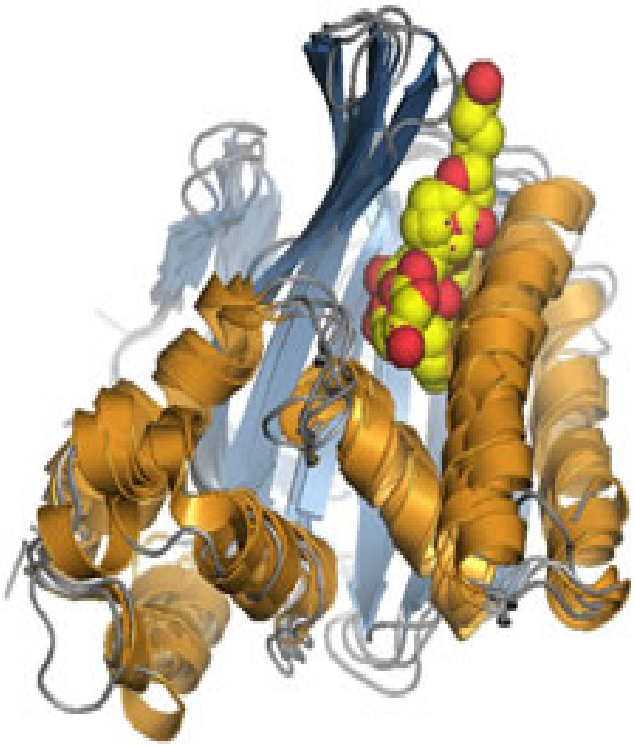
PhytoChem & BioSub Journal

Peer-reviewed research journal on Phytochemistry & Bioactives Substances

ISSN 2170 - 1768



PCBS Journal

Volume 8 N° 1, 2 & 3 2014

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Peer-reviewed research journal on Phytochemistry & Bioactives Substances

ISSN 2170 - 1768

PCBS Journal

PCBS Journal

Volume 8 N° 2 2014

Edition LPSO

Phytochemistry & Organic Synthesis Laboratory

http://www.pcbsj.webs.com , Email: phytochem07@yahoo.fr

PhytoChem & BioSub Journal Vol. 8(2) 2014
ISSN 2170-1768
CAS-CODEN:PBJHB3

PCBS Journal
ISSN 2170-1768

PhytoChem & BioSub Journal

2014
Vol. 8 No. 2

The perspectives of use of waters artesian wells of Bechar (Algerian west south) for the potable water supply

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DOI:10.163.pcbsj/2014.8.2.122

Abstract. *The artesian well of Mougheul (wilaya city of Béchar), with depth of 185 meters is one of potential sources of water supply of district, and allows to provide initial water productivity up to 8 l/s. Requirements to the water for potable needs in district, as well as in all country, are presented according to specifications of the World Health Organization (WHO).*

***Key Words*:** Water supply; WHO ; Algeria; Sahara

Introduction

The resources of superficial water in Algeria are estimated approximately in 11 billions of m^3. These sources represent the superficial drains non-uniformly distributed on the territory of Algeria. The most part of them is located in the north of the country where the majority of the rivers and reservoirs is concentrated. Because of specific natural and climatic conditions of Algeria, mouths of the rivers frequently dry up. During a raining season the water quality of such sources is characterized by the big contents of suspended matters. The widespread measures on settlement of distribution of superficial drains with the help of dams frequently conduct to the deterioration of water. Water in such artificial reservoirs is exposed to periodic flowering that makes problematic an opportunity for supply of the country's population by water with required quality and in necessary quantity. Stocks of underground waters of the country are estimated in 6,8 billions of m^3. However underground waters of Algeria are on very big depths and in the majority differ by enough high mineralization [1]. The result of above-mentioned problems is the instability of situation in the country, as with water delivery (existing schedules of the potable water delivery to the population frequently are broken and do not solve a problem of water supply), and with its quality. Certainly, such state of affairs has a negative effect on sanitary-and-epidemiologic conditions of many populated areas.

Results and discussions

The artesian well of Mougheul (wilaya city of Béchar), with depth of 185 meters is one of potential sources of water supply of district, and allows to provide initial water productivity up to 8 l/s. Requirements to the water for potable needs in district, as well as in all country, are presented according to specifications of the World Health Organization (WHO) [2].

For definition of the opportunity to use the well as a source of water for potable and domestic needs, samples have been taken and the basic physical and chemical parameters of water are determined according to standard techniques [3]. The researches of water quality have been executed in the Ionic Exchange and Adsorption Laboratory of the National Technical University of Ukraine "Kiev Polytechnic Institute". In tab. 1 are presented the analysis results of water quality of the Mougheul well in comparison with the requirements regulating quality of potable water within the framework of the international standards, and also in Ukraine.

The analysis of data (tab. 1) shows, that the general mineralization of water of Mougheul well considerably surpasses allowable requirements of all above-mentioned standards.

