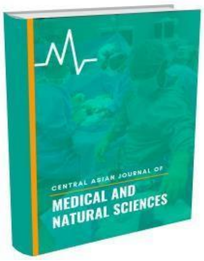


CENTRAL ASIAN JOURNAL OF
MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 03 | July 2024 ISSN: 2660-4159

Article

Study of the Physical and Chemical Properties of Drinking Water Purification Plant in Al-Ishaqi District/ Salah Al-Din Governorate

Tabarak Madin Abd El, Majmaie[1]*, Salma Khaled Yassin[2]

1 Department of Life Sciences, Tikrit University, College of Education for Girls, Iraq
2 Supervised, Assistant Professor Dr. med.
* Correspondence: tabarkmedaan@gmail.com

Abstract: The current study was conducted in the laboratories of graduate studies / Department of Life Sciences / College of Education for Girls / University of Tikrit, Salah Al-Din Water Department (Department of Quality Control) and laboratory of the Faculty of Engineering (Department of Chemical Engineering). To study the environment and microbiology and to know some of the qualitative characteristics of the water of the Ishaqi station located in the Ishaqi district, Salah Al-Din Governorate, and to show the validity of the selected station's water and to observe the monthly and location changes during the study period, which amounted to six months, starting from October 2023 until the end of March 2024. The study included the measurement of some physical properties (water and air temperature, turbidity and electrical conductivity, dissolved solids) and some chemical properties (pH, total basal, chloride, total hardness, calcium, nitrates, sulfates, biorequisite for oxygen, salinity, sodium ion, potassium ion) and heavy water traces that include Cadmium, nickel, cobalt, as well as indicators of bacterial contamination.

Keywords: Drinking Water Purification, Physical Properties, Chemical Properties

Citation: Tabarak Madin Abd El, Majmaie, Salma Khaled Yassin. Study of the Physical and Chemical Properties of Drinking Water Purification Plant in Al-Ishaqi District/ Salah Al-Din Governorate. Central Asian Journal of Medical and Natural Science 2024, 5(3), 795-807

Received: 11th June 2024
Revised: 15th June 2024
Accepted: 26th June 2024
Published: 02th July 2024

1. Introduction

The present study was conducted at the laboratories of the Graduate Studies Department and the Department of Life Sciences, College of Education for Girls, University of Tikrit, in collaboration with the Salah Al-Din Water Department (Quality Control Department) and the Faculty of Engineering's laboratory (Chemical Engineering Department). The objective was to comprehensively investigate the environmental and microbiological parameters and evaluate specific qualitative characteristics of water sourced from the Ishaqi station in the Ishaqi district of Salah Al-Din Governorate.

The primary goals were to validate the water quality at the designated station and to monitor temporal and spatial fluctuations over a six-month period, spanning from October 2023 to March 2024. The study encompassed an extensive analysis, including measurements of various physical properties such as water and air temperature, turbidity, electrical conductivity, and dissolved solids. Additionally, chemical properties such as pH levels, total alkalinity, chloride content, total hardness, calcium concentration, nitrate levels, sulfate levels, biochemical oxygen demand, salinity, and levels of sodium and potassium ions were investigated.

Furthermore, the study examined the presence of trace heavy metals including cadmium, nickel, and cobalt, along with indicators of bacterial contamination. This comprehensive approach aimed to provide a thorough understanding of the water quality dynamics at the Ishaqi station, contributing valuable insights for environmental monitoring and management in the region.

2. Materials and Methods

This study was conducted in the postgraduate laboratory of the Department of Life Sciences, College of Education for Women, University of Tikrit, the Salah Al-Din Water Department (Department of Quality Control), and the laboratory of the Faculty of Engineering (Department of Chemical Engineering). The study aims to analyze the environment and microbiology, as well as determine several qualitative characteristics of the water at the Ishaqi station located in the Ishaqi district, Salah Al-Din Governorate, assess the validity of the selected station's water, and observe the monthly and locational changes during the study period, which lasted six months, from October 2023 to the end of March 2024. This research includes the measurement of several physical properties (water and air temperature, turbidity, electrical conductivity, and total dissolved solids), chemical properties (pH, total alkalinity, chloride, total hardness, calcium, nitrate, sulfate, biochemical oxygen demand, salinity, sodium ion, potassium ion), heavy metals (cadmium, nickel, and cobalt levels), and bacterial contamination indicators, where analysis was conducted to determine the presence of bacterial contamination in the water samples. Throughout the study, data were collected and analyzed to determine the water quality and the changes occurring monthly at the study location.

