

A STUDY OF THE QUALITY OF HOUSEHOLD WATER TANKS IN TIKRIT, IRAQ

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(Received 7 June, 2021; Accepted 21 June, 2021)

ABSTRACT

This study was conducted to assess the quality of domestic tank's water and its suitability for various daily uses. The physical, chemical and biological characteristics give an idea of the quality of water as people resort to using household tanks for the purpose of preserving water and meeting daily needs. The results showed normal proportions allowed within the Iraqi and international water specifications according to the physical and chemical factors, but it leads to an increase in the number of bacteria in the water. The reason for contamination of household drinking water with bacteria is the residents' negligence of the constant cleanliness of the tanks and the lack of tight sealing of the tanks which exposes them to dust and animal excrement that interacts with the stagnant water in the ditches and it leads to the activation of bacteria. The study found the following results, the conductivity recorded the lowest value of 350 and the highest value of 690 microsomia / cm, the lowest value of dissolved oxygen was recorded 4.6 mg/l, and the highest value was recorded at 11.9 mg/l while the pH was recorded the lowest value of 6.2, the highest value of 8.8 while the total hardness ranged Between (88-225) mg/l. As for the total numbers of bacteria they increased in the winter months and decreased in the summer.

KEY WORDS : Water quality of household tanks, Tikrit, Water chemistry

INTRODUCTION

Water is a chemical liquid compound that is composed of two hydrogen atoms and one oxygen atom and occupies about 71% of the Earth's area (Al-Hamdani, 2015). The purposes of using water are multiple. It is used for cooling, cooking, generating electrical energy, watering plants and drinking animals, and also for industrial purposes (Al-Rifai, 2014). Man depends in his life on water, and his life is related to its purity and lack of contamination, as the pollution of water negatively affects living organisms and makes it unfit for various uses (Moslehi, 2008). Water pollution is a change in the natural characteristics of water, and there are several types of physical pollution, including a change in temperature or an increase in suspended substances, chemical contamination with pesticides and fertilizers, or microbes may be a source of pollution (Al-Najjar, 1999) and among the main dangers resulting from drinking unclean or

untreated water is infection with various water-borne diseases (Qaidan, 2016).

Objectives of the study

The study aims to assess the quality of household water tanks through: -

1. Knowing the physical and chemical properties of domestic water tanks and comparing them with the permissible international and Iraqi standard specifications.
2. Investigation of bacterial contamination of reservoirs water by studying the number of bacteria present in them.

Materials and working methods

Water samples were collected from five stations in Tikrit city and randomly from several different houses, from January to the end of July 2019.

Physical and Chemical tests

Electrical conductivity

The ability of water to transmit electric current was

recorded using an EC meter Lovebond instrument that Golterman made in the field.

pH measurement

The pH was measured directly in the field using a pH meter made in Germany after being calibrated with standard circulating solutions.

Measurement of dissolved oxygen

The dissolved oxygen was measured directly on site using a Germany-made lovebond oxygen meter.

Total hardness

In measuring total hardness by correction method with Na₂EDTA standard solution (N0.01) and Erichrom black _T index (APHA, 2005).

Biological study

Calculation of total bacterial count

The decimal dilution method was used with sterile tools and conditions, and by using distilled water, a series of dilutions were prepared up to 4-10. After preparing the dilution series for the models, 0.1 cm³ of the dilution was withdrawn and each dilution was added to the Nvtrint agar and moved in a circular motion over the medium to incubate the dishes. In the incubator at a temperature of 37 m for a period of 24-48 hours, after which the total number of bacteria was calculated (APHA, 2005).

