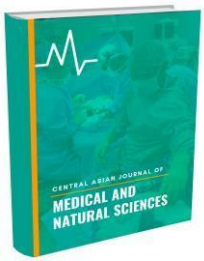

CENTRAL ASIAN JOURNAL OF MEDICAL AND NATURAL SCIENCES
https://cajmns.centralasianstudies.org/index.php/CAJMNS
Volume: 05 Issue: 03 | July 2024 ISSN: 2660-4159

Article

Study of The Changes of Some Physical Parameters of Drinking Water For The Project of Liquefaction of The City of Tikrit

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Abstract: This study was conducted in the laboratories of the University of Tikrit / College of Education for Girls / Department of Life Sciences / and quality control laboratories for the study of the unified Tikrit city water station project , which is located on the course of the Tigris River within Salah al-Din Governorate, where the study included five stages, starting with river water, sedimentation basins and preservation tank, and ending with the last stage liquefaction water for the Shuhada neighborhood, For the purpose of studying the physical properties of the project water and comparing the results with standard specifications, and the study period extended from August 2023 AD until January 2024 AD, the study included measuring (water temperature, turbidity, salinity, electrical conductivity), temperature values ranged between (29.8-14) degrees Celsius and turbidity values ranged between (1.4-54.6) and salinity values ranged between (145-256) The electrical conductivity values ranged between (106-256) mg/L.

Keywords: Tikrit water station, physical properties of water, Iraqi Standard Specifications 2001

1. Introduction

Water is an essential compound for all living organisms, and its importance lies in being one of the basic components that enter the structure of a living cell by 75-95% of the protoplasmic mass, and enters the composition of the various human and animal body tissues and most plant components, as well as none of the digestion, absorption and metabolism processes take place except in an aqueous medium (Bresha and Sharif, 2018). Due to the development in various areas of life[1], developed countries have invented various stations that filter and purify water and ensure the retention of Water with its chemical and physical properties in its natural proportions, and to obtain water of excellent quality and high quality. Many reports have indicated that the next crisis will be due to water and maytransform the water crisis globally[2]. This urbanization and rapid industrialization not only polluted water sources, but also led to a shortage of water in different regions, so effective management of water resources is very necessary for sustainable development[3]in addition, environmental activities also contributed to the arrival of many pollutants to the river. Pollution is any change in the physical and chemical properties of water quality and may occur directly or indirectly, which affects the properties of water and makes it non-existent. Drinkable[4]. Analysis and examination of the physical[5], chemical and biological properties of water is important, through which

Citation: **Rafal Ahmed Majeed, Ali Muayad Sultan**. Study of The Changes of Some Physical Parameters of Drinking Water For The Project of Liquefaction of The City of Tikrit. Central Asian Journal of Medical and Natural Science 2024, 5(3), 808-814.

Received: 15th June 2024
Revised: 18th June 2024
Accepted: 02th June 2024
Published: 08th July 2024

it is possible to know the quality and mechanism of its interaction with the surrounding environment, as well as to describe water nutrition and runoff conditions[6].

2. Materials and Methods

This study was conducted on the project of the unified Tikrit water liquefaction station, located on the Tigris River in the city of Tikrit - Salah al-Din Governorate, which was established in 1975 and has a production capacity of 750 m3/ hours and the index with coordinates (N43.6812). E 34.6212), as the physical properties of the water were analyzed and examined, the Tigris River is the main supplier of the city's water, and for this reason the Tikrit Unified Water Project was established on it[7].

- Sample collection

The sample collection process was carried out in the morning at a rate of once a month, starting from raw water to theliquefaction area, as the study period extended for six months from August 2023 until December 2024, where the sample was taken using sterile bottles prepared in advance and washed with sample water to maintain the physical properties of the samples, and a quantity of sample water must be pumped for a quarter of an hour before filling the bottles to get rid of the contaminated water Stagnant samples, the samples are collected inside plastic bottles made of (Polyethylene) size (2.25) (and transported to the laboratory for the purpose of conducting physical tests) and the necessary information is written on the bottles and transferred directly to the laboratory after closing them well. The physical analyzes were conducted in the laboratories of the Department of Life Sciences at the College of Education for Girls and the quality control laboratories of the Water Department[8].

- Physical tests

- Water temperature Temperature and air

The measurement of water temperature inside the laboratory was carried out after immersing the electrode used to measure the temperature of the HANNA device in the sample, and when the reading is confirmed, the result is recorded[9].

- Turbidity

The turbidity was measured in the laboratory using the Turbidity meter type HANNA-LP2000, which is measured in (NTU)[10], and the samples were shaken well until mixed and then put an amount of the sample in the special container, taking into account not to leave a trace of the fingers on the measuring container[11], where it must be wiped with a cloth or handkerchief and the stability of the device and the non-formation of bubbles and expressed by (N.T.U)[12].