3. Results and Discussion

Physical properties of water

Water has specifications necessary for human use, and it is very important to talk about the foundations of determining the quality of natural water in terms of physical and chemical specifications that must be within specific levels and have wide acceptance, and these characteristics are as follows (Al-Hafeez, 2005(

a. Temperature:

Temperature affects chemical reactions significantly as it can increase the speed of chemical reactions and affect the solubility of gases and salts in water, which affects many chemical and physical properties of water in a direct relationship by increasing the kinetic energy of molecules (Ali et al., 2016; Dellys, 2017). 2020). Temperature also affects enzymes involved in metabolism (Chevalier et al., 2010). The metabolic activity of the organism increases when the temperature of the water rises, which works to consume oxygen and cause damage to living organisms, and thus the dissolved oxygen in the water decreases, not only the activity of the organism causes a decrease in oxygen, but the temperature can affect as a physical factor the percentage of oxygen (Al-Saadi, 2002). Cold water is generally more acceptable than warm water, as warm water allows the growth of microorganisms and this leads to increased problems related to water properties such as color, smell and taste, the high temperature works on the lack of dissolved oxygen in the water (WHO, 2017). In general, the temperature of the water varies according to the geographical location, the weather throughout the year and the impact of human activities, and this is shown (Al-Sarraj et al., 2014). High temperature can promote the growth of microorganisms, and increase the problem of water color, odor and taste (WHO, 2006).

b. Turbidity:

It is defined as the measure of the amount of light rays reflected by suspended particles and zooplankton and plants in the water column instead of the rays passing straight, and is considered one of the most important characteristics to determine the quality and viability of diverse water resources in nature (Rajesh et al., 2018) and because turbid suspended materials are diverse either organic, including phytoplankton, zooplankton or inorganic such as silt and mud, are Turbidity is responsible for changes in water color (Hassan, Helfrich et al., 2005), (2017). It is an excellent shelter for many microorganisms due to its effect on sterilizers and disinfectants that are added to water for treatment (Al-Azzawi, 2010). It was noted that there is a close association between microbiology activity and water turbidity (Al-Omar, 2000).). Natural water varies in the amount of turbidity between clear mountain lakes in which the turbidity rate is very low and some rivers where turbidity is very high, and since the nature of the materials causing the turbidity is the one that is directly responsible for the color, the concentration of these materials will control the transparency of the water through its effect on the passage of light in it (Maulood et al., 1979.

c. Electrical Conductivity (EC):

It is a numerical expression of the ability of a water model to electrical conductivity, and depends on the total concentration of ionized substances dissolved in water, and is directly proportional to the temperature because it increases the speed of ionization of salts in water, and is measured in microseminal units / cm (Hammadi, 2020). The electrical connection is a guide to total water from total dissolved solids containing compounds and organic and inorganic substances dissolved in water (Rusydi, 2018). It can be defined as a measure of the ability of a water body to conduct electric current, and this measure is directly proportional to the temperature and concentration of ions dissolved in water (Vertem, 2018). Electrical conductivity is a numerical expression for positive and negative ions present in water, and depends on two factors, namely the concentration and valence of dissolved ionized substances in water, and on the temperature of the water during measurement, because heat directly affects the movement and direction of different ions (Mohamed, 2018). And when the temperature increases by one degree Celsius, it can increase

Water conductivity by 2% (APHA, 2003). Electrical conductivity is one of the most important general indicators of water quality and is the fastest approximate estimate of total dissolved substances in water

(Guilfoos et al., 2016). Measuring electrical conductivity to determine the concentration of salts in water is more commonly used than measuring total dissolved salts because this measurement is immediate for salt concentration in water and easier to use at the field level (Hamad, 2017). Water containing inorganic compounds has high conductivity while water containing non-biodegradable organic compounds has poor conductivity (Al-Sheikhly, 2014).

Chemical Properties of Water:

The pH indicates the negative logarithm to show the concentration of the hydrogen ion, and the value of organic matter is affected by the decomposition of these substances subtracts carbon dioxide, the concentration of which is inversely proportional to the pH (Abdel-Amir, 2013). The pH affects the availability of nutrients and in turn on biodiversity as well as physical and chemical factors (Al-Azzawi, 2019), and pH is of importance as one of the environmental factors affecting the sustainability of aquatic organisms as well as has to do with the process of dissolving many minerals in water, and the high acidity in water affects the solubility of many minerals, which affects the life of phytoplankton and other organisms, its decrease in water during the warm months increases biological activity and increases the level of CO_2 In water, pH increases in colder months due to an increase in phytoplankton density and an increase in the concentration of dissolved oxygen in water (Peterson et al. 2003) Iraqi studies of water have shown to be characterized by low alkalinity (Hassan et al., 2013). The results were also shown (Udoh et al., 2013). Spatial and temporal variation, climatic factors and human activities all affect the pH value. Dissolved oxygen in water is an important criterion for water because it gives important information about the state of the water body such as pollution and metabolic activities of microorganisms, through the availability of nutrients (Ayanshola et al., 2019). The sustainability of metabolic processes of aquatic organisms and organisms needs dissolved oxygen and at the same time is an important determinant of aquatic environments and that the production of chemical compounds leads to the consumption of quantities of oxygen during redox reactions (Al-Naqib, 2021). Therefore, dissolved oxygen is an important factor for the respiration of living organisms, as well as an important factor for metabolic processes through the decomposition of organic matter, in the production of less complex products and less damage to the environment and works to get rid of unpleasant odors, and toxic compounds

