International Journal of Advanced Materials Research
Vol. 6, No. 3, 2020, pp. 43-47
http://www.aiscience.org/journal/ijamr
ISSN: 2381-6805 (Print); ISSN: 2381-6813 (Online)

Evaluation of Drinking Wall's Water Quality in Murzuq Basin Southwest of Libya

Wafa Khalleefah Amhimmid[1, *], Emhemmad Jumha Emhemmad[2], Mahmoud Abdullha Ali[3]

[1]Chemistry Department, Azzaytuna University, Tarhuna, Libya
[2]Chemistry Department, Sebha University, Taraghun, Liby
[3]Faculty of Engineering and Technology, Sebha University, Brack Al-Shati, Libya

Abstract

Groundwater is the most important water source in the study area due to its occurrence within the dry areas, therefore it became necessary to evaluate and study the quality of Murzuq basin water which located in the southern east of Libya. It is a one of the largest reservoirs in Libya, it covers 350.000 km^2 containing 7700 km^3 of freshwater, about 4100–13800 years old. This study investigated the quality of drinking water supplied from the Murzuq basin to the general drinking water network of Murzuq city and suburbs. A total of 10 sites were selected for water analysis. Chemical and physical parameters were determined and compared to the WHO and Libyan Standard. The results obtained from this study showed in terms of a difference in the concentrations of salts in drinking water, the pH values were between 5.50 - 7.73, while the concentration of Total dissolved salts TDS range between 54 - 1903 mg/L, the water sample of wall No. 7 exceeded the permissible limit within the specifications, the EC value is between 85 - 2970 µs/cm^3, while the total hardness concentration was between 20 - 992 mg/L and there are samples of water No. 7 and No. 8 have exceeded the limits. while the calcium concentration was between 6 - 306 mg/L and the water sample No. 7 exceeded the limit, the concentration of magnesium ranged between 2 - 55 mg/L, As for the concentration of sodium, it was between 4 - 183 mg/L, and potassium was between 6 - 39 mg/L, while the concentration of chloride was between 10 - 344 mg/l where the water sample No. (8, 9) exceeded the permissible level according to specifications, and concentration values Bicarbonate ranged between 33 - 122 mg/L.

Keywords

Groundwater, Drinking Water Quality, Murzuq Basin, Physiochemical Properties

Received: September 22, 2020/Accepted: October 23, 2020/Published online: November 6, 2020

1. Introduction

Pure drinking water is one of the basic needs of societies for what it contributes to preserving human health, hence the average serving per individual of pure drinking water has become a human development indicator at the world level, and it is one of the basic factors necessary for many industrial and commercial activities as the needs of these activities have become constitutes a substantial proportion of the total daily consumption of drinking water [1], completely pure water free of impurities and salts is not available in nature due to the fact that water is a solvent for gas, liquid and solid materials, They dissolve when crossing waterways a lot of mineral salts and organic compounds, therefore we find that the dissolved compounds in the water are different and varied depending on the nature of the layers of the land and the environment surrounding the waterway [2], and the water is considered polluted when its constituent elements change in quantity or qualitative directly or indirectly, so that

* Corresponding author
E-mail address: Khlwafaa321@gmail.com (W. K. Amhimmid)

this water becomes less fit for the natural uses designated for it, and whatever the source of the water pollution is, the state and nature of the pollution is one of four types of pollution, physical, chemical, biological, or radiological pollution [3].

Water sources are limited and non-renewable in Libya in general and in the southern regions in particular, and therefore the laws on non-depletion of groundwater should be activated, and reduction of well drilling for agriculture, and the use of water in agriculture to the extent necessary only, and agricultural regulations must be followed in terms of the quality of crops and irrigation methods to ensure the lowest water consumption and the largest yield on production. [4, 5]

A quantitative deterioration in water resources in the southern region has been observed over the past 25 years. Low groundwater > 1.0 m/year due to excessive water consumption to cover development needs, In addition to a decrease in the quality of water, especially at the edges of the underground reservoir of Murzuq basin. [6] It has been accompanied by a Significant soil degradation due to salting and possibly sodium, where the conductivity of some soil reach (16.32 ds/m) in the surface layer [7], the region is dominated by acidic and weak alkaline soils, which is characterized by a sand bag with a percentage of sand granules > 85% and represents 6.62-7.51 Mud and silt in< 13%, putting it at risk of wind erosion, and the region is experiencing a significant deterioration of the Vegetarianism cover in terms of the lack of diversity and the weakness of growth and spread due to water scarcity and low levels, where Agricultural activity in this basin, especially on the northern and north-eastern edge of it, around the oasis of Sebha and nearby oases to increase the consumption of groundwater, which has had several negative effects, including a sharp decline in Groundwater, depletion of some springs and dry lakes [8].

