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Study on the environmental characteristics of the water of the tanks of some Schools in Tikrit, Iraq

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ABSTRACT

The current study included the identification of some physical, chemical and biological characteristics of water reservoirs of Tikrit from January 2018 to April 2018. And compare the results with the standards of Iraqi and global drinking water. Bimonthly samples were collected from each plant for four months and eight samples during the study period. The evaluation included the study of the following physical and chemical factors (air temperature, water temperature, electrical conductivity, salinity, total hardness, calcium titration, magnesium titration, total alkalinty, total acidity and chlorides. The results showed that the air temperature ranged between (15-30.1) m while the temperature of water between (12-26.4) m. Electrical conductvity values ranged between (7.0-8.10), salinity ranged between (0.230-0.400) mg/l. The dissolved oxygen values ranged between (5.0-11.9) mg/l while the biological requirement values ranged from (1.1-7.5) mg/l total fermentation ranged from (128-127) mg/l, which resulted from calcium carbonate ranged between (100-170) mg/l while magnesium carbonate ranged between (20.2-84.0) mg/l and basal ranged between (22-80) mg/l and acid values ranged between (4-124) mg/l.

Key words: *Water quality of tanks, Environmental characteristics of tank water*

Introduction

Water can be considered as the most important thing to everything that lives on earth, including humans, animals and plants. It is one of the second necessities of life after air, and it is very important for the continuation of life. Drinking water is one of the dangerous sources that may afflict a person with various diseases in the event of contamination of its water (Alwan *et al*., 2013; Al-Hilali *et al.,* 2021). The person depends on the water that is saved in tanks to achieve their different needs for drinking, cooking and cleaning.

Reservoir water is affected by many physical, chemical and biological factors that cause pollution for its water such as the use of human activities which greatly changes the physical, chemical and biological processes of water systems, and can be evaluated through water quality control as the main source of disease and bacteria transmission (Abdul-Aziz, 2018; Mustafa *et al.,* 2020), so the importance of the safety of drinking water that is saved in tanks and in the interest of public health, the research aims at: Studying some physical and chemical properties of schools' water that is saved in tanks. and comparing the results to examine the studied water samples with the Iraqi standards and international standards specifications which are permitted for drinking water.

Materials and Methods

Description of the study area

Four school stations were chosen for the water tanks

of Tikrit schools, and some physical, chemical and biological characteristics were studied putting in mind the monthly changes in the school tanks in Tikrit city.

Stations of the study

The first station (Al-Yusr School) : This station is located in Tikrit, the center of Salah El-Din Governorate, the old recruitment area.

The second station (Toyoraljana School): This station is one kilometer away from the first station in the forty area in Tikrit, the center of Salah El-Din Governorate.

The third station (Al Bayan School): This station is located about 30 meters away from the second station, in the city of Tikrit, the center of Salah El-Din, in al arba'een road.

The fourth station (Al Nidaa' School): This station is 200 meters away from the third station in al arba'een road in Tikrit, the center of Salah El-Din Governorate.

Samples collection

Four study stations were chosen by taking samples from their drinking water in school tanks in Tikrit, and samples were taken monthly from 1/1/2018 to 11/4/2018. The samples were collected by taking 5 liter polyethylene containers for chemical and physical analysis. After washing the container well with the sample water and using the dissolved oxygen samples and the vital oxygen, 250 glass bottles with the addition of oxygen measuring solution.

Testing of physico-chemical parameters

All water testing were done as per APHA (2005).

Results and Discussion

The results of the current study showed clear monthly differences in air temperature, and these differences are due to the distinct difference in the region's climate between summer and winter temperatures, day and night, and there was also a difference in the time of taking samples from one location to another. On the other hand, water temperature, is also associated with and affected by air temperature. The variation and difference in the water temperature of all the studied stations was a natural variation due to the occurrence in the weather throughout the year (Al-Khashab *et al*., 1983).

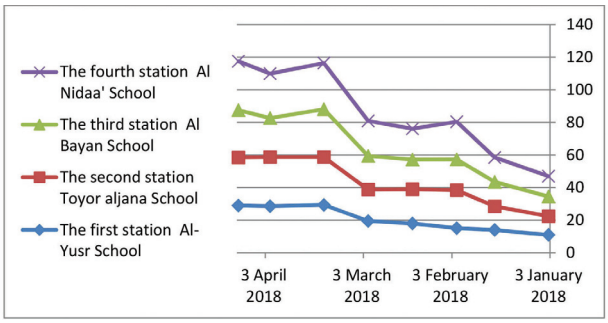

Fig. 1. Monthly and local changes in air temperature during the period of study (° C).