(Fadaee et al.,2020). The biological requirement for oxygen is an important criterion that indicates the level of organic pollution in water and refers to the amount of oxygen consumed by these aerobic microorganisms during the analysis of organic matter at a given temperature during a time period (Gupta et al. 2017). The biological requirement of oxygen is affected by any change in the characteristics of water such as oxygen concentration, temperature, etc., and that increasing the bacterial content in water increases the values of the biological requirement for oxygen (Al-Mashhadani, 2019). In addition, the biological requirement for oxygen is one of the main factors in determining the viability of water, which represents the amount of oxygen necessary for microorganisms to oxidize organic matter that has the ability to biodegrade and convert it into CO2. And other materials (Mansour, 2021), and the percentage of dissolved oxygen in water decreases, especially water where pollution is severe with organic materials due to the effective effort and work of aerobic bacteria to decompose these complex pollutants into materials that are easy and simple, and this needs to consume a large amount of dissolved oxygen in water and its low percentage (Al-Naqib, 2021The bio-requirement of oxygen is directly proportional to temperature, and the amount of organic load can be inversely proportional to the amount of oxygen dissolved in water (Salaudeen et al., 2018). Bacteria (aerobic) consume them while they oxidize organic matter (Saleh, 2020). Chloride ion is found in many water sources as a result of the dissolution of sedimentary and igneous rocks in water, and one of the most important sources of chloride is the puncture of agricultural lands, in addition to the presence of other sources such as human liquid waste, plastic, rubber industry and others.

(Negwa et al., 2016). If the chloride ion is found in the water at a high concentration, it has a toxic effect on agricultural crops and that domestic and industrial waste contains quantities of it (Al-Kamar, 2018). The chloride ion is a chemical indicator of pollution, because this ion can be oxidized and not reduced, and the salinity in the water is the result of the concentration of chloride ion in addition to its association with other components, Such as potassium, sodium and calcium salts

The total basicity in water is defined as the amount of negative ions dissolved in water, which can act to resist the hydrogen ion, so it is a measure of the ability of water to neutralize the acidity

(Moses and Ishaku, 2020). The presence of bicarbonate and carbonate in the form of negative ions with different quantities of silica, phosphate, borate, hydroxide salts and humus acids is known as total basicity (Al_Saffawi & Al_Sardar, 2018). The basicity is divided into several sections according to the type of ions, namely the base carbonate, bicarbonate and hydroxides (Hassan, 2007). Basality is the mass of negative hydroxyl ions (OH-) Additive to any aqueous solution in which the equivalence point is before the addition of (OH-) (Benefied et al., 1982). The reason for this is the presence of weak acid salts and weak and strong base salts such as carbonate, bicarbonate and hydroxide salts that lead to an increase in the basicity of water (Badran, 2001). Basality is a function of knowing water and its suitability for various purposes, as it expresses the presence of positive and negative ions, which are mostly carbons and bicarbonates (UNEP\WHO, 1996). Carbons and bicarbonates are of great importance to many aquatic organisms as they regulate the change in natural pH caused by human intervention (Weiner, 2000). The high concentrations of carbons

CO3-2 and bicarbonate (HCO3-1) raise the pH of natural water above 8.5, as the high yield in carbonate concentration pushes calcium and magnesium ions to form insoluble salts in water, leaving sodium ions (prevalent in the water (Holland, 1978(

Physical and Chemical Properties

a. Air and water temperature Temperature of air and water

The results of the study showed that the lowest value recorded for air temperature was (13.5) degrees Celsius in the house station in the month of January during the winter season, and the highest value was recorded (34) degrees Celsius in the raw terminal in October, specifically in Table (1-1) and Appendix (1), while the lowest value recorded for water temperature was (11.6) °C in the crude terminal during the winter season in December February, and the highest value of (24.3) °C was recorded in the crude terminal in October as shown in Table (1-2) and Appendix (2). The reason for the temperature variation between the current study stations is due to the variation in temperature between seasons and between night and day (Hussein, 1996).). The results of this study were similar to what some researchers obtained, including (Al-Dulaimi 2021,), (Al-Douri, 2019) and (also, 2018), where the two studies recorded these results respectively (11.5-27.3, 10.7-29) (28.0-11.0).) ° C in water. The reason for the difference in temperature values during the study months is due to the hot continental climate Iraq in summer and cold in winter, and the monthly difference in temperature (Al-Mandeel 2005).

The results of the statistical analysis of air and water temperatures using the variance analysis test also showed the existence of significant differences in time according to the months of the study and the absence of spatial significant differences according to stations and water at a significant level P≤ 0.05 and this is confirmed by the Dunkin' test of temperatures, and this phenomenon has been confirmed by many studies, including a study (Al-Watar, 2009) and (Al-Shahri, 2006) The values of the water temperature of the stations converged in the current study US Environmental Protection Agency Association (US-EPA, 2002) proposed for drinking water of (35-15) °C (Al-Khashab et al., 1978).

