



ISSN: 2319-9490

RESEARCH ARTICLE

INVESTIGATION OF THE DRINKING WATER QUALITY IN SOME WATER PUMPING STATIONS AT THE EUPHRATES RIVER (SHATT AL-MUDAINA), IN AL-MUDAINA CITY, BASRAH, IRAQ

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Received 18th September, 2018; Accepted 09th October, 2018; Published 30th November, 2018

ABSTRACT

This study aimed at using of physical, chemical and bacteriological parameters in evaluating the quality of water drinking by choosing four sampling stations: (St.1- Inlet of Abu-Shawi water pumping station, St.2- outlet of Abu-Shawi water pumping station, St.3-Inlet of Al-Abaraa water pumping station and St.4- outlet of Al-Abaraa water pumping station) in the Euphrates River (Shatt Al-Mudaina) in Al-Mudaina city. Samples collected monthly for each station from January to June 2017. The measured parameters were ranged each for (water temperature 11.1-30.2, pH 7.0-8.1, TDS 942.4-2155.7mg/l, total hardness 597.5-1052.3(mg CaCO₃/l). Other chemical parameters like chloride ranged from 45.4-185.4 mg/l and dissolved oxygen (DO) ranged between (4.9-11.6) ppm. The results of bacterial tests shows that a total coliform bacteria which is Low fecal contamination levels in the outlet of both drinking water pumping stations, in contrast fecal contamination levels are high in water samples at the inlet of both drinking water pumping stations.

Key words: Drinking Water, Bacterial contamination, Euphrates River.

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Citation: Amaal S. Al-Sheraa, Khaled K. Al-Khafaji and Ghazi M. Al-Maliki. 2018. "Investigation of the drinking water quality in some water pumping stations at the euphrates river (shatt al-mudaina), in al-mudaina city, Basrah, Iraq" *International Journal of Current Research in Life Sciences*, 7, (11), 2797-2800.

INTRODUCTION

Drinking water in Iraq comes from rivers, lakes, wells and springs. These sources are exposed to a variety of pollutants caused by the diffusion from nonpoint and point sources which are difficult to control, monitor, and evaluate, such as sewage, agricultural and industrial wastes (Ahuja, 2003). The Euphrates is the longest and one of the most historically important rivers of Iraq. Euphrates flows through Syria and Iraq to join the Tigris in the Shatt al-Arab, which empties into the Arabian Gulf. It is a vital resource to communities, agriculture and industry in Turkey, Syria and Iraq (Shamout, 2015). Rivers not only supply drinking water for human consumption but also receive wastewaters discharged from all human activities (Abo-Nasrya, 2009). Water has uncountable benefits, but on the other hand is more environmental components susceptible to contaminants because of its characteristics that make it to be more environmental components received for the pollutants in the environment and then get the pollution, which is defined as a disturbance in natural balance for environment which leads to affect the lives of organisms (Abo-Nasrya, 2009). The internal water in Iraq covers about (24000) km² which consist more than (5%) of Iraq area including, marshes, lakes, Tigris, Euphrates, their tributaries and branches (Jerry & Webb, 2004) (Jerry, 2004). The aim of this study is to assess the present status of water quality in at the main Pumping of water stations (St.1- Inlet of

Abu-Shawi water pumping station, St.2- outlet of Abu-Shawi water pumping station St.3-Inlet of Al-Abaraa water pumping station, St.4- outlet of Al-Abaraa water pumping station in Al-Mudaina city) for three uses; domestic, recreation, and aquatic life support. The quality of water used for different purposes has an important effect on living beings health. Water of poor quality can be the reason behind the spread of disease and the growth of undesirable aquatic life.

MATERIALS AND METHODS

Water sampling: Monthly water samples were collected from selected four sampling stations: (St.1- Inlet of Al-Abu-Shawi water pumping station, St.2- outlet of Al-Abu-Shawi water pumping station 3-Inlet of Al-Abaraa water pumping station, St.4- outlet of Al-Abaraa water pumping station) in the Euphrates River (Shatt Al-Mudaina) in Al-Mudaina city, from January to June 2017, (Figure 1). 3 replicates of water samples, One of each 3 replicates from each station assigned for bacterial analysis, the other two replicates assigned for chemical tests water samples for bacterial analysis were collected in previously sterile screw cup glass container size 500ml and kept in an ice box until reaching the laboratory.