As a rule, waters are subdivided into categories depending on a level of their mineralization (Tab. 2, [4, 5]) or their rigidity (tab. 3). There are also other approaches to classification of water of various sources, for example, taking into account simultaneously its mineralization, rigidity and the contents of organic impurity (tab. 2, [6]). Apparently from tab. 2 and 3, the boundary values for division of water into categories are sufficiently conventional and they differ in various sources of information. The type of water and the contents of the basic impurity in it allow to choose correctly a method of its conditioning, and also to pick up the most effective materials and the equipment for water-preparation [7-9].

According to the above-mentioned data (tab. 1-3), water of Mougheul well in the Béchar wilaya can be classified in the category of salty underground waters with high hardness. The most suitable method of conditioning of such water to have a quality up to a level of the required norms for potable and domestic to water is the technology of barometric membrane or the combined technology of barometric membrane with ionic interchange method of water treatment. The development of basic alternative technological schemes of water-preparation and the evaluation of economic parameters of these schemes will allow to choose the most rational and economic scheme of water conditioning to have its quality up to a level for potable water.

Besides, the presence of such impurity as the dissolved iron, silicates and organic substances (tab. 1) in the water, demands to provide in the technological scheme of water treatment the corresponding stages of preliminary purification at the entry of the membrane.

Table 1. Parameter of water from Mougheul

Designation of parameter	Value of parameter				
	Well of Mougheul, Béchar	Boundary concentrations of admixtures in water according normative requirements			
		Standard 2874-82 (Ukraine)	WHO	European Union	USEPA
pH	7,4	6,0-9,0	6,5-8,5	6,5-8,5	6,5-8,5
Overall hardness, mg-equiv./l	53,2	7,0	Not norm.	Not norm.	Not norm.
Calcium, mg-equiv./l	40,6	Not normalized	Not norm.	100	Not norm.
Magnesium, mg-equiv./l	12,6	Not normalized	Not norm.	50	Not norm.
Overall alkalinity, mg-equiv./l	2,64	0,5-6,5 *	Not norm.	0,5	Not norm.
Potassium, mg/l	8,04	Not normalized	Not norm.	12	Not norm.
Sodium, mg/l	1876	Not normalized	200	200	Not norm.
Overall iron, mg/l	2,54	0,3	0,3	0,2	0,3
Overall manganese, mg/l	<0,01	0,1	0,1	0,05	0,05
Nitrates, mg/l	15,6	45	50	50	44
Sulfates, mg/l	2496	500	250	250	250
Chlorides, mg/l	2851	350	250	250	250
Bicarbonates, mg/l	161	Not normalized	Not norm.	Not norm.	Not norm.
Silicates, converted in SiO_2, mg/l	23,4	Not normalized	Not norm.	Not norm.	Not norm.
Fluorides, mg/l	1,0	0,7-1,5	1,5	1,5	2,02-4,0
Oxidability, mgO_2/l	3,2	4 *	Not norm.	5,0	Not norm.
Overall mineralization, mg/l	8418	1000	1000	1500	500

** Sanitary norms No 136/1940 "Potable water. Hygienic requirements of potable water quality for central water supply".*

Table 2. Category of water

Mineralization, mg/l	Category of water according to different sources of information		
	[4]	[5]	[6]
< 0,05	Ultra soft water	Soft water	Ultra soft water (COM – low)
0,05-0,2			Water with low mineralization: - tap water (COM – middle) - surface water (COM – middle or high
0,2-0,5	Soft water		
0,5-1,0	Water with relatively high mineralization		Water with middle mineralization: - underground hard water (COM – middle) - sewage or water after secondary pollution (COM – high)
1,0-2,5	Brackish water	Mineralized (brackish) water	
2,5-3,0			
3-5	Salt water		
5-10			Water with high mineralization: - underground hard water (COM – middle) - sewage (COM – high)
10-15	Water with high salinity		
15-25			Sea-water: - underground or littoral water (COM – low or middle) - open sea-water (COM – middle or high)
25-35		Water with sea salinity	
35-50	Brine		
> 50		Brine	

Note: COM – Contents of Organic Matters.

Table 3. Level of hardness

Hardness of water, mg-equiv./l	**Category of water according to level of hardness**			
	Reference book of chemistry	**Reference book of water treatment**	**Germany DIN 19653**	**USEPA**
0-1.5	Soft water	Very soft water	Soft water	Soft water
1.5-1.6		Soft water		Reasonably soft water
1.6-2.4			Water with middle hardness	
2.4-3.0				
3.0-3.6		Reasonably soft water	Water sufficiently hard	Hard water
3.6-4.0			Hard water	
4.0-6.0	Water with middle hardness			
6.0-8.0		Hard water	Very hard water	Very hard water
8.0-9.0	Hard water			
9.0-12.0		Very hard water		
> 12.0	Very hard water			

Conclusion

The development of rational technology of water conditioning received from the artesian well of Mougheul in the wilaya of Béchar will allow to receive drinking water quality and to minimize economic expenses for process of water treatment. The introduction of such installations will allow keeping resources of dams and other existing sources of water supply for more remote regions of the country and, that is important, for needs of agriculture.

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