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# The Assessment of Pollution in Zeza River Water through Microbiological Parameters

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**Abstract:** The environment pollution is the main problem in Albania and for Zeza River water as well.. Zeza River flows through the Fushe - Kruja town and joins the Gjola River near Koder – Thumane and together go to Ishmi River (Saraci. R 2002). During September 2014- September 2015 the river has been monitored periodically in two stations. **1:** Before Zeza River passes through the town of Fushe-Kruja (500-600m). **2:** After the river passes the town. Stations of taking samples are presented by tables and graphics. It is made a specific and detailed study with the focus of microbiological monitoring, in order to evaluate the real conditions of water in Zeza River. There are assessed Faecal coliforms and Total coliforms, that are the most fundamental indicators for the fecal pollution by waste waters. It is made also the statistical elaboration of data and their presentation with graphics and tables. Samplings transport and water testing is done according to the rules of International Standards. Faecal coliforms are tested by plating methods and Total coliforms by MPN test. This research assesses the quality of water in Zeza River, based on the microbiological analysis. The maximal values of Total coliforms for the two station of Zeza River are taking during spring-summer 2015 and the maximal values of Faecal coliforms are taking during spring 2015. Zeza River water was grossly polluted by Total and Faecal coliforms organisms during 2014-2015. The discharge of industrial and urban wastes into the river and mismanagement of agricultural practices are causing high water pollution and river conservation is threatened.

***Key words:*** *Total coliforms, Faecal coliforms, water pollution, indicators, MPN*

## Introduction

Fushe- Kruje town is located in a favorable position in the central part of country, near to the capital. Its source is from the east of mountains of Kruja. Zeza River is located in western Albania, as a branch of the Ishmi River. Zeza River flows through the town of Fushe- Kruja and joins the Gjola River near Koder – Thumane and together go to Ishmi River (Saraci, 2002). Zeza River stands for a regiment abductee, it's upper part has a deep bed of close to 79% sloping (Dhimitri, 1997). Since 2012 Zeza River has brought out five time by bringing enough damages for residents who have their hauses and businesses along the river bank.

As the major part of the rivers in Albania, Zeza River is exposed to different sources of pollution related to industrial and urban pollution, sewerage discharge, agricultural activity, and climate change which are associated with an increase in water levels, erosion and floods. In this paper we`ll present data about Total coliforms and Faecal coliforms, general characteristics, figures, their role as indicators of water pollution.

The aim of the study is to evaluate the microbiological parameters in Zeza River based on Directive of the European Parliament and given the importance of continuing studies of natural aquatic ecosystems. Monitoring for the presence of bacteria pathogens in essential evaluation of water quality, where the direct of indirect use leads to serious human health (Chapman, 1992).

Monitoration and evaluation of the quality of surface water, the level of pollution control and determination of the main pollutants emitted in them takes a special importance to recognize the situation and take measures to protection or rehabilitation of water facilities (MMPAU, 2012). Identifying sources of feacal pollution in water used for humans recreation and fish breedingis necessary to reduce the potential for human contact with enteric pathogens. Water contaminated with faecal matter has the capability to pose serious health risks for fish consumers and swimmers (Trevett, 2005).

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## Materials and Methods

During September 2014 - September 2015 the river has been monitored periodically at two stations. Stations of taking samples are presented by tables and graphics. It is made a specific and detailed study with the focus of microbiological monitoring, in order to evaluate the real conditions of the Zeza River water. Microbiological analyses of water are made in the Laboratory of Microbiology, near the University of Tirana. Samplings transport and water testing is done according to the rules of International Standards.

For sampling are used sterilized glass bottles, in a sterilizer at 180°C for 90 minutes. Each sample is associated with the label and identification: the station where the sample is taken, the date and time of sampling and water temperature (Hysko, 2012). Samples are transported to the laboratory within 24 hours, so that doesn't changes parameters.

The river runs through a wide bed with troubled waters during rain precipitation. In its water often are floating solid waste, especially plastic materials that are discharged from different parts. On both sides of the river there are many businesses and homes, who poured their waste into the river causing the river pollution.

For Zeza River are defined two water sampling points.
Station 1: Before Zeza River passes through the town of Fushe-Kruja (500-600m).
Station 2: After the river passes the town.

