STUDY ON THE GROUNDWATER QUALITY IN MARU COMMUNE, CARAŞ SEVERIN COUNTY

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Abstract. *Groundwater is the largest freshwater reservoir in the world, accounting for more than 97% of all freshwater reserves available worldwide (excluding glaciers and glaciers). The remaining 3% consists mainly of surface waters (lakes, rivers, marshes) and soil moisture. Until recently, the focus on groundwater has mainly referred to its use as drinking water (for example, about 75% of European Union citizens depend on groundwater for water supply), but it has also been recognized as an important resource for industry and agriculture (irrigation). Underground waters are regarded as future water reserves and their use and introduction into the water circuit in nature must be done with great care and caution. In relation to surface water, groundwater has many advantages: it has a much larger surface area than rivers, meaning a much better graphics; being protected from pollution by covering layers, groundwater present a better quality, its physico-chemical properties are sensitively constant, hence the significant savings in the cost of water treatment; the aquifer is a true natural reservoir, just a surface dam, but this time it's covered. However, it has become increasingly obvious that groundwater should be viewed not only as a water tank, but must be protected for their environmental value. Under these circumstances, the knowledge of its quality becomes more and more necessary. Samples were taken from two springs,in October 2018, March 2019 and October 2019 one upstream Maru commune, another downstream and one fountain in the middle of the village. The analyzes were made in the Hydrology and Hydrogeology Laboratory of USAMVBT. Nitrates, nitrites, phosphorus, ph and water hardness were analyzed. As a result of the researches carried out, it was observed that the water quality is good, with small overruns at some parameters. The research carried out has a particular importance, given that a large percentage of the population uses this groundwater as drinking water.*

Keywords*:groundwater, quality, nitrates, nitrites, phosphorus, pH, water hardness*

INTRODUCTION

The European Union sets the legislative framework for the quality of water. Directive 2000/60/EC of the European Parliament and of the Europe Council from 23 October 2000 establishes the framework for water policy, also known as the "Water Framework Directive", is the basic law for drinking water for the countries of the EU.

In general and especially in Romania, are used two water sources: groundwater and surface water. Underground waters are regarded as future water reserves and their use and introduction into the water circuit in nature must be done with great care and caution.

In relation to surface water, groundwater has many advantages: it has a much larger surface area than rivers, meaning a much better graphics; being protected from pollution by covering layers, groundwater present a better quality, its physico-chemical properties are sensitively constant, hence the significant savings in the cost of water treatment; the aquifer is a true natural reservoir, just a surface dam, but this time it's covered (McGrory et all, 2017, Runkel et all., 2016).

Water resources represent a source for the normal development of the economy, ensuring balance in nature and ensuring the continuity of life, they must be used rationally in normal times and crisis (for example drought). Underground waters are known to be a good with ecological, economic value and as being a strategic resource, and the measures to be taken

aim at their proper use while maintaining their natural quality. Strategies must be as flexible as possible in order to respond effectively to changes in water use, new legislative, socio-economic or technical conditions, and severe environmental requirements as well as information from the public in view of increased scientific knowledge (FOSTER ET ALL., 2002). It is very necessary to be promoted and supported the integrated management, paying close attention to both aspects quantity and groundwater quality, taking into account the specific features of groundwater, which require special measures to protect aquifers. Groundwater legislation must contain measures to ensure its effective application, including all forms of manifestation and existence (for example mineral waters, drinking waters, thermal waters) as well as the subordination, attributions, competence and authority of the management and control bodies of the country's waters, by central units (Romanian Waters), territorial (Water Directorates) and studies and research and development in hydrology, hydrogeology and water management (INHGA).

The experience of the past 20 years on remediation of contamination has shown that the measures taken have not been able to completely remove all contaminants and that the sources of pollution, even partially removed, continue to release pollutants for a long time (for example several generations). Therefore, an important focus must first be placed on pollution prevention (RADULOV ET ALL., 2016, LI ET ALL, 2018).

Second, since the surface water systems receive the groundwater that supplies them, the quality of the groundwater will ultimately be reflected in the quality of the surface water. In other words, the effect of human activities on groundwater quality will actually have an impact on the quality of aquatic and directly dependent terrestrial ecosystems, if so-called natural attenuation reactions such as biodegradation in soil and subsoil are not sufficient to remove them contaminants.