Table (1-1). Monthly and Location Changes in Water Temperature For the Studied Station (°C)

medium Sample	**Mar 2024**	**February ٢٠٢٤**	**January ٢٠٢٤**	**December ٢٠٢٤**	**November ٢٠٢٣**	**October ٢٠٢٣**	**Samples/month**
19.9A	23.2	13.5	15.4	19.6	23.1	24.3	**Raw**
19.5A	23.4	12.2	15.2	19.1	23.2	24.1	**Precipitation**
20.5A	22.1	11. 6	15.5	18.2	22.5	24.2	**Alum**
19.1A	22.7	12.9	15.2	17.3	22.7	23.8	**Chlorine**
18.7A	21.9	12.5	14.9	17.8	22.9	22.2	**Houses**
	22.66 b	12.78 and	15.24 d	18.4 c	22. 88 b	23.72 a	**medium Months**

Table (1-2). Monthly and Location Changes in Air Temperature Station Studied during the Study Period (°C)

Medium Sample	Mar 2024	February ٢٠٢٤	January ٢٠٢٤	December ٢٠٢٤	November ٢٠٢٣	October ٢٠٢٣	Samples/ month
22.55A	30	18.6	14.5	13.10	25.10	34	**Raw**
22.73A	29.5	15.7	16.4	18.2	24.5	32.1	**Precipitatio n**
21.97A	29.2	15.9	13.10	18.5	24.3	30.80	**Alum**
22.01A	32.4	14.3	14.9	18.9	23.10	29	**Chlorine**
20.14A	30.5	14.6	13.5	18.3	23.8	30. 5	**Houses**
	30.32 a	15.82 d	14.48 d	17.4 c	24.16 b	31.48 a	**medium Months**

b. Electrical Conductivity EC

It is defined as a numerical value that indicates the ability of water to transmit electric current, so the electrical conduction can be directly proportional to the amountof dissolved substances (Al-Dabbagh and Al-Saadi, 2004). The electrical conductivity of water depends on the salts dissolved in it (electrolytes), as the conductivity can be directly proportional to these salts (Al-Saadi, 2006).) indicated that the values of electrical conductivity of water may range during the study period (-680-15.48) microsimens/cm, as the lowest values were recorded in the alum station during the month of March while the highest values were recorded in the second station during March. In this study, it was noted that the values of electrical conductivity rise in winter and spring, and the reason for the rise leads to the drift of large quantities of soil on both banks of the project into the main stream during the rainy season, which helps to increase the amount of dissolved salts in Water can also cause an abundance of highly soluble carbon dioxide that increases negative carbon ions that can combine with ions of positive elements to form ionized salts that also contribute to higher electrical conductivity values (Haidari, 2003).

Note that the conductivity depends on the concentration of dissolved ions, Pearson's correlation coefficient recorded a positive correlation between the values of electrical conductivity, total hardness, calcium, silica and chloride respectively (0.607, 0.617, 0.686, 0.435 r =) at a significant level P≤0.01, as well as a negative significant correlation between electrical conductivity and both air temperature and water temperature (0.591, 0.652 r =) respectively at a significant level. P≤0.01. The results of the current study in recording the highest value of conductivity in the winter agreed with the results of many researchers, including (Salman, 2006) and this study did not agree with (Al-Shahri, 2006) (Shekha, 2008). The statistical analysis showed that there were no significant differences between the stations for the values of electrical conductivity, and this was proven by the Dunkin' test. With significant differences by months at a significant level of P≤0.05.

Table (1-3). Monthly and Location Changes Electrical Conductivity during the Study Period (Micro Simpens/cm)

medium Sample	Mar 2024	February 2024	January 2024	December 2024	November 2023	October 2023	Samples/ month
407.3B	264.4	417	480	418	433	431	Raw
508.5A	680	472	485	420	415	489	Precipitation
374.7C	15.48	580	422	452	432	20.68	Alum
469.8A	604	552	442	418	431	37.2	Chlorine
461.2A	475	462	440	414	445	531	Houses
	465.8 Off	496.6 a	453.8 bc	424.4 cd	431.2 c	406.0 d	medium Months

3-3 pH (PH):

The results of the study showed in Table (1-4) and Appendix (4) that the lowest pH value for all stations was recorded at Al-Shab station, as it reached (3.3) in December, and the highest value of these stations for the pH value was recorded at the Alum station as well, in October, where it reached (10.7). The values recorded at the crude terminal ranged between 6.11-9.3)) during the six semesters in which the study took place at the beginning of October and the end of March.

The recorded values of pH for the second station ranged from (6.59-9.1) during the study months, while the alum station recorded the highest and lowest values of the five stations recorded during the six seasons, which ranged between (3.3-10.7), while the fourth chlorine station recorded values between (3.94-10.2) during the six months of the study, while the fifth station recorded values during the study period within the six months that were mentioned between (4.2-9.10).

Table (1-4) Monthly and Localized Changes in pH during the Study Period

medium Sample	Mar 2024	February 2024	January 2024	December 2024	November 2023	October 2024	Samples/month
7.62A	6.11	7.2	9.3	8.1	7.2	7.8	Raw
7.88A	6.59	8.2	9.1	8.2	7.6	7.6	Precipitation
5.21B	2.38	8.1	3.4	3.3	3.4	10.7	Alum
7.57A	3.94	7.4	9.2	7.2	7.5	10.2	Chlorine
7.54A	5.12	4.2	9.10	9.2	8.2	9.4	Houses
	4.83 d	8.02 c	8.02 b	7.20 c	6.78 c	9.14 a	medium Months

c. Total Dissolved Solid:

The results of Table (1-5) and Appendix (5) for the content of total solids in water samples during the study months showed that there is a discrepancy between stations in the levels of total dissolved solids for water samples, as it was found that the highest value of total dissolved solids reached (499) mg / l during the month of February while the lowest value was recorded (299) mg / l during October.