Measures of Physicochemical parameters: pH measured by pocket pH meter WTW 720. Turbidity by turbidity meter and total dissolved solids (TDS) measured by Millipore filter paper according to (Hp Technical Assistance, 1999).

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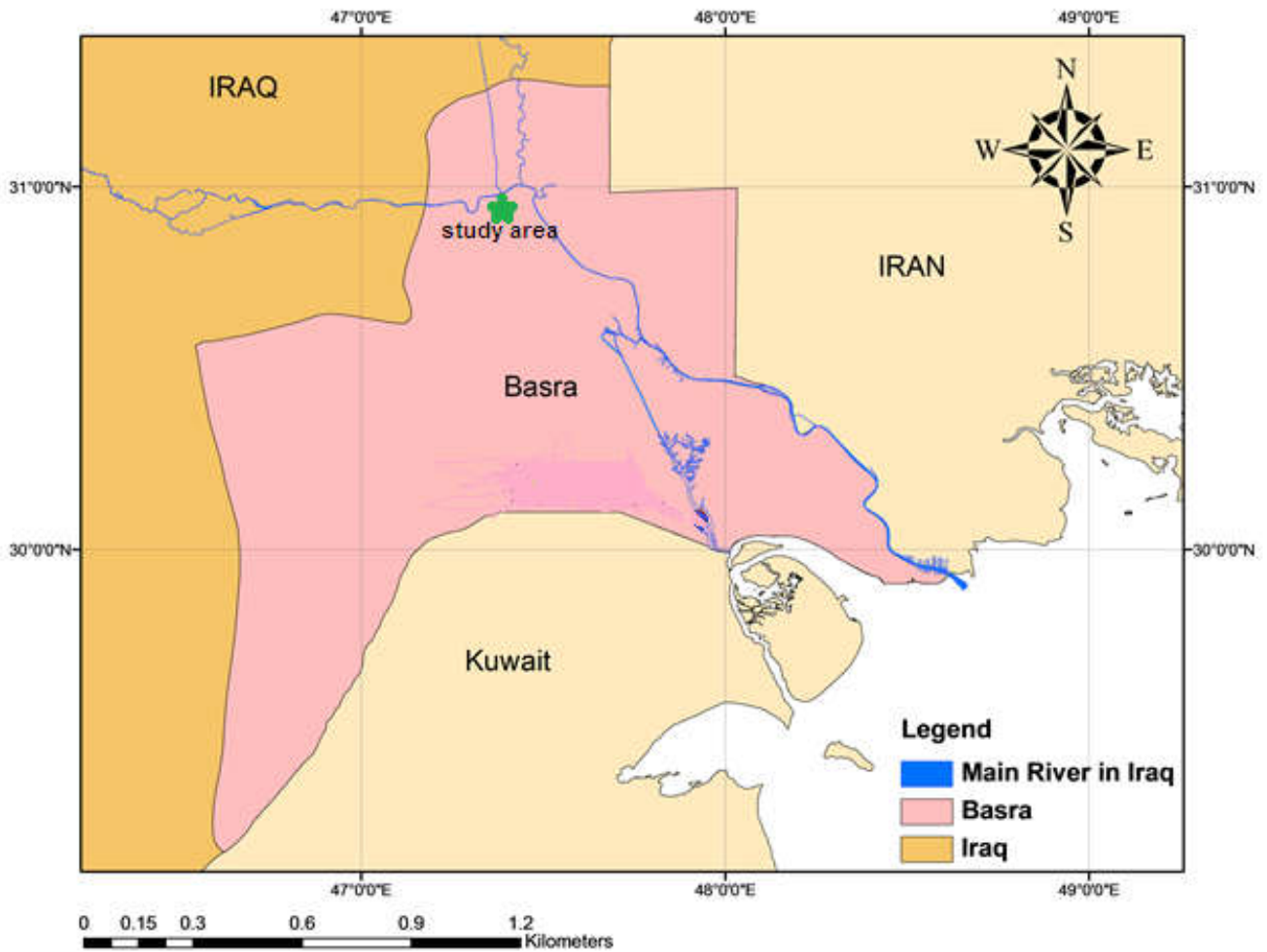


Figure 1. Study area for collected water drinking samples

Chloride and Total hardness (TH) measured according to standard methods (APHA, 2005).