- Electrical Conductivity

The value of the electrical conductivity of the water samples was recorded by an electrode after placing it in its own solution until the reading is stabilized, and then the measurement is made when the electrode is immersed in the water sample, and the reading is recorded after its stability in microkinis / cm[13].

- Salinity salinity measurement

Salinity measurement was performed by a field device containing electrodes placed inside the water sample and the result appears on the device screen and when the result is proven it is recorded in mg / liter[14].

3. Results and Discussion

As shown in Table (1), the highest value of pre-treatment temperature was recorded at 29.8 in the first station in August, and the highest value recorded for the water sample after treatment was 28 degrees Celsius in the fifth station in September[15]. The heat associated with the increasing number of personal vehicles in the absence of public transport as well as diesel generators fill the deficit in the supply of electrical power[24]. The climate of Iraq, which is a continental climate hot in summer and cold in winter, is a reason for the difference in temperature values during the months of study [16]The mentioned values of the temperature of the water of the studied plants, with the exception of the January month values for the first plants, have approached the proposed American standard specifications (US-EPA, 2002) [25] for drinking water, which is (35-15) °C as in theAnnex (21) [17]

The high rainfall rates have a great impact on the high percentage of water turbidity, as it showed the results of the current study are in table (2) that higher the value of the turbidity before water treatment recorded in the first plant in January is 54.6 NTU The highest value recorded after processing at the fifth plant in January is 49.7 NTU[26]. TheTo rise in Turbidity rates in River water During a class Winter Back to A reason Loss Rainfall which Leads to an increase in Turbidity Water As a result of drift Soils and clays and his arrival at the river [27] as Turbidity is affected and is directly proportional to Ratio Falling rain and torrential rains resulting from it، [18]

The decrease in the turbidity value at the fourth plant is due to the stages of purification that the water passes through at the purification plant [19]

The values of the electrical conductivity of water were at their highest pre-treatment value in the fourth station in November, where it recorded 482 microsiemens / cm, and the highest value after treatment was recorded in the fifth station of November[27], where it was 474 microsiemens / cm as in Table (3). There is a direct relationship between the electrical conductivity value of water and the number of dissolved salts because the ions in the water transfer the electric charge [20]

The increase in the electrical access of water during the winter may be due to the[28] washing away of a percentage of the soil with rainwater, which increases the amount of dissolved salts in the water [21]

Table (4) shows the results of the salinity values of the current study[22], where the highest value recorded for water salinity before the filtering and treatment process

was 256 mg/l in the first station in August, and the highest value of the sample of water prepared for drinking was 252 mg/l in the fifth station in August[22], and it was found that the river water in the current study was identical World Health Organization (WHO, 2004) and Iraqi Standard Specifications 417 for the year (2001)[23].

Table 1. Monthly and localized changes in water temperature in the studied stations

Average months	Fifth stop	Fourth stop	Third stop	Second stop	First stop	Stations / Months
27.56 A	25.3	29.0	26.8	26.9	29.8	**August**
27.20 A	28.0	29.6	26.3	26.2	28.3	**September**
23.66 B	23.0	23.2	24.3	24.1	23.7	**October**
22.25 C	22.0	23.0	22.0	21.6	22.0	**November**
15.00 D	16.6	18.8	15.5	15.0	15.3	**December**
15.38 D	16.0	17.0	14.5	14.2	14	**January**
	22.86 A	23.05 A	22.78 A	23.05 A	23.56 A	**Average sample type**

Table 2. Monthly and location changes of the turbidity in the studied stations

Average months	Fifth stop	Fourth stop	Third stop	Second stop	First stop	Months/Stations
13.76 CD	5.2	4.9	15.7	19.8	23.2	**August**
8.11 D	1.4	1.4	2.9	15.2	19.8	**September**
13.59 CD	4.3	4.0	17.4	18.4	23.9	**October**
15.42 C	8.6	8.5	18.0	18.0	24.0	**November**
21.42 B	13.2	13.0	25.8	27.8	27.3	**December**
47.18 A	49.7	49.5	41.0	41.1	54.6	**January**
	13.73 B	13.54 B	20.13 Off	23.39 A	28.79 A	**Average sample type**

Table 3. Monthly and Location Changes in Electrical Conductivity in the Studied Stations

Average months	Fifth stop	Fourth stop	Third stop	Second stop	First stop	Stations / Months
451.0 A	456	457	447	447	448	August