These results are very similar to what was recorded by (Vertem, 2018), where it was found that many of the values of T.D.S are confined between (232-186) mg / liter, and lower than what was recorded by AL-Amier et al., 2014) where the values of T.D.S reached are (687-506) mg / liter, and lower than what was recorded by (Sahn 2019, and Mohammed et al., 2015) recorded (1407-790) and (510-433) mg/l respectively.

Rani (2008) and Babu also stated that conductivity compared to water-soluble solids. He pointed out that (Al-Saadi and his group, 1986) that the nature of the salts present in any body of water and their quantity can depend mainly on the geology of the surrounding land and the reason is that a large proportion of the soil of these lands can drift into the water body at different times of the seasons of the year, and through the results reached the water is under study It falls within the category of freshwater with total TDS values between (0-1000).According to the report (WHO, 2011), water containing less than 500 mg/L of dissolved substances is considered safe to drink.

The results of the statistical analysis showed that there were no significant differences in the rates of total dissolved solids at the stations, while significant differences were recorded between the months at a significant level of 0.05 P≤.

Table (1-5) Monthly and Localized Changes of Total Dissolved Solids (TDS) mg/L during Study Period

medium Sample	Mar 2024	February 2024	January 2024	December 2024	November 2023	October 2023	Samples/ month
266.8B	235	322	278	268	258	240	**Raw**
261.7B	268	296	264	262	235	245	**Precipitation**
312.5A	262	499	344	255	254	261	**Alum**
262.7B	272	330	260	242	230	242	**Chlorine**
249.8C	245	278	270	234	229	243	**Houses**
	256.4 c	345.0 a	283.2 b	252.2 c	241.2 c	246.2 c	**medium Months**

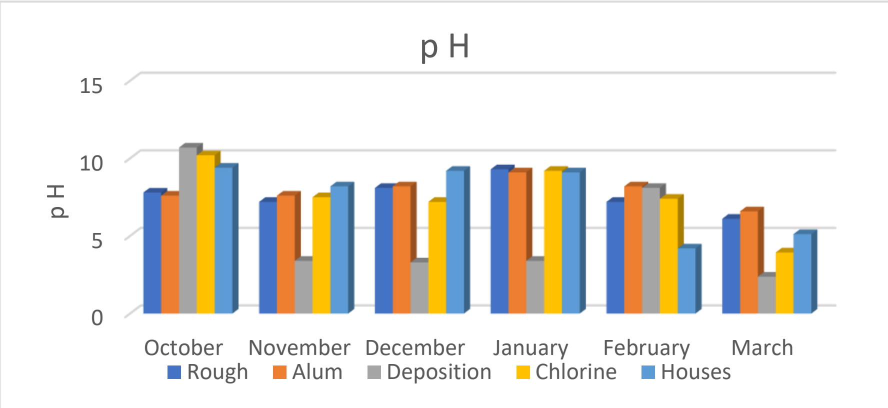
d. Total Alkalinity (T.A):

Table (1-6) and Appendix (6) show the basic values in the water samples during the study period in the six months, which is a measure of the content of the samples of negative ions such as carbonate CO3, bicarbonate HCO3 and hydroxyl OH, from which we may find clear differences between the baseline values of all samples in the studied stations, as the total basic values range between (160-40) mg / liter on the duration of the months of the study, as the lowest value of the basal 40 mg / l, during the month of October and the highest value of 160 mg / l during the month of December, and the results of the current study are of a wider range than mentioned (Vertem, 2018) as the values of the base were ranging between (230-146) mg / l, for the Tigris River in the city of Tikrit within the province of Salah al-Din and are not identical to the study(Al-Sultan, 2019) who indicated that the basal range ranged between (240-

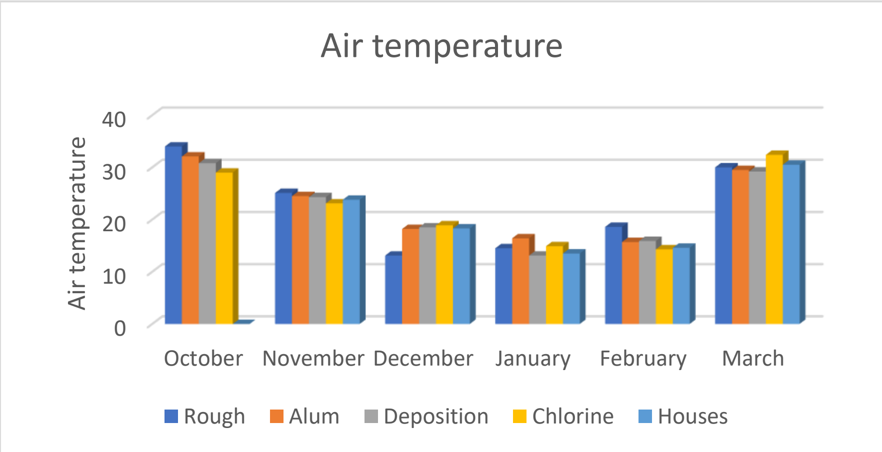
145) mg / liter for the Tigris River in the city of Mosul, and found that the highest value of the results reached by (Al-Jubouri, 2009) and (Al-Hamdani, 2010), as it reached (210-82), (202-92) mg / liter respectively.

