Environmental and microbial study of some wells water in Samarra city compared to some wells in the vicinity

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Abstract. The aim of the research was to evaluate the groundwater within the study area as well as its impact on the surrounding border conditions and the extent of the change in its properties as a result of feeding operations.Water of nine wells were studied, three of it in the city of Samarra (AL-Kathra, AL-Moalmeen and AL-Thopat), and six of them were distributed in the neighboring areas (Al-Mutasim, Tal Al-Aleg,al- Ishaqi, AL-Dahiri, AL-Ashiq, AL-Kalaa) In order to identify some of the physical, chemical and biological properties of these wells in the city of Samarra from month of November 2017 until January 2018. The results showed that the water of the studied wells were characterized by high electrical conductivity in most of the water of Samarra wells, reaching 1750 micros / cm in water of AL-Thopat area . The statistical analysis showed significant differences in the physical and chemical measurements of the wells water inside and outside the Samarra area at a significant level (p. 0.05). In addition, the statistical analysis showed no significant differences between phosphate and nitrate between the wells water inside and outside the city at a significant level ($p \leq 0.05$). The results of the microbial study show that it is pure for most of the wells water because it did not exceed the permissible limits for raw water and drinking water according to Iraqi specifications.

1 Introduction

Groundwater is one of the most important water resources because it constitutes 71% of the world's potable water. It includes groundwater, wells and springs, which are deposited into the ground and stored underground in non-porous layers to form aquifers. [1] Water surfeces such as rivers, lakes, And groundwater exposed to pollution of various kinds and that the future carries with us a growing concern about the scarcity of fresh water sources for different uses, and therefore different types of water should be used different according to use in order to make the most of the sources of water wealth [2]

Groundwater is one of the most important sources of water used by human, even for countries where there are no large rivers. Groundwater is the one that submerges a layer under the soil, and fills the pores or cracks in the rocks below it and constitute a major link in the water cycle by dissolved movement of water between the ground until the upper layer of soil becomes saturated and then reaches the level of the aquifer, which is the top of the saturated layer (the water-filled area). [3] Therefore, the interest in groundwater investment in the countries of the world has become an appropriate source of irrigation for small and individual areas, Some household uses and animals drinking water [1]. The quality of groundwater varies according to location, well size, climatic and

seasonal changes and is affected by movement. The more latent the more contact between rock and water increases, resulting in an increase in the concentration of soluble substances in water.

2 Materials and Method

Collection of samples and laboratory analysis:

Table 1: Characteristics of the study wells in Samara city and vicinity.

Using	Depth	Area
Used for watering and household uses	7m	AL-Kathra/ inside Samara
Used for watering, drinking animals and household uses	16m	Al-Mutasim/outskirts of Samarra
Used for watering and household uses	12m	AL-Moalmeen/ inside Samara
Used for watering, drinking animals and household uses	13m	Tal Al-Aleg/ outskirts of Samarra
Used for watering, drinking animals and household uses	7m	Ishaqi/ outskirts of Samarra
Used for watering and household uses	5m	AL-Thopat/ inside Samara
Used for watering, drinking animals and household uses	7m	AL-Dahiri/ outskirts of Samarra
Used for watering, drinking animals and household uses	7m	AL-Ashiq/ outskirts of Samarra
Used for watering, drinking animals and household uses	8m	AL-Qalaa/ outskirts of Samarra

Collection of samples and laboratory analysis:

Water samples were collected from wells studied each month from November 2017 to January 2018 in polyethylene bottles after washing. The acidity was measured by a HORIBA PH-meter and the electrical conductivity was measured using Oyster's conductivity measurement by immersing the device pole in the model for five minutes. The total base was measured according to [6] as well as the measurement of chloride, total hardness and concentration of calcium and magnesium ions by method [7]. The measurement of plant nutrients (phosphates and nitrates) was used the method used by [8] and was measured by Spectrophotometer (420) nanometers using a cell (1) ml and expressed in unit terms μg / L. Nitrate is used as a wavelength of 395 nm and expressed in unit terms μg / L

The biological study included estimating the total number of bacteria by standard plate count by series of dilution as mentioned In [9] two types of medium were used: Nutrient agar medium and MacConkey agar medium. The results were statistically analyzed using the ANOVA Tow Way binary analysis at a significant level of ($P \leq 0.05$) [10].