456.6 A	457	459	455	451	461	September
452.2 A	461	464	450	441	445	October
462.6 A	474	482	442	442	473	November
460.0 A	454	459	463	460	464	December
426.8 B	452	455	403	403	421	January
	459.0 A	462.7 a	443.3 B	440.7 b	452.0 Off	Average sample type

Table 4. Monthly and Location Changes in Salinity in the Studied Stations

Average months	Fifth stop	Fourth stop	Third stop	Second stop	First stop	Stations / Months
251.0 A	252	253	246	248	256	August
249.4 A	249	249	247	248	254	September
243.0 A	245	243	239	243	245	October
224.8 A	145	243	244	244	248	November
249.0 A	243	248	251	251	252	December
249.6 A	248	246	250	251	253	January
	230.3 A	247.0 A	246.2 A	247.5 A	251.3 A	Average sample type

4. Conclusion

The rates of turbidity values were very high, especially in January because of their impact on rainwater based on the Iraqi specifications for drinking water for the year2001, so the number of sedimentation basins must be increased or a new technique must be adopted to reduce the values of turbidity.

The values for temperature , electrical conductivity and salinity values for the plant's water were within the permissible limits according to local and international specifications.

REFERENCES

[1] S. Glass and S. Zelinka, "Moisture relations and physical properties of wood," Chapter 4 in FPL-GTR-282, 2021, [Online]. Available: https://www.fs.usda.gov/research/treesearch/download/62243.pdf

[2] A. A. Koelmans, N. H. M. Nor, E. Hermsen, M. Kooi, and ..., "Microplastics in freshwaters and drinking water: Critical review and assessment of data quality," Water Res, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0043135419301794

[3] J. Tarique, S. M. Sapuan, and A. Khalina, "Effect of glycerol plasticizer loading on the physical, mechanical, thermal, and barrier properties of arrowroot (Maranta arundinacea) starch biopolymers," Sci Rep, 2021, [Online]. Available: https://www.nature.com/articles/s41598-021-93094-y

[4] D. Nowak and E. Jakubczyk, "The freeze-drying of foods—The characteristic of the process course and the effect of its parameters on the physical properties of food materials," Foods, 2020, [Online]. Available: https://www.mdpi.com/2304-8158/9/10/1488

[5] W. H. Organization, Guidelines for drinking-water quality: incorporating the first and second addenda. books.google.com, 2022. [Online]. Available: https://books.google.com/books?hl=en&lr=&id=x3RyEAAAQBAJ&oi=fnd&pg=PR3&dq=some+physical+parameters+of+drinking+water&ots=73UhkoSWb5&sig=4W6ikgv0-Y9cjJiQ1Lo7p14CfE0

[6] M. Syafrudin, R. A. Kristanti, A. Yuniarto, and ..., "Pesticides in drinking water—a review," International journal of …, 2021, [Online]. Available: https://www.mdpi.com/1660-4601/18/2/468

[7] M. E. A. El-Sayed, "Nanoadsorbents for water and wastewater remediation," Science of the Total Environment, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0048969720334239

[8] L. Ding et al., "Effective ion sieving with Ti3C2Tx MXene membranes for production of drinking water from seawater," Nature …, 2020, [Online]. Available: https://www.nature.com/articles/s41893-020-0474-0

[9] Y. Zhang, A. Diehl, A. Lewandowski, and ..., "Removal efficiency of micro-and nanoplastics (180 nm–125 μm) during drinking water treatment," Science of The Total …, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0048969720308937

[10] B. Ma, W. Xue, Y. Ding, C. Hu, H. Liu, and J. Qu, "Removal characteristics of microplastics by Fe-based coagulants during drinking water treatment," Journal of Environmental …, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1001074218320941

[11] S. Chonsakorn, S. Srivorradatpaisan, and ..., "Effects of different extraction methods on some properties of water hyacinth fiber," Journal of Natural …, 2019, doi: 10.1080/15440478.2018.1448316.

[12] A. Acharya, M. L. Sharma, K. Bishwakarma, and ..., "Chemical characteristics of the Karmanasha river water and its appropriateness for irrigational usage," Journal of Nepal …, 2020, [Online]. Available: https://nepjol.info/index.php/JNCS/article/view/30494

[13] A. E. Kabeel, R. Sathyamurthy, A. M. Manokar, and ..., "Experimental study on tubular solar still using Graphene Oxide Nano particles in Phase Change Material (NPCM's) for fresh water production," Journal of Energy …, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2352152X19314483

[14] A. Raj, D. Sathyan, and K. M. Mini, "Physical and functional characteristics of foam concrete: A review," Constr Build Mater, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0950061819314771

[15] M. A. Mazhar, N. A. Khan, S. Ahmed, A. H. Khan, and ..., "Chlorination disinfection by-products in municipal drinking water–a review," Journal of Cleaner …, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0959652620332042

[16] K. N. Palansooriya, Y. Yang, Y. F. Tsang, and ..., "Occurrence of contaminants in drinking water sources and the potential of biochar for water quality improvement: A review," Critical Reviews in …, 2020, doi: 10.1080/10643389.2019.1629803.