Measure of Fecal Coiforms

Bacteriological examination had been done directly after collection water samples in sterilized glass bottles. fecal coliform have been detected according to (APHA, 2005). The results were expressed in terms of colony forming units per 100 ml of sample (cfu/100ml). Due to the presence of high numbers of fecal colonies, tested samples have been diluted and then the numbers of colonies were calculated to get the final results. Statistical tests for results have been done like analysis of variance (ANOVA), Duncan test, LSD and correlation coefficient.

RESULTS AND DISCUSSION

Physicochemical parameters: The physico-chemical parameters of the stations were given in table (1). The highest water temperature values were observed during June (30.2°C) in St.1 and the lowest values were observed during January (11.1°C) in St.3. The results were showed significant difference ($p < 0.05$) between months. The present study was showed obvious change in water temperature during the seasons, while the highest values of temperature were recorded during summer and the lowest were recorded during winter. These results have been agreed with what was reported by (Ewaid, 2017; Khudhair, 2015 and Fadhil, 2017).

The highest pH values were recorded during March (8.1) in St.3 and the lowest values were recorded during august (7.0) in St.2. The results were showed significant deference ($p < 0.05$) between months The pH was showed slightly alkaline trend. Generally pH of water would have been influenced by geological of catchments area and buffering capacity of water (Shyamala et al., 2008). Thisis agree with that reported by (Atiaa, 2015; Al-Abadi, 2014). The dissolved oxygen (DO) values were ranged the between lowest values in June (5.5 mg/L) in St.2 and the highest values in February (11.6 mg/L) in St.3. The results show significant difference ($p < 0.05$) between months. The results which were obtained from this study were showed an elevated DO during winter and a decrease during summer, According to the USDA [13], the level of oxygen depletion depended primarily on the amount of added waste, the size, velocity and turbulence of the stream, the initial DO level in the water and in the stream, and the temperature of the water.

The TDS level within stations water fluctuated from 612.5 mg/lto 974.0 mg/l with an annual mean of 686 mg/l during thestudy, and there were no differences across the stations but therewere between the different seasons. Water containing morethan 1000 mg/L of TDS is not palatable as drinking water (USGS,2015). The results were revealed significant difference ($p < 0.05$) in values of total dissolved solid (TDS) between months and the stations were ranged from the highest value during January in St. 2 to the lowest value during April in St.1.

Table 1. Physico-chemical parameters of water in study sites from January to June 2017 in Euphrates River (Range, Mean \pm SD)

Parameters	Sites			
	St. 1	St. 2	St. 3	St. 4
Water	10.2-32.9	9.8-31.4	11.1-30.6	10.5-29.4
Temperatures $^{\circ}$ C	21.4 \pm 6.6	20.6 \pm 6.1	20.9 \pm 6.3	19.4 \pm 5.7
pH	7.2-7.7	7.5- 7.9	7.0-7.6	7.4-8.2
Dissolved Oxygen (mg/l)	7.5 \pm 0.72	7.7 \pm 0.63	7.4 \pm 0.35	7.9 \pm 0.75
	5.6-10.3	7.1-11.6	5.5-9.5	6.6-9.7
Total Dissolved solid (mg/l)	7.6 \pm 2.2	9.5 \pm 2.5	7.5 \pm 1.7	7.9 \pm 1.9
	612.4-837.5	674.2-974.0	642.4-945.5	623.8-805.6
Total hardness (mg CaCO ₃ /l)	1635.3 \pm 35.2	824.1 \pm 42.5	793.4 \pm 37.3	714.7 \pm 31.7
	434.2-488.7	412.5--495.4	382.1-432.6	436.5-494.2
Chloride (mg/l)	461.3 \pm 46.3	453.7 \pm 40.4	407.3 \pm 34.2	465.5 \pm 42.4
	45.8-96.9	56.5-179.7	51.0-118.4	648.8-185.4
	70.5 \pm 10.3	115.4 \pm 18.2	85.0 \pm 12.	116.6 \pm 19.7