Table (1-6). Monthly and Localized Changes of Total Base Mg/L during Study Period

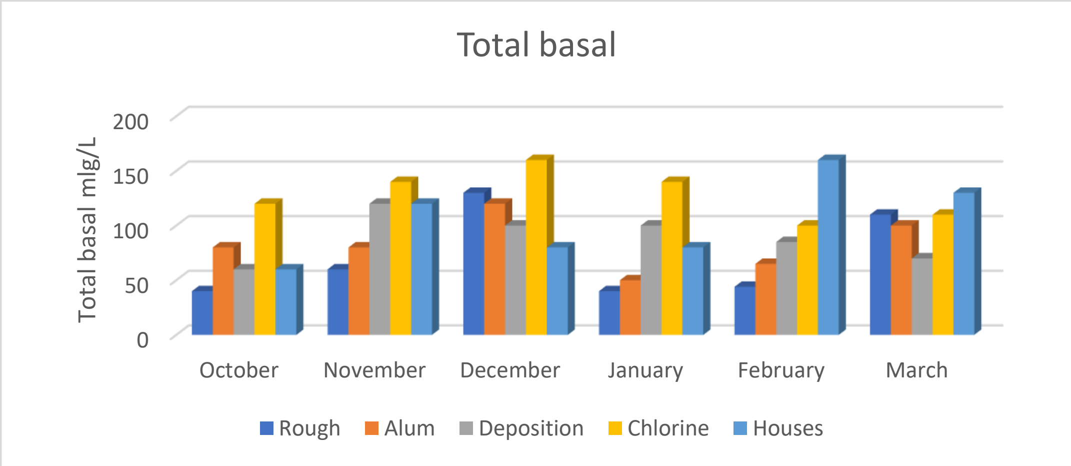
medium Sample	Mar 2024	February 2024	January 2024	December 2024	November 2023	October 2023	Samples/ month
70.7D	110	44	40	130	60	40	**Raw**
82.5C	100	65	50	120	80	80	**Precipitat ion**
89.2C	70	85	100	100	120	60	**Alum**
128.3A	110	100	140	160	140	120	**Chlorine**
1.5.0B	130	160	80	80	120	60	**Houses**
	104.0 a	90.8 b	82.0 c	118.0 a	104. 0 a	72.0 d	**medium Months**



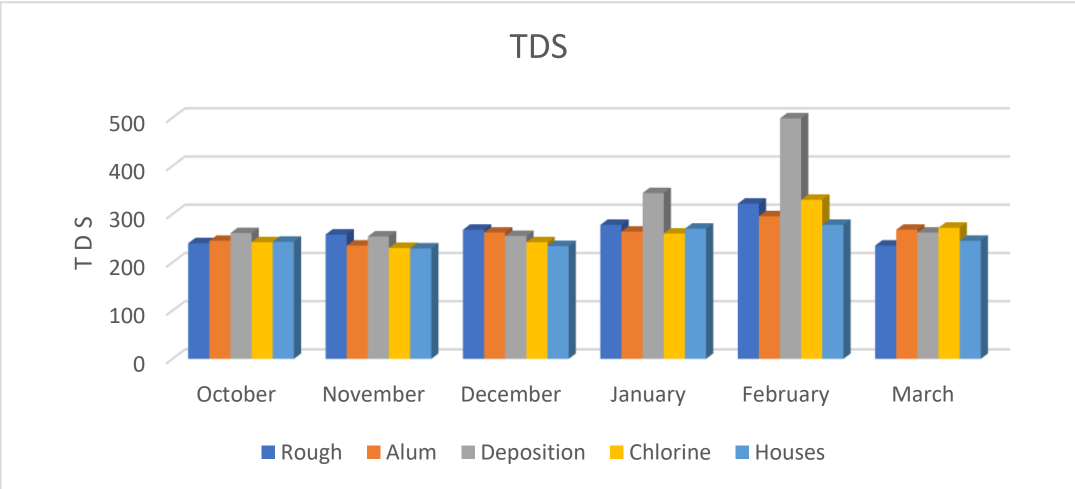
Accessory (4)



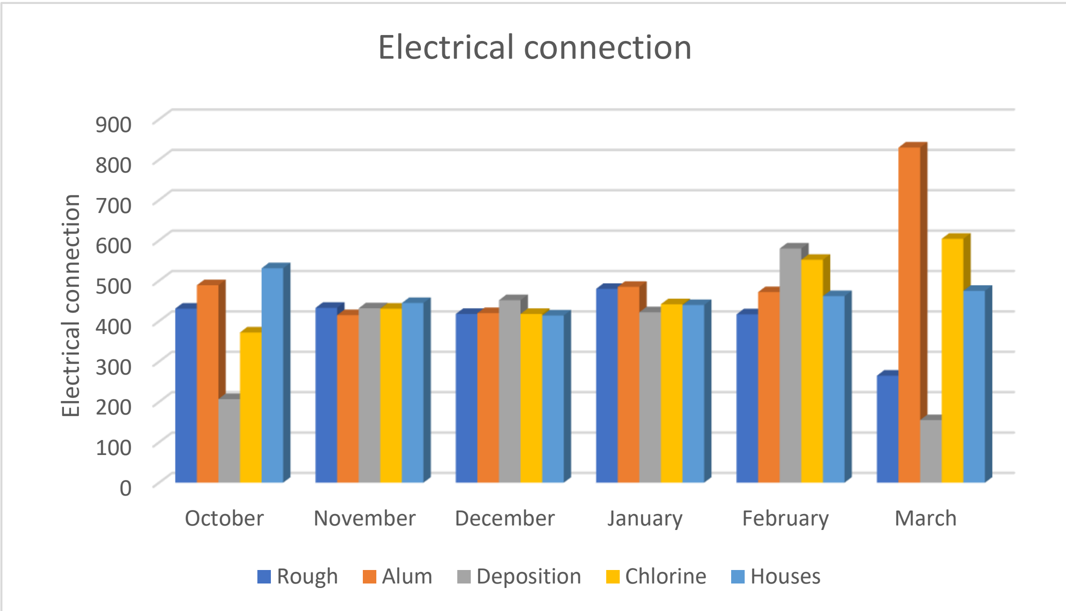
Appendix (1)