**Table 1.** Microbiological methods and nutritive terrain (APHA. 1992)

| Test | Methods | Temp.and time of incubiation | Nutritive terrain |
|---|---|---|---|
| Total coliforms | MPN | 37°C for 24 h | Lactoze Broth(LB) |
| Faecal coliforms | Plating | 37°C for 48 h | YEA |
| Dilution | 1/10 | Room temp. | Pepton diluents |

1.Determination of Total coliforms by the method of MPN tubes with lactose method Most probable Number or MPN known as methods zero Poissonit is a method to obtain quantitative data on concentrations of items discrete data from positive / negative (Taras, 1998) . MPN technique evaluates microbial populations in the field of liquid (lactose). Number of Total Coliforms was determined with the method of Most probable Number (MPN), which is the most likely number of Coliforms in 100 ml of water (Wilrich, 2010). The statistical evaluation is determined based on specific tables based on probability formulas. A series of tubes placed in the ground tripod liquid containing lactose equipped with small tubes Durham (used for gas gathering).

2. The presence of Faecal coliforms in aquatic environments may indicate that the water has been contaminated with the faecal materials of humans or other animals. Determination of Faecal coliforms by the methods of Plating. The temperature and the time of incubation is 37°C for 48 h. The nutritive terrain used is YEA. Total coliforms bacteria are gram- negative, oxidase negative that ferment lactose to produce gas at temperature 35-37°C. Four particular species of enterobacteriaceae family produce positive results as *Escherichia, Klebsiella*, *Enterobacter* and *Citrobacter*.

**Table 2**. Standarts of total coloformes for the water rivers quality (ISO 6222:1999)

| Total Coliformes | Very good quality | Good quality | Bad quality | Very bad quality |
|---|---|---|---|---|
| Cfu/100ml | 1250 | 2500 | 5000 | 10000 |

## Results and Discussion

During September 2014- September 2015 Zeza River is monitored periodically at two stations.
**1**- Before Zeza River passes through the town of Fushe-kruja (500-600m).
**2**- After Zeza River passes the town.

For the stations are identifying Total coliforms and Faecal coliforms . Data are shown in tables and graphics.

In the Figure 1 is shown the average of Total coliforms and Faecal coliforms which is presented in the station 1. As seen from the table and figure, the minimal value of Total coliforms is presented in

January 2015 with 260300 Cfu/100ml water, the maximal value is presented in July 2015 with 580000 Cfu/100ml water. The minimal values for Faecal coliforms is presented in September 2015 with 196000 Cfu/100ml water and the maximal values is presented in March 2015 with 383600 Cfu/100ml water. (Table 3 and Figure 1). During spring and summer 2015 are presented the maximal values of coliforms. Compared with previous years coliform values have increased in Zeza River , attributed to the high amount of raw sewage. ^

**Table 3.** Microbiological data for station 1

| Month | Total coliforms (Cfu/ml) | Faecal coliforms (Cfu/ml) |
|---|---|---|
| September 2014 | 530000 | 270000 |
| Octomber 2014 | 540000 | 310000 |
| November 2014 | 420300 | 350000 |
| December 2014 | 420300 | 350000 |
| January 2015 | 260300 | 331000 |
| February 2015 | 420300 | 350000 |
| March 2015 | 436300 | 383600 |
| April 2015 | 450000 | 370000 |
| May 2015 | 510000 | 365000 |
| June 2015 | 560000 | 340000 |
| July 2015 | 580000 | 300000 |
| August 2015 | 555000 | 272000 |
| September 2015 | 430000 | 196000 |

**Table 4.** Microbiological data for station 2

| Month | Total coliforms (Cfu/ml) | Faecal coliforms (Cfu/ml) |
|---|---|---|
| September 2014 | 680710 | 432000 |
| Octomber 2014 | 690900 | 450000 |
| November 2014 | 610200 | 560000 |
| December 2014 | 610200 | 560000 |
| January 2015 | 603200 | 652000 |
| February 2015 | 610200 | 560000 |
| March 2015 | 710300 | 695000 |
| April 2015 | 770000 | 610000 |
| May 2015 | 800000 | 570000 |
| June 2015 | 750000 | 535000 |
| July 2015 | 700000 | 500000 |
| August 2015 | 680000 | 493000 |
| September 2015 | 600000 | 380000 |

