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Hydrochemical Analysis of Some Springs of Salominao Village of Vani Municipality

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Abstract

For the first time, a hydrochemical analysis of some springs of Salominao village of Vani municipality was conducted. The content of magnesium, calcium, hydrocarbonate, chloride and sulfate ions, dry balance, permanganate oxidizability, dissolved oxygen and carbon dioxide content and BOD5 are determined. Relatively simple and fast chemical and physico-chemical methods with good reproducibility were selected for determination. Biogenic substances have been determined by the photometric method.

Objective: We aimed to study the hydrochemical composition of some spring waters in the village of Salomino, Vani municipality. The purpose of our research was to study the content of Mg2+, Ca2+, HCO3-, SO42-, CI-, permanganate oxidizability, dissolved oxygen, BOD5, dry balance, carbon dioxide, dissolved oxygen and biogenic elements in the spring waters of the village of Salomino, Vani district. The relevance of the issue lies in the fact that the content of the above-mentioned ions was determined for the first time in these waters, for which highly sensitive methods were selected.

Introduction: A spring is a natural exit of underground water to the surface of the earth. Classification of spring is different. There is also a difference according to outflow. For example, there are constant, weakly variable, variable springs. Springs can be permanent, periodic, seasonal and other types .

According to chemistry, there are: fresh, mineralized and salty springs; According to temperature: boiling, hot, warm and cold springs. The temperature of the springs depends on the depth of its feeding underground water, the nature of the extraction channel, the geographical and hypsometric location of the spring and the temperature regime of the environment surrounding the groundwater. There are about 2,000 springs in Georgia, which are distinguished by great variety.

During rain, a large part of the water enters the ground, it first passes through the loose layer of the ground, then it goes deeper into the ground. It will pass through sand, pebbles, stones. This is how water is purified. Finally, it passes through that layer. which does not carry water. Sometimes the bottom layer of the soil is sloping. Because of this, water cannot accumulate. It flows into the ground. In the end, it can go up. This is how the spring appears. The spring is cold and clean. A person drinks spring water. While moving through the soil crust, water acquires many substances, including salts, and a specific composition is formed. The amount of salts in water varies within wide limits, their total concentration e. i. mineralization is relatively low in surface water and significantly high in groundwater.

Water is an invaluable resource and has always been considered the source of life. It is widely and versatilely used, modern human can influence on the biosphere to use its resources for the development of production and material well-being. Today, the greatest attention is paid to the rational use and protection of water resources. Currently, the water is purified and neutralized, as a result of which it is used for drinking and centralized water supply [1].

The development of all branches of the public economy and the increasing standard of living of the people put more demands on the quality of drinking and agricultural water. The use of water for its intended purpose requires a deep chemical and microbiological examination, determination of its physical-chemical, organoleptic and chemical composition, and based on this, quality assessment. All of this is closely related to the development and improvement of methods of chemical and bacteriological analysis. The purpose of conducting hydrochemical analysis of water is to teach students the methods of water research and treatment, to introduce the essence and mechanism of the chemical processes that are the basis of water treatment, to give an idea of the chemical composition of water and its connection with its quality[2].

Judging the experiment. Thus, the content of Mg2+, Ca2+, HCO3-, SO42-, CI-- ions, permanganate oxidizability, content of oxygen, BOD5, biogenic elements of dry residue was determined for the first time in the spring waters of the village of Salomino, Van municipality, by chemical and photometric methods. The results of the analysis are given in Table #1.

In the investigated spring waters, the PH varies from 6.08 to 6.72.

The Chulukhadze spring contains the largest amount of magnesium ion, 1.76 mg/l. The smallest magnesium content is in the Talakhadze spring at 0.12 mg/l.

The Ca^{2+} ion content is also variable. A relatively large amount of it was recorded in the Meburishvili spring at 6.04 mg/l, while Ca^{2+} content was low at 1.02 mg/l in the Eristavi spring.

The content of HCO_3^- ion is the largest in the spring of Meburishvili 7.74 mg/l, the content of hydrocarbonate ions is small in the spring of Eristavi 2.56 mg/l.

A high SO_4^{2-} ion concentration is recorded in the Churadze spring at 3,131 mg/l. A small amount of sulfate ions is contained in Meburishvili's beer at 0.124 mg/l.

The Churadze spring contains relatively large amounts of chloride ions, 2.56 mg/l. And its mass content is small in the spring of Tlishvili at 1.50 mg/l.

The content of carbonic acid gas is the highest in Chulukhadze spring, 2.30 mg/l. Eristavi spring contains a small amount of carbonic acid gas, 0.48 mg/l.

Permanganate oxidizability is relatively high in Eristavi spring, 1.28 mg/l, an is in small amount in Chuladze spring, 0.08 mg/l.