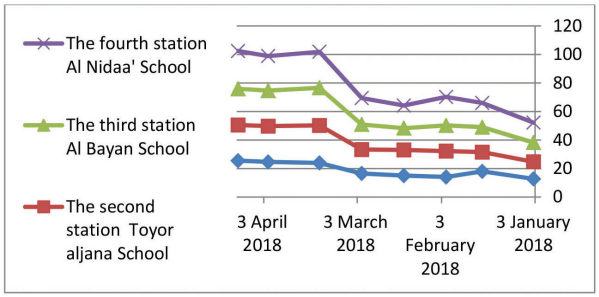

Fig. 2. Monthly and local changes in water temperature during the study period (° C)

The results of the current study showed clear seasonal changes in air temperature, as it recorded its lowest value in the first station on 3/1/2018 which is (11), while its highest value was recorded in the second station on 1/4/2018 which is (30.1 ml)

As for the water temperature, it ranged between (12 - 26.5 ° C), as it recorded its lowest value in the second station on 1/3/2018, which is (12 °C) and the highest value recorded in the fourth station on 11/4/2018, which is (26.5 °C)

It is one of the general indicators of water quality and it is an estimate of substances dissolved in water (Guilfoos,2016). The electrical conductivity values during the study period ranged between (410-566) Micro Stems / cm and showed clear quarterly differences in the conductivity values, as the highest values were recorded in winter And for all the studied stations, while the lowest electrical conductivity values were recorded for the fourth station, (410) Micro Steams / cm, on 11/4/2018.

The pH has a direct effect on the biological and chemical activities that occur in the aquatic environment, so it is necessary to know the pH in any study on water bodies (Al-Tamimi and Al-Ghaflih, 2006). Algae and aquatic plants play a big role in controlling the pH value. It consumes carbon dioxide in the

photosynthesis process, leading to a pH balance (Thompson *et al.*, 2003).

The pH values during the study period showed values ranging between (7 - 8.5), as it recorded the lowest value (7) on 1/3/2018 in the first station. And its highest value (8.5) on 01/20/2018 at the second and fourth stations. The current academic results matched the permitted natural limits according to the Iraqi and Standard Specifications (2001) and the World Health Organization (WHO, 2008). (6.5-8.5).

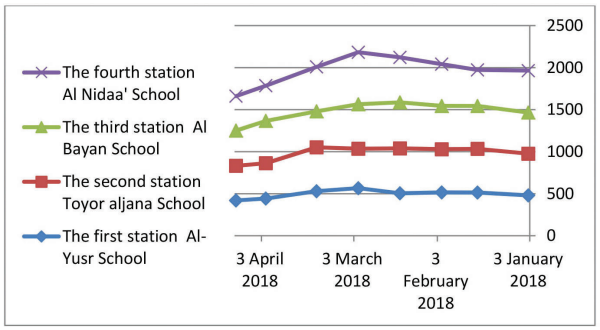

Fig. 3. Monthly and local changes to electrical conductivity during the study period (Micro-Siemens / cm)

The total hardness of water is calculated on the basis of the presence of bilateral ions, especially calcium and magnesium (Al-Azzawi and Al-Arazza, 2012). In the event that dissolved salts are carbonate, hardness is described as temporary, if it is sulfate or chlorides, it is described as permanent hardness, and there is no way to benefit from water in such a water photographer except with complicated and costly operations (Omer, 2010).

The results of the current study showed that the hardness values ranged between (128-274) mg/L. It recorded its lowest value in the third station on 11/4/2018 which is (118) mg/L. The highest value of hardness recorded in the fourth station on 1/3/2018 is (274) mg/L. The hardness values of all stations studied did not exceed the maximum permitted level according to the Iraqi specifications for drinking water (2001) and the World Health Organization (WHO, 2008) of (500) mg/L.

There are two elements of calcium and magnesium in the water in the form of divalent ions for both Ca (2) and magnesium (Mg + 2). It is one of the most common hardening agents in natural water (Al-Naimi *et al.*, 2010). The concentration of calcium ion is higher than the concentration of Magnesium in natural water (Hutchinson, 1967). In the current study, this phenomenon was observed where the calcium concentration rates were higher than the magnesium levels for all months of the year and in all locations. The reason is due to the interaction of carbon dioxide with calcium, which is stronger and greater than its interaction with magnesium. Therefore, greater amounts of calcium are converted into dissolved bicarbonate, affecting the hardness value (Koc *et al.*, 2008).

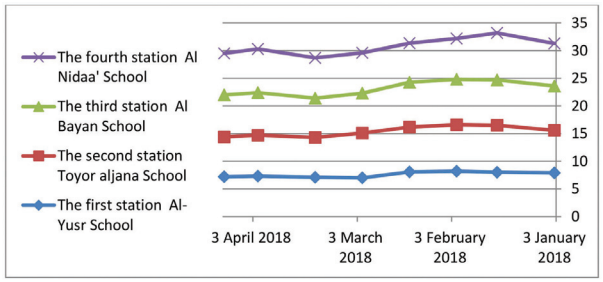

Fig. 4. Monthly and local changes of pH during the study period

The hardness of calcium ranged between (100-170), as the highest value recorded for hardness of calcium is (170) mg/L on 01/20/2018 at the third station. And the lowest recorded value of calcium hardness is (100) mg/L on 11/11/2018 at the first and third stations.