Accessory (6)

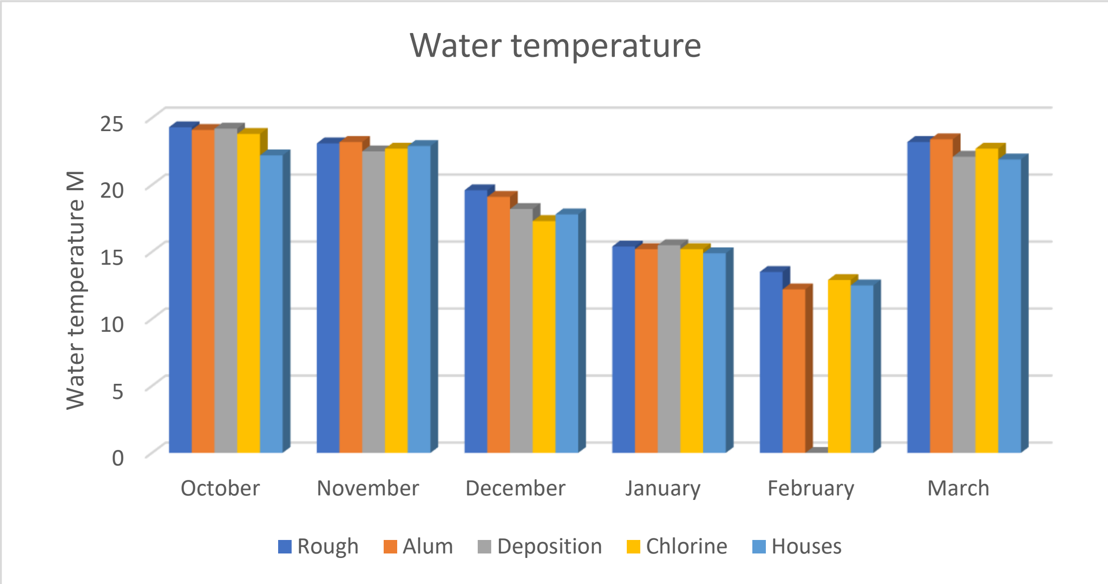


Appendix (5)



Appendix (3)

Appendix (2)



4. Conclusion

This research was conducted at the laboratories of the Department of Graduate Studies and the Department of Life Sciences, College of Education for Women, University of Tikrit, in collaboration with the Salah Al-Din Water Department (Quality Control Department) and the Faculty of Engineering's laboratory (Chemical Engineering Department). The main objective of this study was to comprehensively investigate environmental and microbiological parameters and evaluate specific qualitative characteristics of water sourced from the Ishaqi station in the Ishaqi district, Salah Al-Din Province.

The study aimed to validate the water quality at the designated station and monitor temporal and spatial fluctuations over a six-month period, from October 2023 to March 2024. Extensive analysis included measurements of various physical properties such as water and air temperature, turbidity, electrical conductivity, and total dissolved solids. Additionally, chemical properties such as pH levels, total alkalinity, chloride content, total hardness, calcium concentration, nitrate levels, sulfate levels, biochemical oxygen demand, salinity, and levels of sodium and potassium ions were investigated.

Furthermore, the study examined the presence of trace heavy metals including cadmium, nickel, and cobalt, as well as indicators of bacterial contamination. This comprehensive approach aimed to provide a thorough understanding of the water quality dynamics at the Ishaqi station, offering valuable insights for environmental monitoring and management in the region.

The research successfully provided a comprehensive overview of water quality at the Ishaqi station, which is crucial for supporting efforts towards improved environmental monitoring and management in the area.

REFERENCES

1. (unpublished), college of Science, University of Baghdad, 150P. Helfrich,L. A. ; Jams, P and Richard, N (2005). Guid to understanding and managing lakes، part 1، Physical measurement publication 420-538. Holland HD. (1978).The chemistry of the Atmosphere and Ocean Wiley-inter science, New York, .351p.

