

## STUDY ON THE CHEMICAL NATURE AND QUALITY OF WATER FROM SPRINGS VILLAGE BRATCA

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### Abstract

*Waters from karst aquifers are often used as a source of supply for the population living in the neighbouring areas. Padurea Craiului Mountains are in the north west of the Apuseni Mountains. Waters accumulated in carbonate deposits within this area are discharged through various water sources. The springs in the area surveyed are considered to be supplied exclusively by diffuse infiltration storm water. The purpose of this paper is to study how the aquifer is supplied (by means of infiltration or through the karst system exclusively), as shown by certain analysis of the water composition, and to study the degree of pollution of waters.*

**Keywords:** karst aquifer, hardness, chemical nature, vulnerability

### INTRODUCTION

Vulnerability to pollution of an aquifer may be defined in several ways. The *International Association of Hydrogeologists* (IAH) accepts the following definition: "Vulnerability is an intrinsic property of the aquifer system that depends on its sensitivity to human impact and / or natural".

One can define at least two types of vulnerabilities generally accepted, namely:

- *Intrinsic* (or natural) *vulnerability*: the vulnerability measured only by hydrogeology factors (aquifer characteristics), the characteristics of covering deposits and soils.
- *Specific* (or integrated) *vulnerability*: in addition to the intrinsic vulnerability, this type of vulnerability includes the potential impact of land uses and sources of contaminants that can affect, in space and time, in terms of quantity and quality, the groundwater resources.

Karst aquifer waters are often used as a source of supply for the population living in the neighbouring areas. Research on the vulnerability of these waters is becoming increasingly important since this research can provide solutions for the protection of these aquifers. Over time there have been a number of studies on the vulnerability of karst water within the infiltration plateaus in the north side of the Padurea Craiului Mountains. In these areas there are a lot of small or large springs used as a source of

drinking water for residents of the neighbouring villages. The aim of this paper is as follows:

- To analyze several water springs located within the administrative territory of the Bratca commune, in order to establish their nature, and by this, their supplying way;
- To determine the level of pollution with organic and nitrogen compounds, the later occurring frequently in the groundwater pollution by means of agriculture.

## **MATERIAL AND METHODS**

Sampling was done in April 2012 under ISO 5667-11. They collected water samples from five sources: Sampling was done from 5 springs: 4 located in the Bratcuta valley (on the left bank, right bank and from the centralized system source supplying the village of Bratca) and one from a side of the Nemes hill. Sampling was done taken after a period of relatively abundant rainfall. We measured, in accordance with applicable standards, the following parameters: water alkalinity, total hardness, calcium ion concentration, the concentration of magnesium ions, a CCO-Mn, expressed oxidability, ammoniacal nitrogen, pH, electrical conductivity, and fixed residue. The methods for determining the values of parameters listed herein are volumetric, electrochemical and optical methods. The measured values of the parameters were compared with values regulated through the Law No. 458 of July 8, 2002, on regulating drinking water.

## **RESULTS AND DISCUSSION**

The five sources studied are positioned as follows:

- Spring. No. 1 – at the ranger cabin, on left bank of Bratcuta valley,
- Spring. No. 2 - right bank of Bratcuta valley,
- Spring. No. 3 – left bank of Bratcuta valley,
- Spring. No. 4 – systematically supplies a part of Bratca village,
- Spring No. 5 – beneath Nemes hill.

The chemistry measurements results are presented in the Table No 1 bellow. The comparison made between the values measured for nitrate parameter and the amount for drinking water allowed by law is shown in the Graph No. 1 bellow.

Table 1

Representative indicators values						
Parameter	M.U.	Spring 1	Spring 2	Spring 3	Spring 4	Spring 5
Bicarbonate ions	Mg/l <i>meq/l</i>	183.00 <i>3.00</i>	323.30 <i>5.30</i>	237.90 <i>3.90</i>	183.00 <i>3.00</i>	237.90 <i>3.90</i>
Total hardness	German degrees	8.19	13.57	10.32	7.85	15.93
Calcium ions	Mg/l <i>meq/l</i>	44.09 <i>2.20</i>	90.58 <i>4.52</i>	71.34 <i>3.56</i>	48.90 <i>2.44</i>	93.79 <i>4.68</i>
Magnesium ions	Mg/l <i>meq/l</i>	8.75 <i>0.72</i>	3.89 <i>0.32</i>	1.46 <i>0.12</i>	4.37 <i>0.36</i>	12.16 <i>1.00</i>
CCO-Mn	mgO <sub>2</sub> /l	3.19	2.60	4.10	2.21	2.37
Expressed oxidability	Mg/l	8.83	7.42	8.35	7.90	7.85
pH	Unit.	6.3	6.5	6.6	6.7	7.0
Electrical conductivity	mS/cm <sup>3</sup>	0.25	0.44	0.33	0.25	0.42
Fix residues	Mg/l	250.75	425.40	320.20	244.70	352.20

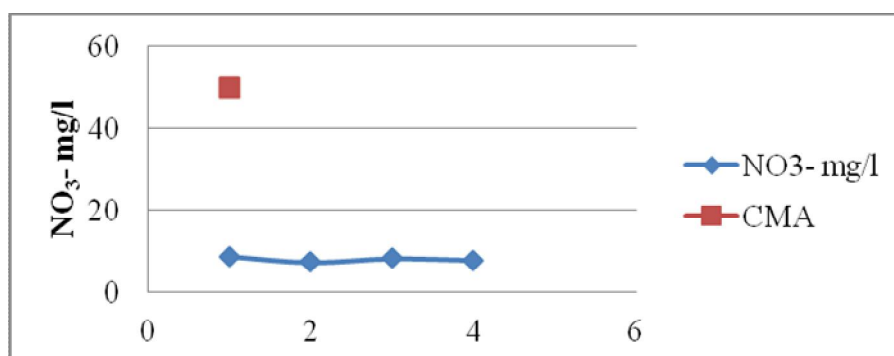


Fig. 1 Concentration of nitrates ion measured in the 5 springs surveyed

Water accumulated in the carbonate deposits within the Padurea Craiului Mountains are discharged through various sources. Their water is captured either in a centralized system (very rare cases) or for supplying with water the inhabitants of villages by means of individual systems. In these circumstances one should address the question of measuring the groundwater vulnerability, nature and drinkability. Throughout our work we aimed at establishing the chemical nature of the water source, to monitor the water quality within the Bratca village area and to compare the results thus obtained with the allowed values of monitored parameters, as set in the drinking water standard.

## CONCLUSIONS

1. The minimum permissible value for water hardness is 5 German degrees (°dH). Spring waters analyses revealed, as expected, higher hardness, which qualifies the water studied as moderately hard water (springs no. 1,3,4), and very hard water (springs 2.5).
2. Judging from the values of total hardness, carbonate hardness, and the calcium and magnesium concentrations, we measured the water character as follows: for the first four springs, the water shows a bicarbonate calcic nature and, as for spring the spring No. 5, the water has a sulphate-bicarbonate-calcic character. We conclude that given the low concentration of magnesium, the waters spring from the calcareous and not dolomitic areas.
3. Although the area surveyed is considered by some researchers as showing a medium vulnerability and the studies made by the Administration of Cris Rivers considers it as unsatisfactory protected, its waters are not polluted since there are no pollutant sources within the area. The main economic activity of people living in the area is farming: livestock and potato culture. However in the past years, however, the farmers' livestock has decreased, there are no flocks of sheep in the village of Bratca anymore, and the horses are individually bred in households.

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