3 Results and discussion

The pH values of water wells ranged from (6-8) if the lowest value was recorded in the well water of the AL-Dahiri area. The highest pH was recorded in the water of the well of Mutasim area (8) as in Table (2) which It refers to light alkaline water and falls within the values in the specifications of the set of water for living organsim, which ranges from (6.5-8.5) [11]. The results of the statistical analysis using the variable analysis showed significant differences between the wells water inside and outside the city of Samara at a significant level ($P \leq 0.05$). The results were also similar to those of the researcher [12] in a study of the water of the city of Kirkuk. The lowest value of conductivity was recorded in the well water of the AL-Ishaqi, amounting to 620 Microsemens, while the highest value was in the water well of AL-Kathra area and amounted to 1700 micros. one of the areas inside the city. the value of the electrical conductivity depends on the total dissolved salts during measurement [13]. The water of the well of the AL-Kathra recorded the highest chloride content of 140 mg / L, and this may be due to the deposition of domestic waste water and is usually loaded with large quantities of salts. [14] The results of the statistical analysis also showed significant differences between the wells water inside and outside the city ($P \leq 0.05$). As for

alkaline, the highest value was in the water of the AL-Ishaqi well which was 325 mg / L. The lowest value was in Tel AL-Eleg, which is 100 mg / L. The increase in alkaline in general during the study season is due to feeding of the wells with adjacent saline water, Leading to an increase in alkaline[15]. The increase in calcium and magnesium leads to an increase in alkaline, as the highest value of the total hardness was recorded in the water well of AL-Thopat area , which was (2200) mg / L. the hardness It is important to determine the suitability of water for different uses. [16] Calcium was the highest value in the water of the AL-AL-Thopat area which is 1400 mg / L. while the lowest value in the water of the well of Tel El-Aleg and Al-Ashiq which is 600 mg / L. The lowest value of magnesium was 100 mg / L in the well water of AL-Eshaqi region, and the heights value was in Water of the well of AL-Kathra area is 1000 mg / L. In general, the water hardness is different according to the water resource, since the surface water is less hardness than the groundwater, and this follows the geological property of the land that passes through it. [17] Calcium accounts for 30.23% of sedimentary rocks, and 4.7% of carbonates rocks form magnesium. [18] This explains why the concentration of calcium ions in general is higher than the concentrations of magnesium ions in watery systems [19]. The results of the statistical analysis showed significant differences in the wells water of the AL-Kathra and the rest of the wells at a significant level (P≤ 0.05).

Table 2: Physical and chemical characteristics of wells water.

The well Area	pH	Total hardness. ml/l	Calcium hardness ml/l	Magnesium mg/l	Electrical conduction
AL-Kathra	6.9	2000	1000	1000	1700
Al-Mutasim	8	1200	1000	200	1500
AL-Ashiq	6.7	900	810	90	1000
Tal Al-Aleg	7	1000	760	240	800
Ishaqi/	7	850	800	50	750
AL-Qalaa	7.1	1200	800	360	1400
AL-Dahiri	6	1400	1200	200	1600
AL- Thopat	7	2200	1400	800	1600
AL-Mamel	6.6	1200	880	320	1650

Table 3: Physical and chemical characteristics of wells water.