Oxygen content is high in Meburishvili spring, 13.45 mg/l. A relatively low concentration of oxygen is recorded in the Chuladze spring at 7.87 mg/l.

The dry balance is the highest in the Beristku spring and in the Meburishvili spring, 1.81 mg/l. Its content is the smallest in the Tatelishvili spring at 1.09mg/l.

BOD5 is the highest in the Meburishvili spring at 5.57 mg/l, the lowest in Chuladze water at 2.11 mg/l.

The content of biogenic elements NO_2^-, NO_3^-, NH_3, PO_4^3 is lower than the detection limit, and their content is not recorded in the investigated spring water of Salominao village of Martvili Van municipality.

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Experimental part. Methodology for determination of chemical elements in water

The analyzes were carried out in the Analytical Chemistry Laboratory of Kutaisi Akaki Tsereteli State University. The methods tested in hydrochemical practice [3,4] were used for the analysis.

The acidity rate was measured by the potentiometric method (potentiometer pH 673-M)

The mercurimetric method was used to determine chlorides (titrant 0.01 $Hg(NO_3)_2$, indicator (diphenyl carbazole).

Hydrocarbons were determined by the acidimetric method (titrant 0.1-0.01 N HCl indicator methyl- orange.

The content of calcium and magnesium, as well as the total hardness of water in the investigated waters, was determined by the complexonometric method (titrant 0.01N Complexon III. To determine the magnesium ion content, we used eriochrome as an indicator, we created the recommended area with an ammonia buffer, and to determine the calcium ion, Merexide was used as an indicator. We created an alkaline area with 2N sodium alkali).

Sulfate ions were determined by the classical gravimetric method, $BaSO_4$ represents a precipitated form.

Carbonic acid gas was determined by the alkalimetric method. Titrant 0.1-0.01N. Indicator Phenophthalein.

Oxidability was determined by the permanganatometric method (oxidizing agent 0.01 N in acidic area. Titrant 0.01 N $NaOH$.

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The oxygen content was determined by the iodometric method (titrant 0.01 N. $Na_2S_2O_3$ In an alkaline environment, it is oxidized by oxygen dissolved in water and passes into a tetravalent manganese compound $Mn(OH)_2$, which is formed by acidifying the solution KI in excess and we get I_2).

The dry balance was determined by the classical gravimetric method [5].

Biogenic substances were determined by photometric method: NO_2^- with shell reagent, NO_3^- sodium salicylate, NH4+ - Nessler's reagent, PO_4^{3-} - ammonium phosphorolybdate.

NO_2^- - photometric determination using Gries's reagent in the acid zone is based on the reaction of formation of a reddish-brick-colored azo dye as a result of the interaction of sulfanilic acid, nitrite ion and alpha-naphthylamine.

NO_3^- - was determined by the photocolorimetric method using sodium salicylate. The method is based on the interaction between nitrate ions and sodium salicylate ions, in the presence of sulfuric acid, during which the resulting yellow coloration is directly proportional to the nitrate ion concentration.

The determination of NH4+ is based on the interaction between the ammonium ion and Nessler's reagent (mercury tetra iodide) in the alkaline zone, during which the resulting yellow coloration is directly proportional to the concentration of the ammonium ion.

PO_4^{3-} was determined by the photocolorimetric method, which is based on the interaction of orthophosphoric acid and ammonium molybdate in the acid zone, during which the blue color formed is directly proportional to the phosphate concentration [6].

Results of hydrochemical analysis of some spring waters of Salominao village of Vani municipality Table N 1.

N	Regional names of spring waters	*pH*	Mg/l									
			SO_4^{2-}	Ca^{2+}	Mg^{+}	HCO_3^{-}	Cl^{-}	Dissolved oxygen	BOD_5	Permanganate Oxidation	CO_2	Dry balance
1	Meburishvili	6,12	0,124	6,04	1,28	7,74	1,68	13,45	5,57	0,32	0,88	1.81
2	Eristavi	6,23	0,289	1,02	0,20	2,56	1,66	9,92	2,24	1,28	0,38	1,49
3	Churadze	6.08	3,131	4,70	0,44	6,24	2,58	7,87	2,11	0,08	0,68	1,56
4	Chulukhadze	6, 38	0,370	5,26	1,76	5,90	2,24	8,90	2.24	0,88	2,30	1,19
5	Talakhadze	6,45	0,289	2,66	0,12	4,14	1,56	10,70	2,18	0,48	1,68	1,29
6	Tatelishvili	6, 72	0,164	1,32	0,60	3,08	1,50	9,57	2,17	1,06	1,32	1,09

Conclusion: the content of magnesium, calcium, hydrocarbonate and chloride ions, carbon dioxide, permanganate oxidizability, oxygen and dry balance in the studied spring waters of the village of Salomino of Vani municipality is within the norm and its use for drinking and from the economic point of view is appropriate.

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აბსტრაქტი

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