the laboratory with appropriate apparatus and laboratory methods mentioned above. According to the Administrative Instruction MESP no. 16/2017 for the classification of surface water bodies, we have these orienting values of physical-chemical elements for surface waters.

Temperature

Temperature measurement was done at the sampling site with the help of digital thermometer. As the soil temperature increases, the activity of microorganisms increases, which is more active at soil temperatures of 10 – 400 °C. Water temperature as a main characteristic that affects water quality, can act as a catalyst, impeller or activator, stimulant, controller or as a killer to life in it. (Bajraktari, 2004). The highest temperature was during April (11.2 °C) and the lowest during June (7.1 °C), due to the large melting of snow in the mountains of Deçan, where the River Lumëbardhi of Deçan comes from.

pH

Low pH values affect the mobility of heavy metals in the soil and can be absorbed by crops and contaminate water bodies. The US recommends that the proper pH range be 6.0–9.0, Israel 6.5–9.5, Italy 6.0–9.5, and Portugal 6.5–8.4 (Jeong et al., 2016).

The pH determination was done on site sampling with the help of pH meter Multi 350i. Calibration of the apparatus was done using buffer solutions with pH = 4 and pH = 7. This determination is not hindered by turbidity, color, the presence of colloidal substances, oxidizing and reducing substances. The normal pH range for irrigation water is from 6.5 to 8.4. An abnormal value is a warning that water needs further evaluation. Irrigation water with a pH outside the normal range may cause a nutritional imbalance or may contain a toxic ion. (Ayers & Westcot, 1994) The pH values during the research period range from 7.75 - 8.24 in the two sampling sites in the derivative channel, which means that these waters are slightly basic, and are within the allowed values. The highest value was presented in June 8.24.

Turbidity

Turbulence is measured with a turbidimeter (model WTW Turb. 430IR) and expressed in NTU (Nephelometric Turbidity Unit Calibration of the apparatus was performed with standard solutions 0.02 NTU/FNU, 10.0 NTU/FNU, 1000.0 NTU/FNU. Turbidity measurement was done at the sampling site but also in the laboratory. Turbidity of irrigation water affects the hydraulic and physical properties of soils, including infiltration rate, hydraulic conductivity and porosity (Salamanti & Moazed, 2008). From the data processing it resulted that the turbulence values range from 1.30-21.1. This increase in values came as a rain and snowmelt in the mountains.

Electrical conductivity

Is a direct correlation with the quantity of ions dissolved in water? Like metal, water can conduct electricity as a resulof salts dissolved in water. Salts come from rocks broken by water passing over them (Nura, 2017). Because dissolved salts and other inorganic chemicals conduct electricity, the conductivity increases with increasing salt. Conductivity is also affected by temperature: the warmer the water, the higher the conductivity. Conductivity is useful as a general measure of water quality. Each water body tends to have a relatively constant range of conductivity that, once established, can be used as a basis for comparison with regular conductivity measurements. The measurement of the electrical conductivity of the waters of the two sampling sites in the study was done using the conductometric method. The measurement of electrical conductivity of samples was done at the point of sampling (in situ), but also in the laboratory. During the research period the values of conductivity varied from 110.7-218.1 from both sampling points, values which categorize these waters in the first category, excellent waters.

Dissolved oxygen

The measurement of dissolved oxygen in all samples was done at the sampling points but also in laboratories by means of oxygen-meter (Mettler Toledo). At levels around 5 mg/l of dissolved oxygen, irrigation water is usually considered acceptable for plant health. Levels of 8 mg/l or higher are usually considered good for crop production. If dissolved Oxygen levels are below 4 mg/l, the water is hypoxic and becomes very harmful, maybe fatal, to plants and animals. If there is a large deficiency of dissolved Oxygen, below about 0.5 mg/l, the water is anoxic. No plant or animal can survive in anoxic conditions (Becker, 2016). From the data processing it resulted that the amount of O_2 dissolved in both samples along the Derivative Channel varies from 11.2-12.1, which means that it is within the levels required for irrigation water.

Ammonium ions NH_4^+

Concentration of nitrogen nutrient salt in water like ammonia, nitrites and nitrates are causing the eutrophication process. Ammonia is a product of the decomposition of organic materials, it can also be toxic to fish and other aquatic organisms (Bajraktari N., et al., 2008). According to the FAO the permissible values of NH_4 are 0-5 mg/l. (Ayers & Westcot, 1994). The results obtained from the analyzes performed show that the values are within the FAO norms, from 0.074 - 0.19 mg/l, values made with digital photometer. Measurement limit value: 0.010-0.500 mg/l NH_4-N, using 50 mm cuvette.

