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Physical-Chemical Characteristics of Mineral Waters of some Wells in the Region of East Kosova

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Abstract The object of this study was to investigate the physical-chemical characteristics of the mineral waters of some wells in the region of East Kosova (Doberqan Well, Mineral water-Ponesh and Shadervani Well-Gumnisht). Water from these wells was used as a material for analyses. For the determination of the quality of these waters, a number of water quality indicators as non stable components (soluble gases, silicon dioxide and bicarbonate) cations, anions and microelements were determined. From the obtained analyses it is ascertain that analyzed waters have volcanic origin and they belong to sodium-bicarbonate-acidic waters. For the determination of the water quality parameters we used standard methods for water analyzes including classical methods and contemporary water analyzes. As classical method we have used volumetric while from the contemporary analyzes we have used instrumental methods of analyzes like spectrophotometer UV-VIS, atomic absorption spectrophotometer, conductivity meter and pH-meter.

Keywords: Mineral Water, East Kosova, Environmental monitoring, Level of polluted species.

Introduction

Although Kosova is rich with water resources there is a big lack of drinking water. And then a question: whether this lack of water comes from the lack of water itself or from the impossibility of researches and the natural water utilization?

East area of Kosova is wealthy with mineral and thermo mineral water resources which present a natural fortune with a unique importance of producing packed water, refreshing drinks and the developing of tourism. While thermo mineral and mineral resources for centuries have been used for drinking, rehabilitation and recovery we think that they need an extra special study in hydro geological, physical-chemical, bacteriological and sanitary aspect. Through these analyzes we have wanted to offer the possibility of utilization of these waters. We have analyzed quality in the physical-chemical aspect of some waters in the region of East Kosova. The purpose of this research was to analyze the quality in the organoleptic and physical-chemical aspect through analytical methods pursued in the laboratories. All this in the water mineral resources in the region of East Kosova Doberqan well (Banja e Doberqanit), mineral water Ponesh (uji i thartë-Ponesh).

Materials and Method

During the investigation of these mineral waters we have used laboratory and terrain methods. The terrain work included sample taking for laboratory analyzes (samples were taken from the wells in the plastic bottles from 1 dm^3, temperature measure, pH and determination of non stable components like dissolved gaseous (CO_2, H_2S, and O_2), iron, SiO_2 and bicarbonates.

Researches in the laboratory included determination of these parameters:

- Cations: sodium, potassium, calcium and magnesium
- Microelements: lithium, manganese, cooper, cobalt and lead
- Anions: chlorides, sulphates, phosphates and bicarbonates.

For determination of the quality of water parameters we have used standard methods for water analyzes including classical and contemporary methods. As classical method we have used volumetric

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while from contemporary methods we have used instrumental methods of analyzes like spectrophotometer UV-VIS (Lovibond PC spectro), spectrophotometer of atomic absorption (Perkin Elmer) conductivity meter (HACH), pH- meter (Knick pH – meter 765 Calimatic).

Oxygen in the mineral waters was determined with Winkler method (Anonymous, 1998). Carbon dioxide was determined with the method of titration with Na_2CO_3 meanwhile quantity of sulphuric according to Jakovlevic (1961).

Sodium and potassium were determined with flame photometry. Iron was determined with spectrophotometer method (Standard Methods from the Examination of Water and Waste Water, 1998). Calcium, Magnesium and general hardness of water were determined with volumetric method (Stanojevic, 1961). With spectrophotometer of atomic adsorption were determined microelements: Li, Mn, Pb, Co, Cu.

Determination of chlorides was conducted with Mohr method (Standard Methods for the Examination of Water and Waste Water, 1998), sulphates according to Schmids (Standard Methods for the Examination of Water and Waste Water, 1998) while bicarbonates with titration with 0.1 mol L^{-1} HCl (Kulskij, 1980). Phosphates, ammonia, nitrates, nitrites silicon dioxide were determined with spectrophotometric method (Standard Methods for the Examination of Water and Waste Water, 1998).

Standard solutions for each parameter were prepared in the laboratory from the chemical pure substances ,,Merck'' with distilled water.

Results and discussion

During the whole 2008 year the temperature of these waters was unchanged (Table 1), higher temperature somewhere over 20 ^{0}C we have noticed in the water of Dobercani Bach, and this is why this water is hypothermal. These waters have also low pH values, lower than pH=7 (Table 1) and they are acidic waters. High conductivity and hardness are indicators for high mineralogy of these waters, respectively high composition of mineral salts.