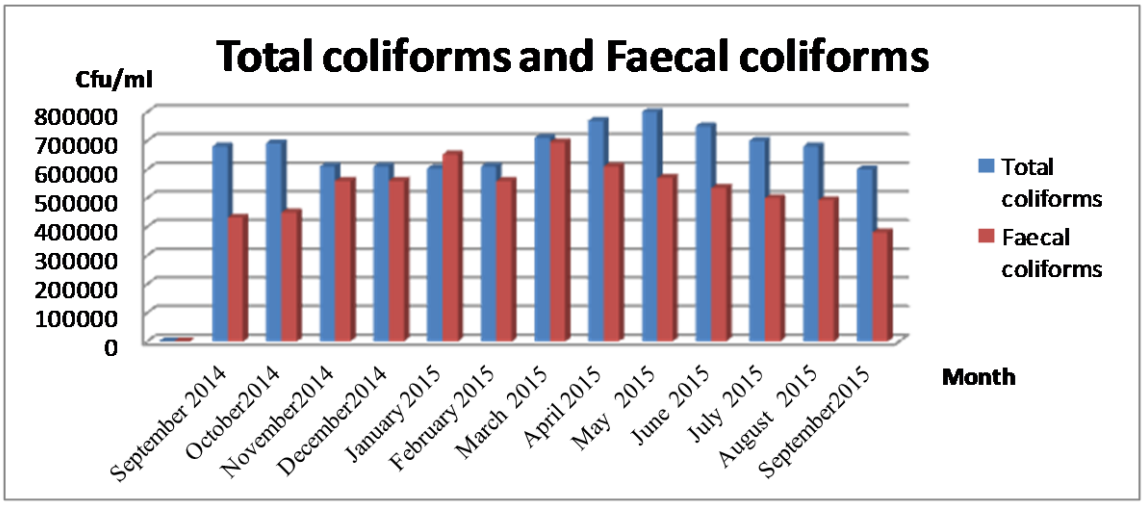


**Figure 1.** Values of Total coliforms and Faecal coliforms for station 1

**Figure 2.** Before Zeza passes through the town of Fushe –Kruje

**Figure 3.** After Zeza River passes the town of Fushe –Kruje

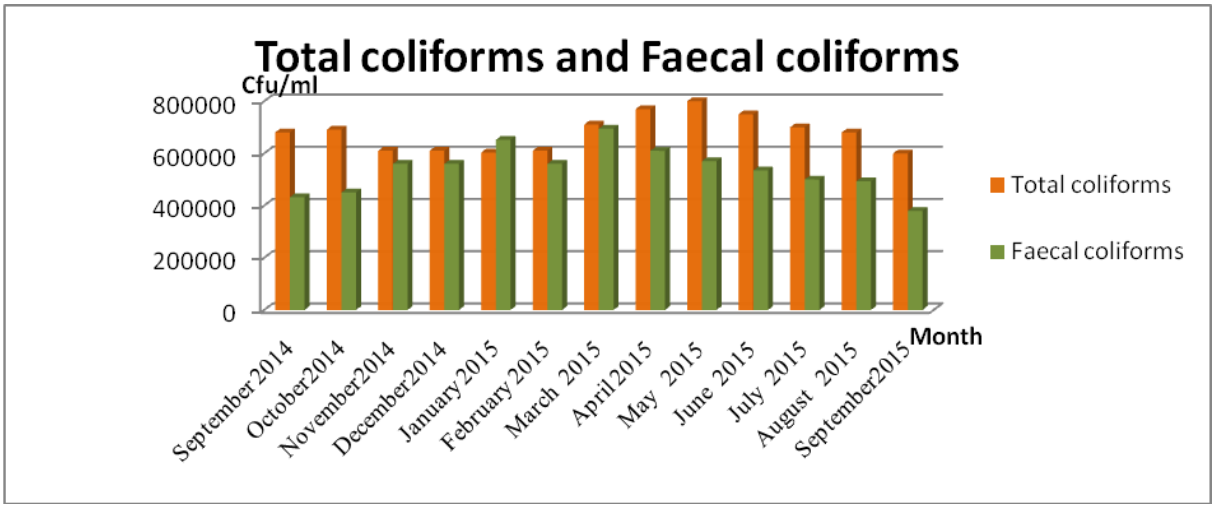


**Figure 4.** Values of Total Coliforms and Faecal coliforms for station 2

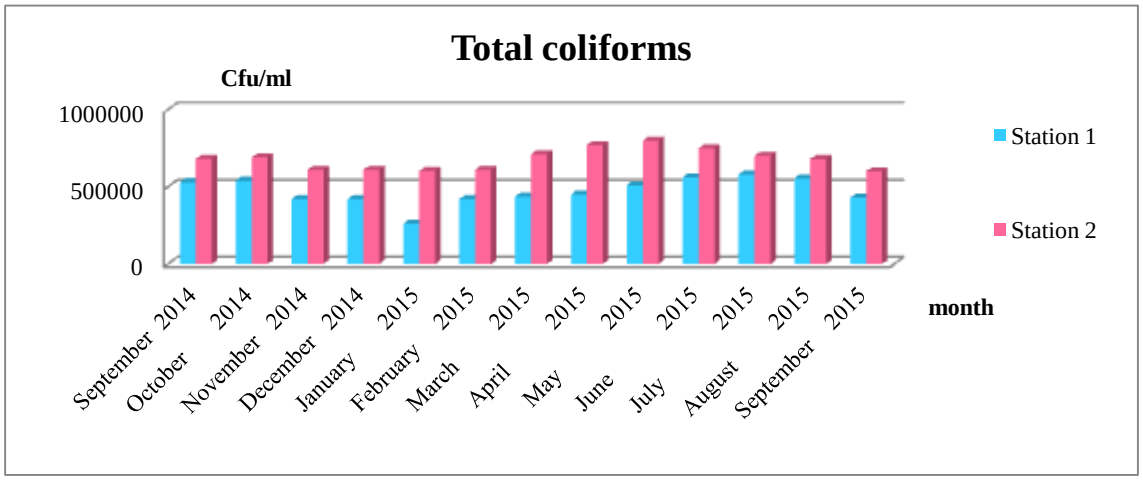


**Figure 5.** The comparison between two stations

In the figure 4 is shown the average of Total coliforms and Faecal coliforms which is present in the station 2 of monitoring. As seen from the table and figure, the minimal value of Total coliforms is presented in September 2015 with 600000 Cfu/100ml water, the maximal value is presented in May

2015 with 800000 Cfu/100ml water. The minimal value for Faecal coliforms is presented in September 2015 with 380000 Cfu/100ml water and the maximal value is presented in March 2015 with 695000 Cfu/100ml water. (Table 4 and figure 4). High microbial load in Zeza River make this river be allowed out of standards for the quality of river waters (ISO 6222:1999).

The figure 3 shows that the station number 2 presents the higher level of pollution in comparison with the station number 1. Possibly this is the effect of several businesses, which shed their waste waters and urban wastes directly into Zeza River. River during summer stinks causing infection risks, notably in the range where the river passes through Fushe-Kruja town and nearby the fruit markets and gas station who discharges theirs wastes into the river destroying the fauna of the river.

## Conclusions

During September 2014-september 2015 are tested and elaborated samples from the waters of Zeza River in order to asses the presence of Total coliforms and Faecal coliforms. The values of Total coliforms for the two stations are up the ISO standards of values. Based on the results Zeza River is considered with a high value of pollution. For the presence of Total