NO_2- nitrites

Nitrite evaluation was done with a digital photometer, with measurement limit values: 0.002-0.200 mg/l NO_2-N, using 50 mm cuvette. Nitrites represent the intermediate state, both in the oxidation of ammonia to nitrates, as well as the reduction of nitrates. It is usually found in higher concentrations where the decomposition of organic matter takes place and is an indicator of pollution with organic substances (Bajraktari, 2004). Concentrations above 10 m/l can be toxic, for certain aquatic organisms even at a concentration of 1 mg/l (Nura, 2017). From the analyzes performed we see that the water in both test sites is within the allowed limits. The values found in our research are from 0.048-0.14 mg/l.

$KMnO_4$

Potassium permanganate is an inorganic compound composed of K^+ and MnO_4^- ions. It is a black crystalline salt that dissolves in water giving pink or purple solutions. The presence of $KMnO_4$ in water is an indicator of pollutants and organic matter. Values in our research are from 0.75 - 2.83 mg/l.

Chlorides-Cl

Chlorides are not absorbed or retained by the soil, so they move easily with soil water, are taken from the crop, move in the respiratory tract and accumulate in the leaves. If the concentration of chlorides in the leaves exceeds the tolerance of the crop, symptoms of damage develop such as burning of the leaves or drying of the leaf tissue. The most common toxicity is from chlorides in irrigation water. According to FAO the allowed values of Chlorides are 0-30 mEq/l. From the analysis of field data, we see that until June the values of Chlorides are within tolerable limits by FAO, while in June, respectively, in the second sampling point (Derivative Channel Outlet) we have a drastic increase of values of 38.9 me/l. All this increase in values has occurred as a result of wastewater discharges into the diversion canal.

Calcium-Ca

Ca, plays an extremely important role in the production of plant tissues and enables plants to grow better. Calcium is responsible for holding together the cell walls of plants. It is also essential in activating certain enzymes and sending signals that coordinate certain cellular activities. According to the FAO, the values of Calcium in irrigation water are from 0-20 mEq/l (Ayers & Westcot, 1994). Due to the rapid flow of river water, the interactions of rocks on the sedimentation surface of the river bed, are very intense, because each part of the river flow brings more or less changes in water content (Bajraktari et al., 2019). From data analysis we see that we have exceeded this standard. This is thought to be due to the carbonate composition of the Lumbardhi River bed. The values found in our research are from March 20 to May 28.

Most of the physic-chemical parameters are determined by standard methods: ISO 5667-5:2006; ISO 7150-1:1984; ISO 6777:1984.

Total hardness

Hardness is the notion used to describe the properties of certain solutes which lead to the deposition of metal carbonates. The main source of water hardness is $CaCO_3$ which dissolves easily in water containing carbon dioxide. Water hardness is expressed in mg $CaCO_3$ at $1dm^3$ or in degrees of hardness; German degree; a German degree is equal to 10 mg CaO or 7.19 mg MgO in 1 dm^3 of water (Bajraktari, 2004). From the analyzes performed we see that the water in the derivative channel is soft water and is within the values of the German allowed degree. Values were found from values 5.88 - 7.28 in German G' scale.

Microbiological parameters

There is growing evidence of the contribution of irrigation water to the contamination of products leading to subsequent outbreaks of food-borne diseases. Surface water is classified as one of the most hazardous water sources for irrigation by some international agencies because, among other reasons, it may involve untreated or untreated wastewater discharges (Tombini-Decol et al., 2016). From the analysis of the samples taken in the Derivative Channel we see that we have an increased number of Coliform bacteria, those of fecal origin and live bacteria. All these large values obtained after the analysis are as a result of wastewater discharges that occur along the course of the Lumbardhi River from where Radoniq Lake is supplied through the diversion channel. It should also be noted that this water is not treated for that reason we also have high values.

Total number of Coliform bacteria

Coliforms come from the same sources as pathogenic organisms. They are relatively easy to identify, are usually present in greater numbers than the most dangerous pathogens, and respond to the environment, wastewater treatment, and water treatment similarly to many pathogens. As a result, testing for coliform bacteria may be a reasonable indicator if other pathogenic bacteria are present (Department of Health, 2017). From the analysis of the data, we see that in June we have the highest number of Coliform bacteria, which suggests that we have other pathogens present in the water.

Evaluation of Fecal Bacteria

Fecal bacteria are the group of total coliforms that are considered to be specifically present in the intestines and feces of warm-blooded animals. Because the origin of fecal coliforms is more specific than the origin of the more general group of total coliform bacteria, fecal coliforms are considered a more accurate indicator of animal or human waste than total coliforms (Department of Health, 2017). From the analysis of the data, we see that in June we have the highest number of bacteria of fecal origin, which may be due to the discharge of sewage into the diversion canal.

Evaluation of living bacteria

Living bacteria or Aerobes are bacteria that can only grow and multiply in the presence of O_2. From the analysis of the data, we see that in June we have the same result in both sampling sites and it is slightly lower compared to the previous two months, and this is because during the months of June we have identified wastewater discharge which has also affected the decline of these bacteria.