The values of calcium hardness showed a decrease from the permissible limit according to international specifications of (200) mg/L and higher than the allowable limit according to the Iraqi specifications (150) mg/l. As for the value of hardness of magnesium, it ranged between (8- 122) mg/L. The highest value (122) mg/L was recorded on 1/3/2018 at the third station. The high magnesium hardness in winter is due to the discharge of magnesium ion from the soil to the surface water sources due to rain and industrial and civil drainage. The low mag-

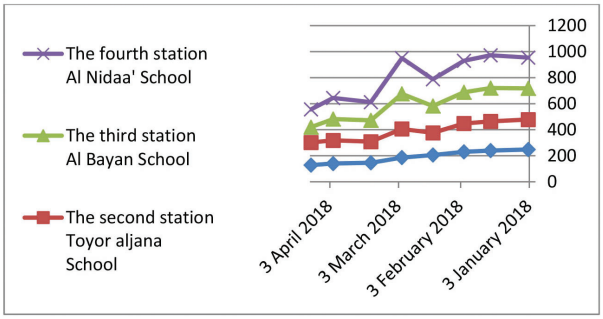

Fig. 5. Monthly and local changes for total hardness during the study period (mg / l)

nesium value in the spring is due to the flowering of plants and algae that absorb magnesium elements, as it enters into the synthesis of the chlorophyll molecule (Razzuqi and Al-Rawi, 2010). The values of hardness of magnesium exceeded the permissible limit of (50) mg/L according to the Iraqi and international specifications for drinking water.

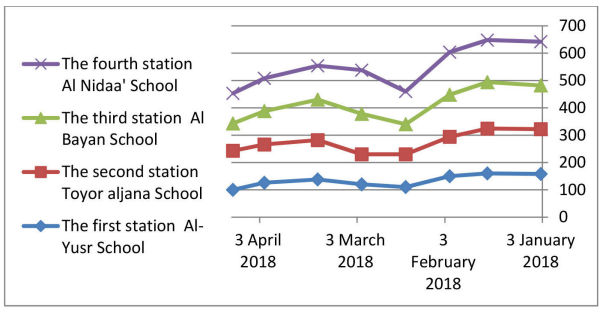

Fig. 6. Monthly and local changes of calcium hardness during the study period (mg / l)

The water base is due to the presence of carbonate ions, bicarbonate and hydroxides, and the water base is affected by various factors, including the concentration of carbon dioxide and the activity of microorganisms and primary productivity (Hussein *et al*., 2006).

The total alkaline values ranged from (22-80) mg /L, the highest value was recorded on 3/15/2018 at the third station, which is (80). And its lowest value was (22) mg/L in the second station 11/4/2018. All results were below Iraqi and international specifications of (200) mg/L.

The acidity of water is due to the increased concentration of carbon dioxide in it and its conversion to carbonic acid or to the presence of acids such as hydrochloric acid or sulfuric acid (Afifi, 2000).

The high degree of acidity of water has a negative impact on human health and aquatic organisms

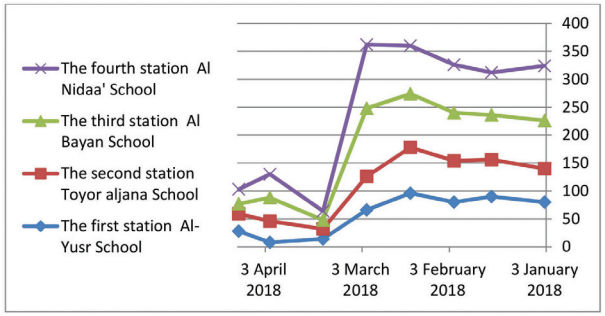

Fig. 7. Monthly and local changes in magnesium hardness during the study period (mg/l)

such as fish and crustaceans, as they lead to their destruction. The acidity of water also leads to corrosion of pipes and mineral structures in its submerged parts of water (Hassan, 2010). The results of the current study showed that the highest concentration of acidity was recorded in the third station, which is (124) mg/liter on 3/15/2018. The reason is due to the dissolution of carbon dioxide gas in the water due to the decrease in temperature leading to the formation of a weak carbonic acid that decomposes to produce hydrogen ion, which by increasing its concentration increases the degree of acidity (Razuki and Al-Rawi, 2010).