This study aims to find out some physiochemical properties of groundwater in some areas of Murzuq suburbs to determine the quality and suitability of this water for drinking and human consumption according to local and international specifications

2. Experimental

2.1. Study Area

The study included Murzuq region located in the southwest of Libya between latitudes 25.9044 - 25.91361 north and longitude 13.91694 - east, where 10 samples (three replicates per sample) were collected from some of Murzuq regions: Taraghun two samples No. (1, 2), Om-Alaranb three samples No. (3, 4, 5), Hajj Hajil One sample No. (6), Wadi Ataba one sample No. (7), Tamsa one sample No. (8), and Ghadwa one sample No. (9), Fongl one sample No. (10). Physical and chemical analysis were performed on these samples.

2.2. Methods

All physical and chemical analyzes of the water samples were performed according to the methods set out in the 1999 American Public Health Association's book [9] on standard methods for testing water where:

The pH of the water samples was measured immediately after collection, using the HANNA HI 8314 pH Meter. Electrical Conductivity (EC) was measured for the samples after collection by using the Conductivity Meter Laboratory type ELE Conductivity Meter 4310, the total dissolved salt (TDS) concentration was calculated mathematically by the electrical conductivity values obtained during the measurement of samples, according to the following equation:

$$TDS = EC \times 0.64 \quad (1)$$

Total hardness, calcium and magnesium were estimated by titration using EDTA. The titration was used to estimate chloride using Mohr's method. The bicarbonate was estimated by titration using a standard solution of hydrochloric acid. Sodium and potassium were estimated using the Corning 410 Flam photometer.

Table 1. Physiochemical properties of drinking water samples in Murzuq basin.

Wall No.	Name of the area	pH	EC	TDS	T.H	Ca	Mg	Na	K	Cl	HCO_3
1	Taraghun1	6.8	103	98	42	6	7	10	15	170	77
2	Taraghun2	7.4	775	450	48	14	3	75	30	191	122
3	Om-alaranb1	7.73	2970	1901	992	306	55	183	39	205	41
4	Om-alaranb2	7.4	1493	956	522	145	38	47	26	349	101
5	Om-alaranb3	7.58	1246	797	388	89	40	40	24	301	80
6	Hajj Hajil	7.34	85	54	36	6	5	10	11	113	41
7	Wadi Ataba	6.73	197	126	116	17	18	25	6	175	33
8	Temsa	7.59	226	145	20	6	2	58	6	118	89
9	Ghadwa	6.5	96	62	32	6	4	13	12	142	45
10	Fongl	7	139	95	40	6	6	4	12	10	43

Statistical analysis:

The correlation coefficient was performed as a statistical analysis of the studied samples using the Statistical Package for Social Science (SPSS) program.

Table 2. Statistical analysis (correlation coefficient) of drinking water samples in Murzuq basin.

	pH	E.C	TDS	T.H	Ca	Mg	Na	K	HCO_3	Cl
pH	1									
E.C	0.663	1								
TDS	0.645	1.00**	1							
T.H	0.562	.974**	.979**	1						
Ca	0.567	.977**	.981**	.995**	1					
Mg	0.514	.905**	.912**	.952**	.917**	1				
Na	0.652	.890**	.885**	.820**	.856**	0.663	1			
K	0.573	.885**	.878**	.789**	.798**	0.707	.773**	1		
HCO_3	0.397	0.087	0.073	-0.073	-0.075	-0.065	0.086	0.338	1	
Cl	0.356	0.52	0.561	0.554	0.5	0.68	0.298	0.554	0.477	1