Most of the physic-chemical parameters are determined by standard methods: ISO 9308-1: 2014; EN ISO 6222:1999.

Heavy metals

One of the most important functions of soil in plant growth is to provide essential plant nutrients macro-nutrients and micro-nutrients. The elements Cu, Fe, Mn, Mo and Zn for many plants are considered as essential plant micro-nutrients. The plant needs these elements only in very small values and are often toxic in high values. It is likely that other elements will be added to this list, as plant growth techniques are improved in environments where specific elements are lacking. Most of these element's act as components of essential enzymes, manganese, iron, chlorine and zinc, can participate in photosynthesis. Although not lightning fast for all plants, it is possible that sodium, silicon, and cobalt are essential nutrients for plants. (Bajraktari et al., 2019).

Iron and manganese are found in a large number of minerals in the soil. Sodium and chlorine (like chloride) are found naturally in the earth and are transported as atmospheric particulate matter. Iron gave values from 0.07 to 0.28 mg/l, while Manganese from 4.9 to 7.7. Some of the other micro-nutrients and trace elements are found in the primary minerals (non-dispersed) found in the soil. The trace elements mentioned above can co-precipitate with secondary minerals, which are constituents in soil formation. Such secondary minerals including alumina, iron and magnesium oxides. While zinc from 0.041 to 0.071, unlike copper which did not give a difference in this value, they were brought from 0.012 to 0.033. Low values gave cadmium from 0.003 to 0.03. Lead from 0.051 to 0.111 values hated in the last period of the season. Very low values gave Co and Ni, from 0.001 to 0.0012. It should be noted that some plants accumulate extremely high values of specific metals in the trace. Those that accumulate more than 1.00 mg/g of dry weight are called hyperacumulators.8 (S. E. Manahan, 1991).

For realistic assessment of the degree of pollution of a natural water and wastewater ecosystem it is necessary to know the exact concentrations of heavy metals. Heavy metals are among the most dangerous non-degradable pollutants. These salts in the form of salts pass into aqueous systems in different ways and then ionically bind to other compounds and after entering the body replace the essential metal in the cell and thus incubate the enzymatic reactions that lead to cell destruction giving effects toxic. The toxicity of heavy metals depends on the type of metal and the compound, the amount that reaches the body and the duration of action of the metal. (S. E. Manahan, 1991).

For the analysis of total metals, the sample was dissolved without prior filtration. The sample was diluted with HNO3 Nitric Acid. As for the analysis of soluble metals, the filtrate was analyzed directly, i.e., we did the preliminary filtering of the sample and finally the determination in AAS.

Thus, during this study, the determination of total metals in surface waters was made. Monitoring of elements and substances classified as micro-pollutants (heavy metals), have been studied and monitored in all sampling sites where other parameters have been researched and in particular where there are strong sources of water pollution, especially from industry and water polluted. Testing was performed according to ISO 8288-1986.

CONCLUSION

In the research part of the study the focus was on the monitoring of water quality which passes along the derivative canal of Lake Radoniq coming from the river Lumëbardhi of Deçan in a period of three months during the spring season. Based on the results obtained with the parameters analyzed from organoleptic, physicochemical, heavy metals to microbiological, it turns out that these waters are quite suitable for irrigation of agricultural lands with norms within FAO standards to acquire cultures with the epithet 'Bio'. Although there are many classifications of irrigation waters, only the ones that are most in use have been considered; based on irrigation coefficient values, based on US Salinity Laboratory and based on Prof. Neugebauer.

Analyzing the time when the study was conducted, we see that during April we have very good results in quality, which are more suitable for irrigation, while during May, we have a slight increase of parameters such as Fe, NH_4, NO_2, $KMnO_4$ and a high increase of turbulence which is thought to have come as a result of rainfall and continuous melting of snow in the spring or mountains. Whereas, on June at the outlet of the derivative canal we have a significant increase of chlorides and electrical conductivity, which is thought to have come as a result of illegal discharges of sewage. This fact is confirmed by the analyzes performed in the microbiological laboratory with coliform bacteria with a significant increase in relation to other sampling periods, those of fecal origin and live bacteria. So, we had an increase during June compared to April and May.

At the end of this paper, with these findings, we recommend that a more detailed control of the diversion canal be made, and that continuous inspection be made to prevent permanent and occasional sewage discharges, given that the impacts can be very large as this water is used continuously by citizens for domestic consumption (drinking water) after pre-treatment.

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Conflicts of interest

No potential conflict of interest was reported by the authors.

Authors' contributions

Conceptualization, Naser Bajraktari; methodology, Agron Shala and Defrime Berisha; software Arsim Elshani and Naser Bajraktari; validation Agron Shala; sampling, Agron Shala; Defrime Berisha and Arsim Elshani; writing—original draft preparation, Naser Bajraktari; supervision, Naser Bajraktari.

All authors have read and agreed to the published version of the manuscript.

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