Although point sources of pollution have caused most of the pollution identified so far, there are data showing that diffuse sources have a growing impact on groundwater. For example, nitrate concentrations currently exceed the limit values in approximately one third of Europe's groundwater bodies (SERIO ET ALL, 2018, OMER, 2016).

MATHERIAL AND METHOD

In this paper, was studied the underground water quality from Maru locality, a village in Zavoi commune, from Caras-Severin County, Banat, Romania. It is certified since 1387. At the 2002 census, Maru had 1,009 inhabitants. A large percentage of the population uses the water from these sources as drinking water, supplying them daily with water from these sources. In these conditions, the research carried out is important and welcome.

In order to track the quality of groundwater, samples were taken from two springs: one upstream of Maru and one downstream (Figure 1). Spring 1 is located in downtown of the village, and spring 2 springs directly from the mountain, being preferred by the locals on the principle that "sure the water is better!".

Samples were taken in October 2018, March 2019 and Octomber 2019 and were analyzed nitrates, nitrites, phosphorus, Ph and water hardness. The water analyzes were determined using the photocolorimeter from the Hydrology and Hydrogeology laboratory of the Geomatics Research Laboratory BUASVM Timisoara.

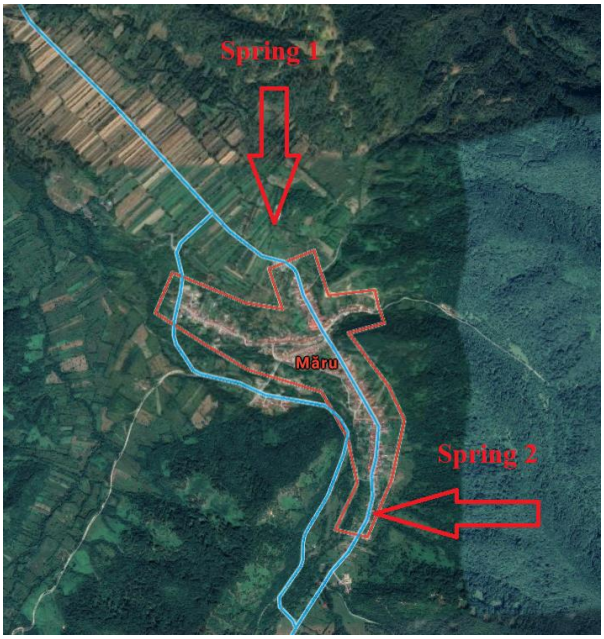

Figure 1 Localizarea izvoarelor

The results were interpreted and compared with the main parameters of physical-chemical quality indicators, according to the Law no. 311 of 28/06/2004, which amends and supplements the Law 458 of 2002, regarding the Quality of drinking water and completed by Emergency Ordinance No. 22/2017.

RESULTS AND DISCUSSIONS

Following the analyzes, it was determined that in October 2018, the nitrate content of 1.8 mg/l in spring 1, much lower compared to 9.4 mg/l in spring 2 (figure 2). Both values are well below the maximum accepted limit. Following the sampling in March 2019, the nitrate concentration of 1.6 mg/l in spring 1 and 5.4 mg/l in spring 2 was determined. In October 2019, nitrates are found in concentration of 2 mg/l in spring 1 compared to 3.1 mg/l in spring two. All nitrates values are recorded below the maximum acceptable drinking limit.

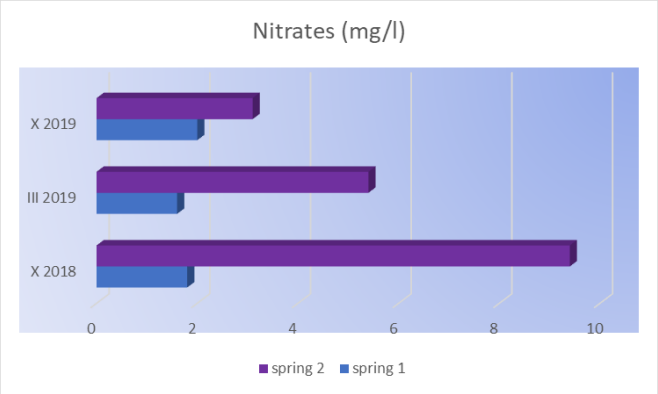

Fig. 2 Evolution of nitrate concentration

The amount of nitrites is very low, only 0.009 mg/l at spring 1 and 0.019 mg/l at spring 2, in October 2018. In March, 2019, the analyzes showed a very low concentration of only 0.004 mg/l at spring 1 and 0.011 mg/l at spring 2. The analyzes performed in October 2019 showed the same evolution of only 0.017 mg/l at spring 1 and 0.014 mg/l at spring 2. The maximum quantity of nitrites for drinking water is 0.50 mg/l, so no exceedance is recorded on this indicator (figure 3).