RESULTS AND DISCUSSION

Electrical conductivity

Conductivity expresses the percentages of total dissolved salts in the water (Al-Sarawi, 2012), and is considered one of the indicators of water quality. Conductivity values ranged between the lowest value of 350 microsiemens in June in Station No. 1 and the highest value of 696 Microsiemens in February for Station No. 4. It became clear that the conductivity values increased in the winter seasons and decreased in the summer season due to the increase in rainwater and the resulting salts. The accumulation of ions in the water and the foreign organic materials cause an increase in the conductivity value when heavy rains (Falih and Rasheed, 2016), and from comparing the results with the Iraqi standard determinants (2001) which were defined as (2000) microsimmins / cm, and the determinants of the World Health Organization (WHO, 2008). Which was specified at (2500)

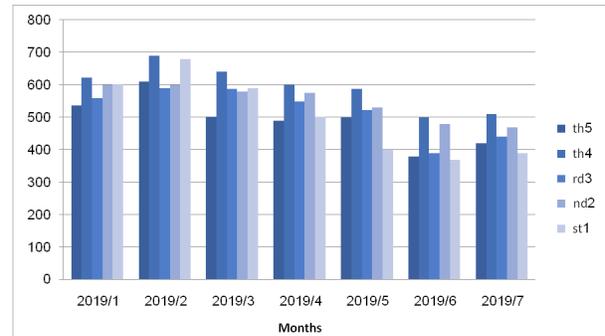


Fig. 1. Electrical conductivity through the study period (mS/cm)

microsimmins / cm. We note that all the stations studied did not exceed the permissible limits.

pH

The pH is important when studying the qualitative properties of water as it plays a major role in the chemical and biological balance of water (Al-Hilali, *et al.*, 2021). The results of the current study showed that the pH value ranged between the lowest value of 6.2 in the fourth station in February and the highest value. It amounted to 8.8 in the first station in April that the increase in pH is due to the increase in the amount of alum that is added to the water for the purpose of filtration and sterilization (Al-Maamouri, 2017) and the high values of the acidic function leads to the spread of biology and the change of standard characteristics (Al-Hayali *et al.*, 2015). The pH values remained within the permissible natural limits according to the Iraqi specifications (2001) (6.2-8.5) and the World Health Organization (2008) specifications (6.5-9.5).

Dissolved oxygen

Dissolved oxygen gas is considered one of the important elements in assessing the quality of water (Reid, 1961) and its quality is very necessary for the

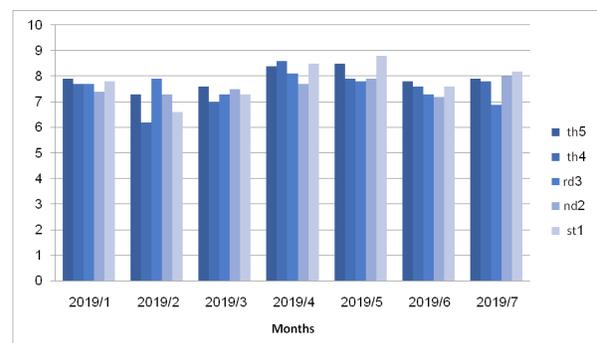


Fig. 2. pH level during the study period.

continuity of most types of aquatic life, including fish, invertebrate animals, and even bacteria that depend on their breathing on oxygen (Al-Ansari, 2006) and the current study recorded the highest value that reached 11.9 mg / l for the fourth station in February and the lowest value was 4.6 mg / l for the third station in July. The highest values were recorded in winter and the lowest values were recorded in summer. The reason is that higher temperatures reduce the oxygen saturation of the water in addition to the activity of some types of

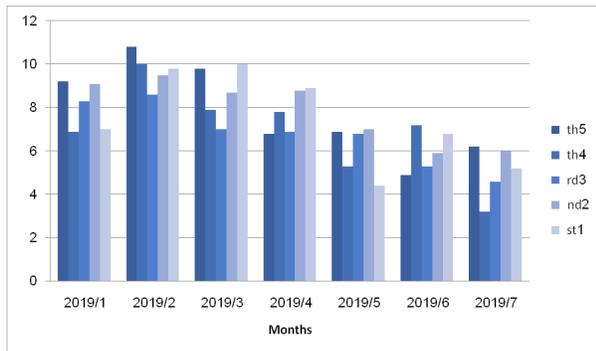


Fig. 2. Dissolved oxygen level during the study period (mg/L)

microorganisms that lead to the depletion of oxygen (Talaat and Al-Safawi, 2018). The growth of organisms such as algae increases oxygen in the construction process Al-Ta'oui (EPA, 2005) Despite this variation in percentages, it is considered conforming to the Iraqi and international standard specifications for drinking water.