2. Al- Saffawi, A.Y.T. and AL- Sardar, N.M.S. (2018) Assessment of ground water quality status by using water quality index in Abu- Jarbaa and AL- Darrawesh villages, Basiqa Subdistrict, Iraq. International J of Enhanced Res. in Sci, Techn. and Engin. . 7(6) : 6-1
3. Ali, M. M., Ali, M. L., Islam, M. S., and Rahman, M. Z. (2016). Preliminary assessment of heavy metals in water and sediment of Karnaphuli River, Bangladesh. Environmental Nanotechnology, Monitoring & Management, 5(2019): 27-35.
4. APHA (American Public Health Association) (2003). Standard metho for the examination of wate and wastewater. 20th ed. American Public Health Association. Washington. Cunningham, W. P.; Cunningham
5. Ayanshola A. M. sossou P. M. Bilewn S. O. Abdulkadri T. S oluwaseun v. O and owolabi so (2019) Evalnation variation on groundwater Quality inilorin mctropolis scie nces osnn state univer sity November 5-7:524-535
6. Badran, M.I. (2001). Dissolved oxygen, chlorophyll and nutrients seasonal cycles in water of Gulf Aqaba, Red sea,Aquat.Ecosys .Health manage,4(2),139-150 .
7. Benefield,J.F.Judkins,B.L.Walend(1982)(Eds.),Process Chemistry for Water And Waste water Treatment, Prentice-Hallinc.,Engle wood Cliffs,NJ,USA
8. Chevalier,S., Juzon,P., Borchardt, G., Galerie, A.,Przybylski K., and Larpin, J.(2010).High_ temperature Oxidation of Fe3 Al and Fe3 Al-Zr intermetallics. Oxidation of metals 73(1_2), 43_64.
9. Fadaee M. Mahdavi Meymand. A.Zounemat-Kermani. M. (2020) seasonal short – Term predication of Dissolved Oxygen in rivers Vir Nature lnspired Algorithms CLEAN soil Air Water. 48(2):1-28.
10. Guilfoos,T; Khanna, N and Peterson, J. M. P (2016). Efficiency of Viable Groundwater Management Policies, Land Economics, November,92 (4) by the Board of Regents of the University of Wisconsin System
11. Gupta, N., Pandey, P., and Hussain, J. (2017). Effect of physicochemical and biological parameters on the Production and manufacturing research 73 quality of river water of Narmada, Madhya Pradesh, India. Water Science, 31, 11–23.
12. Hassan.AM. (2007). Hydrogen chemical of ground water for Mandlifan Aquifers and Hydro chemical modle .ph.D Thesis
13. Maulood, B.K., Hinton, G. C., Kamees, H. S., Salih, F. A., Shaban, A.A., and Al-Shakwani, S.M. (1979) ,"An ecological study of some aquatic ecosystem in southern Iraq ".Tropical ecology 20(1):27-40
14. Mohammed, Z.B.; Hussain, T.A.; Jaid, G.M and Zamil, A. (2015). Evaluation Water qualitY of the potable Water network in Al-Shuala Baghdad City, Iraq: Journal of physics, 2015, 13(28): 116-124.
15. Moses, A. N., and Ishaku, S. (2020). Evaluation of Physico-Chemical Properties of Well Water Qualities in Selected Villages in Zing Local Government Area of Taraba State, Nigeria. International Journal of Contemporary Research and Review, 11(03): 20282-20288
16. Nayar, R. (2020). Assessment of Water Quality Index and Monitoring of Pollutants by Physico-Chemical Analysis in Water Bodies: A Review. International Journal of Engineering Research and Technology, 9(01). 178-185.
17. Rajesh, S., Chakravarthi, S., and Subashini, M. (2018). Groundwater analysis in Sriperumbudur. International Journal of Pure and Applied Mathematics, 119(12): 8903-8912.
18. Rani, A.L. and Babu, D.S (2008). A statistical evaluation of ground water. Chemistry from the west coast of Tamil Nada، India J. of marine sciences Vol. 37 (2): 186-192.
19. Rusydi, A.F. (2018). Correlation between conductivity and total dissolved solid in various type of water: A review. IOP Conference Series: Earth and Environmental Science, 118(1)1-7.
20. Saeed, S.M.I. and Shaker, M.A (2008). Assessment of heavy metals pollution in water and sediments and their effect on Oreochromis niloticus in the northern delta lakes, Egypt. 8th Internat, Symp. On Tilapia in Aquaculture. 475-490.
21. Salaudeen I. A. Ogunbamowo P. Rsheed Adeleke A. A and Olaniyi A.A) 2018) Assessment of heavy metals and microbial load of groundwater sample from lbadan metropolis Nigeria pollution. 4(3):429-438.
22. US-EPA (United State–Environmental Protection Agency). (2002). Ground water and drinking water standards: National primary drinking water regulation.816-F:02-03.

23. Weiner, E.R (2000). Application of Environmental chemistry. BacoRaton. London. U. K. Lewis publisher CRC preLLC. 273p.
24. WHO (world Health organization (2006). Guidelines for safe recreational water environments vol. 2: Swimming pool and Similar environments. Strategic Communications SA, Geneva.
25. WHO (World Health Organization). (1996). Guideline for Drinking Water Quality Health Criteria and Other Supporting Information 2 nd. Ed. Vol. 21. Geneva.
26. WHO (World Health Organization). (2017). Guidelines for drinking _Water Quality.4th ed, incorporating the first addendum? Brazil, World Health Organization, 518
27. WHO, (2011). Guideline of drinking water quality. 3d. ed. Incorporating first and second addenda، vol، 1 : 210-220. Recommendation. (WSH). Geneva.