3. Result and Discussion

3.1. The pH

The importance of pH lies in determining the biological and chemical compositions in natural waters where the degree of decomposition of weak acids and bases depends on the ionic concentration of hydrogen and thus the degree of toxicity of some compounds such as arsenic is affected with a decrease in the pH [10], the pH of all samples studied was Within the permissible limits within the Libyan standards [11] and the World Health Organization for the year 2011 [12], where the lowest value was in the sample No. (9) 6.50 and the highest value is 7.73 in the water well of No. (3) as shown in Table 1 and these results correspond to (Hamid, 2019)[13], and the statistical analysis of the pH indicated as there is no correlation as shown in Table 2.

3.2. Electrical Conductivity

The results of the electrical conductivity of water samples in Table 1 indicate a variation in the electrical conductivity rate, so it was the lowest in sample No. (6) 85 µs/cm^3 and the highest was in sample No. (3) 2970 µs/cm^3, the statistical analysis shown in Table 2 stated that there is a strong correlation between electrical conductivity, total dissolved salts, total hardness, calcium, magnesium, and sodium and potassium.

3.3. Total Dissolved Salts (TDS)

The term total soluble salts in water refers to soluble salts such as bicarbonate, chlorides, calcium, magnesium, and the sum of all positive and negative ions present in water. The importance of this examination is attributed to the general indicator of the viability of drinking water [14], the results of TDS for water samples are shown in Table 1, where the lowest concentration in water sample No. (6) 54 mg/l, while the highest concentration in sample No. (3), which is considered to have exceeded the limit allowed in the Libyan specifications and the WHO, while the rest of the samples are within the permissible limit, the statistical analysis classified in Table 2 indicates a significant correlation between TDS, EC, Total hardness, calcium, magnesium, sodium and potassium.

3.4. Total Hardness (T H)

The T H results of samples under study were ranging from 20 mg/l in a water sample No. (8) to 992 mg/l in the sample No. (3) as shown in Table 1, water samples of No. (3) and No. (4) have exceeded the permissible limit in Libyan specifications and the WHO for the year 2011, the results of Total Hardness in this study correspond to the results of (Hamed 2019) [13], and attributed (Amsery, 2007)[15], the reason for the variation and difference in the concentration of total hardness to the difference in the geological composition and topography of the regions, statistical analysis there is a significant correlation between T H, E C, TDS, calcium, magnesium, sodium and potassium as shown in table 2.

3.5. Calcium

The water of Murzuq region had a great variation in the concentration of calcium where it was in the samples No. (1, 6, 8, 9, 10) 6 mg/l, while rising in the sample No. (3) 306 mg/l, which is the highest concentration of calcium in the samples studied, which exceeded the limit in Libyan specifications and the WHO for 2011, statistical analysis showed that there is a significant correlation between calcium, electrical connectivity, total dissolved salts, total hardness, magnesium, sodium and potassium.

3.6. Magnesium

Magnesium is a necessary element and plays an important role in the enzymatic reactions, protein building and nuclear acids [16], the concentration of magnesium in all water samples in the Murzuq region was within the limit according to Libyan and WHO specifications, ranging from 2 mg/l in sample No. (8) to 55 mg/l in sample No. (3) as shown in table 1, the statistical analysis shown in Table 2 indicated a significant correlation between magnesium, electrical conductive, total dissolved salts, total hardness and calcium.

3.7. Sodium

The concentration of sodium in drinking water samples did not exceed the limit within Libyan and WHO specifications, where it was ranging from 4 mg/l in sample No. (10) and the highest concentration in sample No. (3) 183 mg/l. statistical analysis indicated that there is a significant correlation between sodium, electrical connectivity, total dissolved salts, total hardness and calcium as described in Table 2.

3.8. Potassium

The results in Table 1 showed that the concentration of potassium ranged from 6 to 39mg/l, with the lowest concentration in sample No. (7) and No. (8), and the highest concentration in sample No. (3), and that all samples were below the permissible limit in Libyan specifications and WHO, while statistical analysis in Table 2 indicates a significant correlation between EC, potassium, total dissolved salts, total hardness and calcium.