Total hardness

The degree of water hardness plays an important role in determining its suitability for different uses, as the water is hard if it contains high concentrations of cationic ions, especially calcium and magnesium

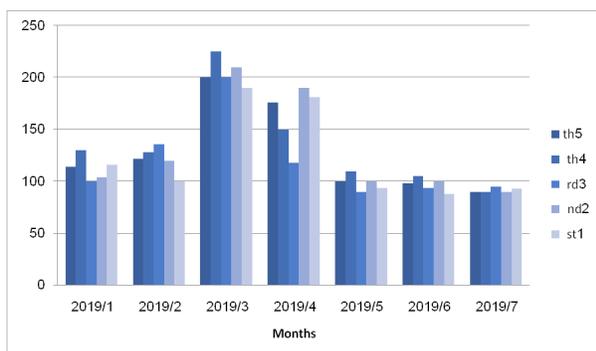


Fig. 4. Total hardness level during the study period (mg/l)

ions (Al-Rabei, 2002). In the current study, the value of hardness ranged between (88-225) mg / l and the reason for the high rate of hardness is because of leaving the tanks open and entering the soil rich in ions, especially calcium, in addition to neglecting to clean the tanks and collecting dust in the tanks. The hardness values of all samples did not exceed the maximum permissible limit in the Iraqi and international specifications for drinking water, which is 500 mg/l.

Bacteriology tests

Total Bacteria Count

The total number of bacteria represents a measure of the quality of water and the suitability of water for drinking and various uses. It is noted through Table 5 that the number of bacteria ranged between (41-220). The total numbers of bacteria were not in conformity with the Iraqi standard specifications (2001) which amounted to (10 cells/ml) and Al-Alamiah (2008), which amounts to (5 cells / ml) that the high numbers of bacteria in winter is due to the lack of sunlight with lower temperatures, which increases the total number of bacteria (Yehia and Sabae, 2011). Also, the presence of sand and mud works to protect the bacteria. (Asano, 2007) As for its low numbers in summer, it is due to the increase in temperature that causes the activity of the primary ones that feed on bacteria (Eccles *et al*, 2004), as well as the low levels of oxygen in the summer that reduce the bacterial representation of organic compounds in the water. Because of the presence of types of bacteria that are resistant to the concentration of chlorine, we find that there are a number of bacteria despite the presence of appropriate concentrations of chlorine, and the high number of bacteria in drinking water is evidence of

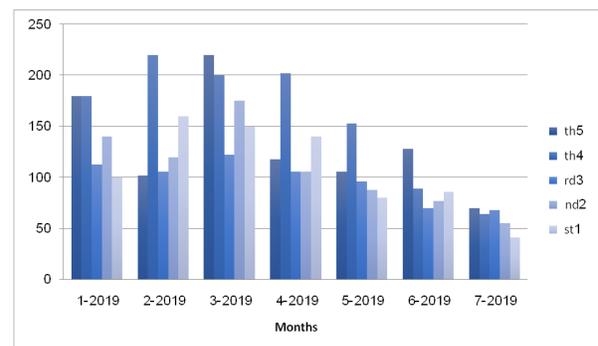


Fig. 5. Shows the total number of bacteria in water during the study months.

the lack of quality of the filtration process in stations equipped with liquefied water due to contamination of filters and Poor maintenance and irregular washing of the filters, as bacteria are adsorbed on the sand particles (Latif, 2019). The high numbers of bacteria in winter are consistent with some studies, such as the study (Al-Badri, 2012); (Mustafa *et al.*, 2020).

CONCLUSION

1. The values of water pollutants varied during the months of the study, but they remained lower than the Iraqi and international standards, except for biological pollutants.
2. Large numbers of the population depend on reservoir water for their daily uses without prior knowledge of the cleanliness of these tanks.
3. An increase in the number of bacteria in the winter and a decrease in the summer.

Recommendations

1. Raising awareness among the population about the importance of cleaning and sterilizing water tanks, externally and internally, to reduce the percentage of pollution while closing the reservoirs tightly.
2. Reservoir water is a microbial pollutant, so its water should not be used until after it has been sterilized.
3. Choose the appropriate place to put the ditches away from the cages of birds and animals to prevent pollution.

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