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Malath I. Yousif ✉; Safa Masser Kmsh; Masar J. AL-Kurdy; Afrah A. Habeeb



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Study of Some Physical and Chemical Properties of Drinking Water in AL-Qadisiyah City

Malath I. Yousif ^{a)}, Safa Masser Kmosh ^{b)}, Masar J. AL-Kurdy ^{c)}, and Afrah A. Habeeb ^{d)}

Community Health Technologies Department, Technical Institute of Al-Diwaniyah, AL-Furat AL Awsat Technical University, Al-Diwaniyah, Iraq

a) Corresponding Author: malath.yousif.idi435@atu.edu.iq

b) safam.kamoush@atu.edu.iq

c) dw.msr@atu.edu.iq

d) Abdulwaheed@atu.edu.iq

Abstract. Al-Diwaniya River is the main water source for human use in Al-Diwaniya city, especially for drinking water, agriculture, public water supply. This study was conducted to detect the validity of drinking water in Al-Diwaniya city and evaluate the efficiency of drinking water from (five stations) Al-Sadr al-oula area, um Al-Khail area, Al-Furat hay, Al-Jamia hay and Al-Hamza area, where samples were collected starting from November 2022 until March 2023. This study included the measurement of pH, electrical conductivity, total dissolved substances, total hardness, calcium, magnesium, chlorides, turbidity, sodium and potassium. The results showed that pH tended to be basic in all months of the study except March where the pH was neutral, It was also found that the total hardness of drinking water was approaching the maximum permissible limit globally, and the results showed that the values of magnesium and turbidity in drinking water were within the specifications of the World Health Organization. As for the electrical conductivity, total dissolved materials and chlorides, they were high and more than the global limit.

Keywords: Aquatic environment, Drinking water, Physical and chemical properties

INTRODUCTION

The problem of pollution of the aquatic environment is one of the most important problems facing developed and developing countries at the present time, due to its direct relationship to the health of the individual and society on the one hand and the multiplicity of sources of pollution and the speed of its spread on the other hand. Chemical waste that enters and accumulates in the aquatic environment across the food chain is one of the most dangerous forms of pollution that affect human health as a result of the locations of most cities, factories and hospitals on rivers. Studies conducted on industrial wastewater and urban waste dumped into rivers have shown their ability to change the chemical and physical properties of water and negatively affect the aquatic environment (2,1).

Water is one of nature's most vital and valuable resources, it is required for the survival of all living species, from the tiniest plants and bacteria to the most sophisticated living system, the human body. Water is a substance composed of hydrogen and oxygen atoms with the chemical formula H₂O and is the most prevalent compound (70%) on the earth's surface. It is notable because of its distinctive chemical and physical features. (3). Many studies concerned with the conditions of Iraqi rivers as a result of exposure to continuous pollution due to industrial and agricultural development (4,5), the major source of raw water processing is AL Diwaniya river to the water complexes that feed the city of Diwaniya and these complexes follow the chemical methods of filtering and sterilization and pumping water through a network of pipes for residential houses in the city (6).

AIMS OF STUDY

- 1-The present study aims to determine drinking water quality
- 2-To investigate the physicochemical properties of purified and non-purified drinking water.

MATERIAL AND METHODS

The study included field visits to the drinking water pumping stations included in the study and to know the efficiency of these stations. The samples were collected by plastic containers of polyethylene type (2) liters and were washed with sample water at least twice before taking the sample, samples representing the raw water of the purification plants were taken at the intake point from the water intake site and a depth of (30) cm. . As for the samples representing drinking water (liquefaction), they were taken from the end of the drinking water pumping stations, and the samples were collected for the period from November 2022 until March 2023

Physical and Chemical Test

The temperature was measured using a graduated mercury thermometer of (0-100) ° C, The pH in the field was measured by the Pocket size-PH-meter after being titrated with standard solutions, Turbidity test were done by turbidimeter (Hach, TU5200), EC is measured by using conductivity meter, chloride, calcium and magnesium were measured by spectrophotometer (Hach, DR 3900).