coliforms the maximal value is presented in July 2015 with 580000 Cfu/100ml water. For the presence o Faecal coliforms the maximal value is presented in March 2015 with 695000 Cfu/100ml water. Monitoring and evaluation of the quality of surface water, the level of pollution control and determination of the main pollutants takes a special importance in order to recognize the situation and take measures for the protection and the rehabilitation of water facilities.

## References

Harikrishna AB, (2008) Study on the Quality of Water in Some Streams of Cauvery River, E-Journal of Chemistry, **5**, 377-384.

APHA.1992. Standart Methods for the examination of water and wastewater.18th. Ed. American Public Health Association, Washington, DC

Chapman D, (1992) Water Quality Assessments - A Guide to Use of Biota, Sediments and Water in Environmental Monitoring

Fish H, (1992) Freshwaters. In: Harrison RM, (Eds), Understanding our environment: an introduction to environmental chemistry and pollution. The Royal Society of Chemistry, Cambridge, pp: 53-68

ISO 6222 (1999): Water quality. Enumeration of cultivable micro- organisms. Colony count by inoculation in a nutrient agar culture medium.

ISO 9308- 1(2000): Detection and enumeration of Escheriachia coli and coliform bacteria. Part 1: Membrane filtration method. 2nd Ed. 2000-9-15.

Hysko M, (2012) Manual of Microbiology.SHBLU. Tirane

Saraci R, 2002) Erosion in river watersheds and erosion mapping of Albania. International Conference, Beograd, Serbia and Montenegro,.

Taras M, Greenberg A, Hoak R., Rand M, (1998) Bacteriological Analytical Manual 8th Ed. APHA, Washington.

Trevett AF, Carter RC, Tyrrel SF, (2005) The importance domestic water quality management in the context of faecal-oral disease transmission. *J. Water Health*., **3**, 259-270.

Wilrich P, (2010) Reconsiderations of the derivation of Most Probable Number , their standard deviations, confidence bounds rarity values. *J. Appl. Microbio*., **109**, 1660-7.