The well Area	Total alkalinity mg/l	Chloride mg/l	Phosphate µg/l	Nitrates µg/l
AL-Kathra	250	140	0.058	0.03
Al-Mutasim	200	85	0.06	0.07
AL-Ashiq	200	66	0.003	0.003
Tal Al-Aleg	120	140	0.009	0.054
Ishaqi/	325	52	0.06	0.006
AL-Qalaa	275	100	0.003	0.04
AL-Dahiri	200	100	0.052	0.09
AL-Thopat	250	120	0.058	0.007
AL- Moalmeen	250	75	0.03	0.001

Nitrate is the common form of inorganic nitrogen in the aquatic environment. [20] Nitrates are an important component in determining phytoplankton growth. Nitrate values ranged from 0.001-0.0.3 µg / L as shown in Table (3). When comparing nitrate ion concentrations with national determinants, they did not exceed the permissible limits of (10_15) mg / L [21]. The results were less than the results of a study [12] in estimating the amount of nitrates for wells. The phosphate component ranged between 0.05-0.001 µg / L. Phosphate concentrations are often low in natural water. The reasons for the decrease may be attributed to

the tendency of phosphate to accumulate in the sediments [22], in addition to being highly adsorbed to clay minerals and soil organic compounds [23]. The high rates of phosphate, especially in the wells of residential areas due to the large quantities of cleaning detergent and solids resulting from phosphate-rich household uses [24]. The current study recorded lowest results from previous studies [12] for wells water. The results of the statistical analysis showed that there were no significant differences between phosphorus and nitrate between wells water inside and outside the city at a significant level (P$\leq$ 0.05).

Table 4: Total bacterial count on nutrient Agar medium and total number of coliform bacteria on the MacConkey Agar medium cell / ml.

The well Area	MacConkey Agar medium			Nutrient Agar medium		
	10^{1-}	10^{2-}	10^{3-}	10^{1-}	10^{2-}	10^{3-}
AL-Kathra	15.7	7	56	10	35	45
Al-Mutasim	1.7	0	22	1.3	15.5	25
AL-Ashiq	1.7	12	25	1.1	42	22
Tal Al-Aleg	1.1	8	50	11.3	22	14.7
Ishaqi/	4	32	44	3.8	2.4	22
AL-Qalaa	1.8	10	20	2.2	22	16.5
AL-Dahiri	1.1	3	36	1.2	21.5	42
AL-Thopat	4	22	55	16	22	40
AL-Moalmeen	4.5	23	60	22	33	33

Biological study

Table (4) shows that the number of bacteria was low during the study. The total number of aerobic bacteria on the Nutrient Agar medium at 37° C for 24 hours was between 0 and 45 x 103 cells / ml in the water of the well of Mutasim in the second and the third dilution. The highest percentage recorded in the water of AL-Moalmeen, recorded (88) cells / ml. The examination of the total number of bacteria in water is important to know the extent of pollution of those waters. [25] The water is pure for most of the wells water, because it did not exceed the permissible limits for raw water and drinking water according to Iraqi specifications (0-100) cell / ml [8]. E. coli bacteria have a fecal source of their permanent presence in human effluents and other mammals and birds in large numbers and are rarely found in soil or water that is not contaminated with fecal waste. The total count of E. coli bacteria ranged from (0 - 60) cells / ml, which was the lowest value of the water of the well of Mutasim for the second dilution, while The highest value was in the water of the AL-Kathra well (45 × 10) cells / ml for the third dilution. The most important source of pollution in human waste is sewage and human waste and many animals are the most frequent pollution in water. [27] They are fed either by oxidation of organic matter or by inorganic compounds containing iron or sulfur for example. [28]the results of the statistical analysis showed no significant differences (P$\leq$ 0.05) between wells outside Samarra, while the statistical analysis showed a significant differences between wells water inside and outside of Samara city. The presence of different numbers and types of bacteria in the water reflects the degree of feeding of the flat as the number of bacteria increases with the availability of high concentrations of nutrients and organic matter. [29] . This explains the increase in the total number of bacteria in the wells water within the city from the wells outside the city.

4 Conclusions

The value of electric conduction and hard of water wells in Samarra areas higher from the wells of the surrounding areas. Contamination of the water of the wells of AL-Kathra with coliform bacteria more than the water of other wells. All measurements did not exceed the permissible values globally and internationally.

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