Table 1. Physical indicators and total hardness

Parameters / Region	Temperature ^{o}C	Turbidity NTU	pH	Conductivity µScm^{-1}	Hardness dH
Dobercani	26.2	0.45	6.59	1302	43.68
Gumnishta	9.8	12.5	6.58	1760	38.64
Poneshi	9.6	14.4	6.69	2300	36.96

Table 2. Quantity of gaseous in the analyzed waters, in mg L^{-1}

Parameters / Region	CO_2	H_2S	O_2
Dobercani	1342	-	6.2
Gumnishta	1200	-	6.1
Poneshi	1434	-	6.6

The content of gaseous in these waters is approximately the same. These waters are characterized with very high quantity of carbon dioxide, while the quantity of oxygen is approximately the same but much lower. After all, the presence of H_2S in the analyzed water has nit been noticed.

Table 3. The quantity of cations in the analyzed waters in mg L^{-1}

Parameters / Region	Na^+	K^+	Ca^{2+}	Mg^{2+}	Fe^{3+}
Dobercani	98	10.3	240	43	0.01
Gumnishta	197	31	134	86	0.15
Poneshi	218	39	136	77	0.15

Given data from literature show that chemical content of mineral waters in most cases depends from geochemical properties of the environment in which they appear. Knowing the chemical nature

of mineral waters geological terrain in which they appear can also be concluded. Hence the water of Gumnisht and Ponesh flow from approximately the same geological terrain. From table 3 we can see that in these waters dominant is sodium, while other cations are in smaller quantities. This high quantity of sodium can be explained as a result of high dissolubility sodium compounds which can be found in the different covering of earth crust. In these waters we came across in the high quantity of potassium. This high content of potassium, characterizes volcanic waters.

In these waters we have found high quantity of calcium and magnesium as well. Quantity of iron in these analyzed waters is very low. In these waters we have found quantity of lithium which is characteristic for volcanic waters. Metals like manganese, copper, lead and cobalt are in very low levels (Table 4).

Table 4. The quantity of microelement in the analyzed waters in mg L^{-1}

Parameters / Region	Li	Mn	Cu	Pb	Co
Dobercani	0.3	0.008	0.12	<0.01	<0.01
Gumnishta	0.4	0.072	<0.05	<0.01	<0.01
Poneshi	0.4	0.072	<0.05	<0.05	<0.01

Table 5. Quantity of anions in the analyzed waters, in mg L^{-1}

Parameters/ Region	Cl^-	SO_4^{2-}	HCO_3^-	PO_4^{3-}
Dobercani	14.18	55	1037	0.21
Gumnishta	13.50	190	1464	0.39
Poneshi	15.90	308	1586	0.18

Comparing to the other analyzed anions, the investigation show that these waters are characterized with high quantity of bicarbonates (Table 5). High content of this ion is as result of a flow of this water in the carbonate covering.

High content of sulphates in these waters (especially the water Gumnisht and Ponesh) can be explained with a so called mineralization sulphide. The formed ion sulphate causes sulphuric acid which accelerate decomposition of sulphides.

From other anions in analyzed waters we have noticed a small quantity of chlorides and phosphates (Table 5).

In these analyzed waters, especially the Dobercani water a high quantity of silicon dioxide has been noticed. The quantity of SiO_2 in the water of Dobercani is 26.5 mg L^{-1}, 5.36 mg L^{-1} Gumnishta while water of Ponesh contains 2.61 mg L^{-1} SiO_2. High content of SiO_2 is characteristic for warm and fountain waters, where magmatic activity can bee seen (Protic, 1978). High presence of nitrites and nitrates in the water Gumnishta shows for indication in polluting the undergrounds with the organic matter.

Table 6. Other parameters in mg L^{-1}

parameters / Region	Organic matter	NH_3 - N	NO_2^- - N	NO_3^- - N
Dobercani	9.35	0.01	0.008	0.24
Gumnishta	9.04	0.07	0.01	4.81
Poneshi	9.60	0.098	0.009	0.88

Conclusion

Content of these waters can be considered as unchanged because these waters flow out from the deepness of the underground. But there is still a distinction between the quality and the content for only one reason, because they flow around the underground layers and this is how they gain organoleptic and physical-chemical properties. To the most of mineral water there is a healing prescription and this is why the utilization of these waters is traditional in the national medicine.

The purpose of this study is to analyze quality of these waters through analytical methods in both aspects organoleptic and physical-chemical aspects. During our analyzes we have determined anions and cations which are of a high importance in determination and evaluation of drinking water in reference to the standards used from us and from European countries.

And from all analyzes we can conclude that: (Water Shadervan-Gumnisht and Mineral Water-Ponesh) belong to mineral water of Sodium-Bicarbonate-Acidic ($Na\text{-}HCO_3^-$) while Dobercani water in Hypothermal Sodium- Bicarbonate-Acidic ($Na\text{-}HCO_3^-$).

In the end we can conclude that these waters can not be used for drinking before they are exposed to technological processes for treatment of drinking waters.

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