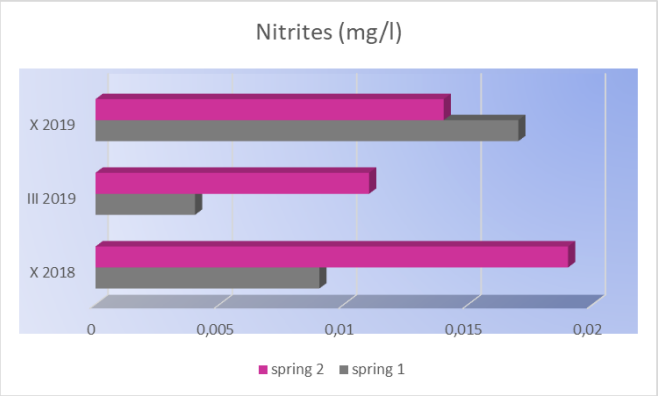

Fig. 3. The amount of nitrites in the water

The phosphate content is 2.4 mg/l at spring 1, almost double the amount of phosphate found at spring 2 at 1.3 mg/l (Figure 4). In spring 2019, in March, the phosphate content is lower, 1.4 mg/l at spring 1 and 2.2 mg/l at spring 2. In October 2019, the analyzes showed that the phosphate concentration is 1.6 mg/l in spring 1 and 8.1 mg/l in spring 2. The presence of this indicator in water is justified by the fact that it is used for plant nutrition, being an active element in fertilization.

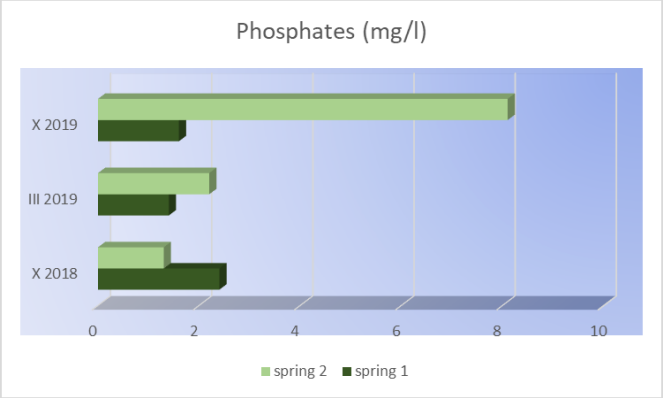

Fig.4 Phosphate concentration in water

The manganese content is very low, only 0.1 mg/l in both springs.

As a result of the analyzes, no iron was found until October 2019, of only 0.03 mg/l at spring 1.

Overall, the water quality is good at both springs, with much better values being spring 1, although spring 2 is preferred by locals because the water springs directly from the mountain.

The results of the research have a high civic value, which can be disseminated by the local authorities by informing the inhabitants about the water quality of the two springs, as well as about the impact of the anthropic activities on the ground water quality. It is also proposed to educate the population on pollution prevention.

CONCLUSIONS

The purpose of the research was to determine the quality of the water from two springs of Măru locality, Caraș Severin county. The spring 1 is located in the village downtown, and the spring 2 is directly from the mountain, being highly appreciated by the locals. Following the water analyzes, the following conclusions are:

1. The nitrate content in spring 1 is much lower compared to spring 2.
2. The amount of nitrite is very low, both at spring 1 and at spring 2.
3. The phosphate content is fluctuating, with higher values for spring 2.
4. The manganese content is very low, of only 0.1 mg/l in both springs.
5. Iron was not found in any analyzed sample.
6. On the whole, the water quality is good at both springs, with much better values being the spring 1, even if the locals prefer spring 2 being located in the mountain.

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