3.9. Chloride

Chloride is responsible for the salty taste of water and its presence in a large extent may indicate contamination with sewage water [11], the results of chloride for drinking water samples for Murzuq region shown in Table 1 show that there are samples that exceeded the permissible limit in Libyan and WHO specifications and were in the water samples No. (4) 349mg/l and No. (5) 301 mg/l, The rest of the samples were within the permissible limit, where the lowest concentration was 10 mg/l in sample No. (10), and the highest concentration in the sample No. (4) 349 mg/l, statistical analysis indicates that there is no significant correlation of chloride as shown in table 2.

3.10. Bicarbonate

The concentration of bicarbonate in the drinking water samples shown in Table 1 was the highest concentration in sample No. (2) 122 mg/l and the lowest concentration in sample No. (7) 33 mg/l, and all samples within the permissible limits in Libyan and WHO specifications, statistical analysis of bicarbonate indicated no significant correlation.

4. Conclusion

by the evaluation of the quality of drinking wall's water in Murzuq basin for the suburbs of Murzuq city, the results show that; sample water of wall No. (3) is not suitable for drinking due to the high percentage of total dissolved salts and total hardness and calcium above the permissible limits according to local specifications and the World Health Organization. Also The percentage of total hardness and chloride in the drinking water No. (4) is higher than the limits allowed in the local specifications and the World Health Organization and is not suitable for drinking. And the chloride content in the drinking water of No. (5) exceeded the limit in local and WHO specifications and is therefore considered undrinkable. The rest of the drinking water samples were of good quality and safe to drink according to Libyan specifications and the World Health Organization.

References

[1] World Health Organization, (2014) Water Quality in Distribution Systems. Geneva, pp. 6-9.

[2] Hayek, Nasr (2017) entrance to water chemistry pollution, treatment and analysis. Publications of the Higher Institute of Applied Sciences and Technology, Syria.

[3] Berisha, Jaer; et al., Water polluters their sources and treatments, University Publishing House, Cairo, Egypt. (2018).

[4] Suleiman S. Baroni, The water situation in Libya - National Water Conference possibilities and prospects, General Authority for Water, 2013.

[5] Libyan Society for Remote Sensing and Geographic Information Systems - Summary Booklet for the Conference International Geospatial Technology Fair - Libya Geotech 2, 2016.

[6] Rima I. Hamidan. Policies for the management of water resources in Libya Reality, challenges and future strategies. Libyan Organization for Politics and Strategies 2017 www.loopsresearch.org

[7] Muhammad, Ramadan (2008), Assessment of irrigation water Quality and salty of soil in Wadi-Al-shati regain, master's thesis, Department of Environmental Science and Engineering, Brack, Sebha university, Libya.

[8] *Elssaidi, M. A. and Mohamed A. R.*, Quantitative and Qualitative Changes in Groundwater Properties of Murzuk Basin and their Impacts on Ecosystems, Libyan Agriculture Research Center Journal international 3 (S2), 1335-1350, 2012.

[9] American Public Health Association, APHA (1999). Standard Methods for Examination of Water and West water. 20th Ed. New York, USA.

[10] Al-Serwi, Ahmed (2012) Basic Processes for Drinking Water Purification. Scientific Books Publishing and Distribution House, Cairo, Egypt.

[11] National Center for Specifications and Standards (1992) Libyan Standard No. (82) for public drinking water. Tripoli, Libya.

[12] WHO (2011) Drinking water quality guides. Third edition, Volume I, Geneva, Switzerland.

[13] Hamed, Khadija (2019) field study about the quality of drinking water in The Murzuq area. Journal of Applied Sciences, Sabratha University, Special Issue 1, p. 90-99.

[14] Kazim, Ahmed; physical, chemical and bacteriological laboratory analysis of water, House of Books and Documents, Baghdad, Iraq. 2018.

[15] Amsery, Omar (2007) Levels of some chemical elements of drinking water Murzuq master's thesis, Department of Environmental Science and Engineering, Graduate Academy, Benghazi, Libya.

[16] Abed, K. F., and Alwakeel, S. S. (2007). Mineral and Microbial Water in Riyadh, Saudi Arabia. *Middle East journal Sci. Res*. 2 (3): 151-156.