RESULTS AND DISCUSSION

Temperature is an influential factor in the life of aquatic organisms because most of them have a short range to withstand temperature changes, in addition to the fact that physiological processes have an optimal temperature and that any change in this temperature may lead to the death of these organisms (8). The monthly changes were evident in the water temperatures, as high temperatures were observed during the month of March and low temperatures during the winter months of 2022. Table (1) shows that the temperature of drinking water was similar, as the smallest temperature was captured in January (10) °C and the greatest degree in March (28) °C

The PH values of natural water range at a rate of 7.8 and there are less or more ranges (7) The concentration of hydrogen ion in liquefied water was inclined to base in all months of the study and in all areas of Diwaniya city except for one station, where the PH value of (7) is neutral during the month of March 2023, as the light basic characteristic in the water is due to its content of a percentage of carbonates, and this is consistent with the findings of a number of researchers about this type of Basal (11,10) as in Table (1), The electrical conductivity of water is a numerical number that indicates its capacity to transport electric current. and this value depends on the proportion of dissolved ions in the water and the temperature of the water (12), while for hardness, it represents the total calcium and magnesium ion concentration and is expressed by mg / caco3 liters.

The results revealed that the electrical conductivity values, calcium and chlorides concentrations increased in March in the all stations, this might be related to a lack of rainfall throughout the research period , which led to an increase in the concentration of salts, as well as moderate temperature and evaporation during the month of March and an increase in the decomposition of organic waste, in addition to the discharge of sewage and agricultural waste, and this is consistent with the findings (13) While it was noted that the values of magnesium decreased during the winter months, and this may be due to the inverse relationship between it and phytoplankton, as it enters into the composition of the chlorophyll molecule of these plankton (14).

As for the values of magnesium, It was within the WHO's allowed limits for drinking water (15), while it was noted that the calcium values did not decrease much when filtering, and this may be due to the cleanliness of the sedimentation basins, filters and water tanks used, where the highest value reached 116 mg / liter.

Unless at high amounts, chloride in drinking water is typically not detrimental to human health. Heart and renal sufferers may be harmed by the high concentration, taste criteria dictate the chloride content limit in potable water. (16) , and it was noted in this study that the chloride concentrations of drinking water did not exceed the permissible limit of 200 mg / l according to the specifications of the World Health Organization, where the highest value in drinking water was 149 mg / l

As for chloride, pollution occurs as a result of the dissolution of inorganic and organic salts in the water or from the excretion of irrigation water used for agricultural purposes and others, and the chloride ion is non-toxic when it is within the permissible limits, but the high concentrations of this ion are harmful to their relationship to heart disease, kidney and blood pressure, and it was noted in this study that chloride concentrations for drinking water did not exceed the permissible limit of 200 mg / liter according to World Health Organization requirements, where the

highest value Its in drinking water 149 mg / l, Because river water is the main source of supply for the governorate, it has been observed that the total concentrations of dissolved substances in drinking water have been high, and this may be due to the increase in chemicals used in the treatment of drinking water, which is an undesirable situation.

The turbidity of the water is caused by suspended substances in the water such as mud, silt and phytoplankton and animal and increase the turbidity of raw water in the event of flooding and high water levels in rivers and lakes and when the fall of rain instinct, which requires attention to sedimentation processes by chemicals such as alum, for example.

It was noted that the turbidity values in drinking water for all pumping stations for those areas were low, ranging between (0.1-2.6) NTU, and this may be attributed to the appropriateness of the amount of added alum with the amount of turbidity, as well as the existence of a balance between the production capacity of the purification stations and the consumption of water by citizens so that there is enough time for water stagnation in the sedimentation basins. The results showed that the amount of turbidity falls within the permissible limits for drinking water (Table 1).

TABLE 1. Values of physicochemical properties Determinants of Water Samples from Liquefied Water Sites for the Period from November 2022 until March 2023.

Location	Site 1	Site 2	Site 3	Site 4	Site 5
Months	November 2022	December 2022	January 2023	February 2023	March 2023
pH	7.8	7.7	7.8	8	7.0
Electrical Conductivity	1381	1383	1393	1390	1530
Turbidity	0.1	2.1	2.3	2.6	2.2
Temperature	24	30	10	25	28
Calcium	112	112	114	116	116
Magnesium chloride	46	47	47	46	52
	149	147	150	152	170

CONCLUSION

- 1-The weathering (temperature and raining) has important role in affecting of physiochemical properties during the study period .
- 2-Drinking water in AL-Diwanya city tend to salinity during study period .
- 3- The method of filtering drinking water in AL-Diwaniyah city is not done in the right way.

RECOMMENDATIONS

1. We recommend that the chemicals used be chlorine and Aluminum sulfate must conform to standard specifications.
2. Health control of water sources and purification steps
3. Treatment of wastewater before being dumped into the river because the river is the main source of drinking water in the city.

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