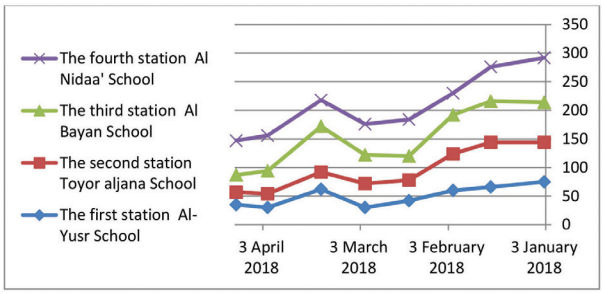

Fig. 8. Monthly and local changes to total basal during the study period (mg / l)

The salinity is made up of the positive and negative ions present in the water. (Saadi, 2009). The salinity of fresh water concentration is less than 0.5 g /l, and in the seas and oceans it ranges between (15-36) g/l. The most important types of salts are calcium carbonate and bicarbonate, as well as sulfate and chloride salts (Hafeez, 2009).

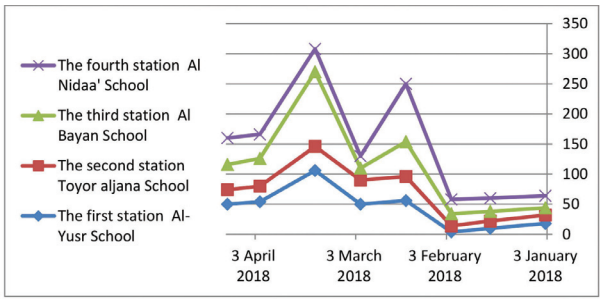

Fig. 9. Monthly and local changes to total acidity during the study period (mg / l)

The current study showed that the highest salinity value recorded was (0.4) mg/liter at 1/3/2018 at the fourth station, due to the abundance of highly soluble dioxide gas that increases the negative carbon ions (Al-Haidari, 2003). The lowest recorded salinity value is (0.2) mg/l on 11/4/2018 at the sec-

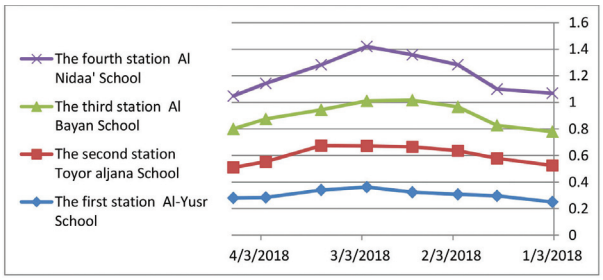

Fig. 10. Monthly and local changes in salinity during the study period (mg / l)

ond station. The reason for the decrease in salinity in the spring is due to the attenuation due to the high level of the river (El Hamdaoui, 2009). The studied samples matched the standard specifications for Iraqi drinking water (2001) and international (WHO, 2008). It is suggested for drinking water which is (0.5) mg/liter.

The chloride levels are an indication of the degree of water quality (Khudair, 2013). In fresh water, the chloride flow is at low levels and its concentrations increase in winter clearly as a result of the erosions caused by soil washing due to the rain (Al-Rubaie, 2007).

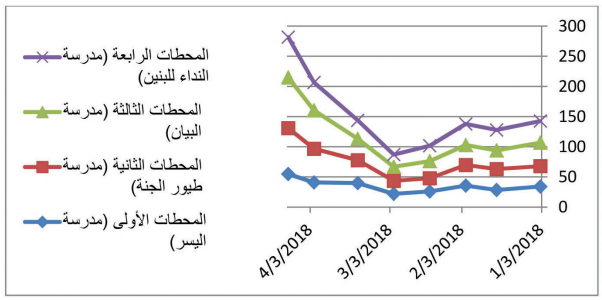

Fig. 11. Monthly and local changes to chlorides during the study period (mg/l)

This is what was observed in the current study, as the highest value of chloride was (84.0) mg/l at the third plant on 04/11/2018. Where Iraqi water is characterized by providing relatively high concentrations of chloride ions and negative sulfate. The lowest value of chloride was recorded (20.2) mg / liter in the fourth station 1/3/2018. All values of the studied stations were less than the permissible limits according to specifications (WHO, 2008). It is (250) mg/l as well as less than the Iraqi specifications (2001) and it is (350) mg/l.

Conclusion

The physical and chemical properties of the studied reservoir water were within the permissible limits according to the Iraqi and international specifications except for the vital requirement that did not meet the Iraqi and international specifications.

Recommendations

Conduct periodic checks on the water of the tanks in all schools to ensure their cleanliness and safety. The tanks must be sealed to prevent pollution from occurring through the air currents that carry dust, insects, and animal and bird droppings. Educating the school administration about the dangers of negligence in cleaning water tanks through the media, social media, lectures and posters.

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