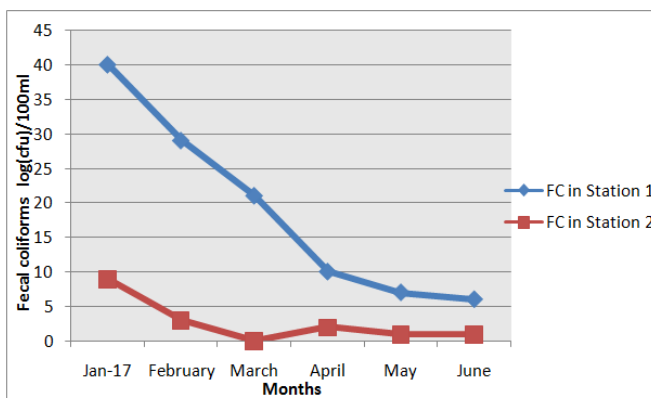


Fig. 2. Fecal coliforms parameter in sampling stations-1, 2

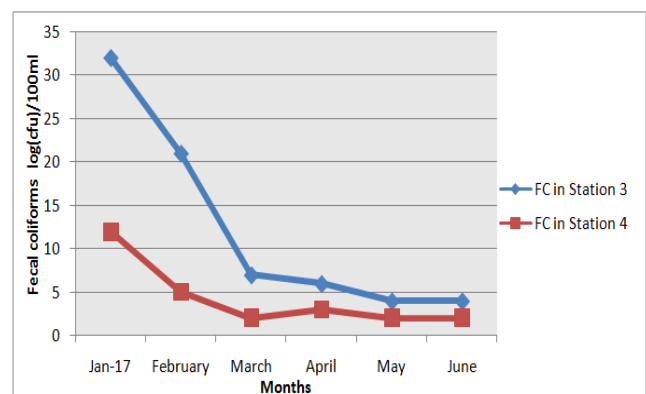


Fig. 3. Fecal coliforms parameter in sampling stations-3, 4

Total hardness (TH) was founded to be at the range between the lowest values during January 382.1mg/l in St.2 and the highest during March 495.4 mg/l in St.3. The results show significant deference ($p < 0.05$) between months. Total hardness values were below 500 mg/l, the permissible levels of the WHO for drinking water at all the stations and during all study months. Chloride values were unstable through the study period. In winter season recorded lowest value (45.8mg/l) in February at stations 1, while the highest value (185.4mg/l) recorded in June at station 4. All readings for chloride were within the acceptable range as recommended by the WHO in 2011. In spite of the variation in the readings were significant at $p < 0.05$ between stations as well as between months of study. As shown in Table-1 chloride readings tend to be high in months of summer season for S.3 and S.4 may be the treatment plant increased chloride addition to drinking water as precaution especially in summer season to destroy all pathogens (WHO, 2011).

Fecal Coiforms parameters

The results of bacterial tests shows that a total coliform bacteria which is Low fecal contamination levels in the two outlet of both drinking water pumping stations, in contrast fecal contamination levels are high in water samples at the inlet of both drinking water pumping stations. The reduction of total coliforms are shown in Figure 2, 3. It was observed that reduction, total coliforms were not removed in St1 and St3 in winter season, while readings tend to be lower in months of summer season for S.2 and S.4, may be the treatment plant increased chloride addition to drinking water as precaution especially in summer season. (WHO, 2011).

Conclusion

The main causes of deterioration of Al-Mudiana city water quality is the poor quality of the raw source water which is represented by (Shatt Al-Mudaina) in Al-Mudaina city because large amount of the contaminants discharged in it. The second reason is the water pumping stations in Basrah city are conventional type that do not deal with soluble elements in water. These plants must be upgraded with units as filter membranes or ion exchange to decrease high dissolve salts and make Basrah water supply safe for human consumption.

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