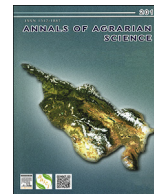




Contents lists available at ScienceDirect

Annals of Agrarian Science

journal homepage: <http://www.journals.elsevier.com/annals-of-agrarian-science>

Uraveli mineral spring and its exploration for industrial development

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ARTICLE INFO

Article history:

Received 20 September 2017

Accepted 15 December 2017

Available online xxx

Keywords:

Mineral

Water

Hydrogeological condition

Underground water

Sediments

Carbon dioxide

ABSTRACT

The article deals with industrial use of Uraveli mineral water deposit, in particular identification of feasibility for development of bottling facility and arrangement of balneal-climate resort. The subject is topical – construction of bottling plants and promotion of bottled water industry in Georgia, rich in ground water resources is considered as priority for development of the country's economy. The article describes: the deposit area, peculiarities of the landscapes and climate conditions, geological composition of the region, bicarbonate mineral water formation processes and coordinates of water outcrops. Water quality has been studied in compliance with ISO and USEPA requirements - chemical and microbiological analyses have been carried out at certified lab of scientific-research firm Gamma. Results of analysis revealed that based on the Uraveli bicarbonate mineral water deposit development of high quality, competitive bottled water production and balneal climate resort is feasible. For achievement of this goal, first of all, thorough hydrogeological survey of the deposit and assessment of exploitation reserves must be carried out, optimum operation regime of the bottling facility – developed.

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Introduction

In Georgia recently big attention is being paid to soil and water contamination with heavy metals among them generally [1,2], in all country [3–8], or West [9,10] and East [11–16] parts.

Georgia is distinguished with the richness and diversity of hydro mineral resources. They are of various types. Waters present different physical and chemical characteristics, broad range of main ions, biologically active components and microelements. Currently, up to 1200 such springs are known [17,18]. In the “Georgian SSR resorts and resort resources” atlas [19], more than 700 cases of mineral waters with medical properties of various purpose are presented.

Unfortunately, only very small part of these rich mineral resources is used for commercial and recreational purposes, which is confirmed by the production assortment given in the National Standard of Georgia – “Bottled Natural Mineral Waters” [20], which consists of only eleven springs. It also should be noted that from

these springs, only five ones are developing their useful storages more or less – Borjomi, Nabeglavi, Sairme, Mitarbi and Flate.

Such poor situation is explained, along with other factors, by the fact that majority of underground mineral springs are not studied, or level of study does not correspond to up-to-date requirements.

We believe that improvement of this situation and more intense use of such unique natural resources is an important direction of development, while commercialization of underground mineral springs, facilitation to the construction of bottling plants and industry of mineral waters bottling is declared the priority of development of Georgian economy.

The group of authors of presented work has conducted several studies of various springs with this purpose [21–23] and plans to continue working in this direction.

Our interest in relation to the Uraveli spring is caused by the quality of mineral water, its taste and medical properties; beautiful natural environment and mild climatic conditions should also be noted; location makes it possible to arrange and develop communications of bottling plant and resort infrastructure, because asphalted road is constructed immediately up to the spring and railway is also in vicinity.

The spring to be studied is situated in Akhaltsikhe municipality, near the village Uraveli, in the southern part of Akhaltsikhe depression, in the Valley of Uraveli River (left tributary of Mtkvari

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Peer review under responsibility of Journal Annals of Agrarian Science.

<https://doi.org/10.1016/j.aasci.2017.12.004>

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(Kura) River). The deposit is located at the distance of 15 km from Akhaltikhe town. Transportation network is well developed in this district, railway Tbilisi-Khashuri-Akhaltikhe-Vale passes this territory. Due to healthy climate and natural carbonic mineral water, there are good possibilities of resort development. This water was used as drinking and healing water and with balneological purpose already in XIX century.

Hydrological conditions

District of Uraveli mineral water is mountain fold of complex composition, composed by volcanogenic, volcanogenic-sedimentary and marine sediments, age of which is Meso-Cenozoic [24].

According to scheme of hydrogeological zonation of Georgia, this territory is within the boundaries of Akhaltsikhe artesian basin of hydrogeological area of mountainous fold system of Lesser Caucasus.

Uraveli deposit is associated with volcanogenic-continental water-bearing complex of Upper Miocene – Lower Pliocene (lower tufa-breccia part of Kisatibi layer $cN_3^2-N_2^1$), which is represented by coarse fragmental tufaceous and lava breccia and tufa. Capacity of the complex is 300–900 m. Circulation of underground waters is fracture-type, with mainly descending character [24].

In our opinion, formation of carbonic mineral water of Uraveli deposit is going according to the following scheme: feeding area of waters is located within the boundaries of Artvin-Bolnisi plate, where sediments of Kisatibi layer are presented, with sufficient capacity, enriched by magnesium ions. Deep-earth deposits of carbon dioxide existing here, in their turn, associated with Abul-Samsari volcanic system of Holocene-Old Quaternary period, play active role in the formation process of chemical composition of mineral water. Water, in the process of circulation within the sediments of Kisatibi layer, is enriched by carbon dioxide, which, in the

condition of certain pressure and temperature, causes leaching of magnesium, calcium and other components from the rocks [17].

Underground waters enriched by carbon dioxide gas, under the influence of strong pressures, migrate from Kisatibi layer rocks to the rocks of Middle Eocene located transgressively above them and in Akhaltsikhe, Uraveli, Vardzia and Nakalakebi areas, are easily unloaded in zones of tectonic deformations, in hypsometrically lowered places. Typical example of such type of unloading is the carbonic hydrocarbonate sodium-calcium-magnesium mineral water spring, emerging at the bottom of right slope of Uraveli River valley [17], with coordinates of output: $X = 337782$ and $Y = 4601396$.

Output of the spring is partially in the catchment and water from catchment structure flows through metal pipe. Current condition of catchment is insufficient and there are losses of water volumes [21] (Fig. 1) (see Fig. 2).

Natural output of mineral water is located at 20 m above of local basis of erosion of Uraveli River. Output of spring varies in the range of 60-70- m^3/day ; temperature of water is $+14\text{ }^\circ\text{C}$.

Results and analysis

Research of water quality was conducted by Scientific-Research Company Gamma Ltd. The laboratory is accredited by the National Center of Accreditation of Georgia [25]. Collection of samples for chemical and microbiological analysis, packaging, transportation and preparation for analysis was carried out in accordance with the international standard ISO-5667-5 [26], which fully conforms to the requirements of technical regulations for natural mineral waters and fresh waters [27]; Analyses are done according to the international (ISO, USEPA) and Georgian national standards [20,27,28].

Results of hydrochemical analyses carried out by us in various years, are presented in Table 1.



Fig. 1. Output of Uraveli spring and temporary water-catchment.

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