[17] M. Shen et al., "Removal of microplastics via drinking water treatment: Current knowledge and future directions," Chemosphere, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0045653520308055

[18] P. Zuccarello, M. Ferrante, A. Cristaldi, C. Copat, and ..., "Exposure to microplastics (< 10 μm) associated to plastic bottles mineral water consumption: The first quantitative study," Water Res, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0043135419302921

[19] N. Pichel, M. Vivar, and M. Fuentes, "The problem of drinking water access: A review of disinfection technologies with an emphasis on solar treatment methods," Chemosphere, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S0045653518323129

[20] S. Mukate, V. Wagh, D. Panaskar, J. A. Jacobs, and ..., "Development of new integrated water quality index (IWQI) model to evaluate the drinking suitability of water," Ecol Indic, 2019, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S1470160X19300500

[21] H. A. Hasan and M. H. Muhammad, "A review of biological drinking water treatment technologies for contaminants removal from polluted water resources," Journal of Water Process Engineering, 2020, [Online]. Available: https://www.sciencedirect.com/science/article/pii/S2214714419304453

[22] M. Radfard, M. Yunesian, R. Nabizadeh, and ..., "Drinking water quality and arsenic health risk assessment in Sistan and Baluchestan, Southeastern Province, Iran," … and ecological risk …, 2019, doi: 10.1080/10807039.2018.1458210.

[23] T. O. Sogbanmu, S. O. Aitsegame, and ..., "Drinking water quality and human health risk evaluations in rural and urban areas of Ibeju-Lekki and Epe local government areas, Lagos, Nigeria," … and ecological risk …, 2020, doi: 10.1080/10807039.2018.1554428.

[24] Breisha, Jaber Zayed: Sharif, Mohamed Ahmed. (2018) Water pollutants, their sources and treatment methods, Universities Publishing House, Egypt.

[25] Central Organization for Standardization and Quality Control (1996). Iraqi standard specifications for drinking water. Iraqi Standards No. 417.

[26] Al-Sultan, Fatima Moaz Hamed (2019) Evaluation of the efficiency of the old left liquefaction station and the statement of pollution sources in the conveyor lines, Published Master Thesis, College of Environmental Sciences and Technology / University of Mosul.

[27] Al-Khashab, Wafiq Hussein Hadid, Ahmed Saeed Al-Sahaf, Mahdi Mohamed Ali (1978) Geomorphology. Definition, developments, applied fields. Part I. University of Baghdad

[28] Al-Oyouni, Jihad Mahmoud Ahmed Abdel Fattah, Hassan Ibrahim Al-Wafa'i, Nahed Amin. (2019). Studies on drinking water pollution and related diseases in Egypt and some Asian countries Zagazig Journal for Agricultural Research. Vol. 46: 1211-1191.

[29] Majma'i, Sarah Hashem Sahi. (2022).Study of some physical, chemical and bacteriological properties of samples from the Ishaqi project liquefaction station within Salah al-Din Governorate, Master's thesis, College of Education for Girls, Department of Life Sciences, University of Tikrit.

[30] Al-Araji, Mona Faeq (2003). The possibility of increasing the capacity of the Dora water project, Master Thesis in Environmental Engineering, Department of Building and Construction, University of Technology

[31] Abdelaziz, Buraq Salah Mohamed (2015). Environmental and microbiological study to evaluate the drinking water purification plant for the city of Al-Dur - Salah Al-Din Governorate, Master's Thesis, College of Education for Girls. Tikrit Universit

[32] Ewaid, S. H., Abed, S. A., and Al-Ansari, N. (2019). Water Footprint of Wheat in Iraq. Water, 11(3):523-535.

[33] Wolde A. M., Jemal K., Woldearegay G. M.and Tullu K. D. (2020). Quality and safety of municipal drinking water in Addis Ababa City, Ethiopia .*Environmental Health and Preventive Medicine*.**(1)25 :**6-9.

[34] Yuping, H; Jianhua, P & Zhongpei, L. (2016). Chemical Characteristics of Groundwater and Its Spatial Distribution in Urban area of Zhumadian City, Earth Sci.

[35] WHO ,(2004). Guidelines for Drinking – Water Quality 2004(3rd Ed.). Geneva Word Health Organization .494pp

[36] USEPA (2000). Methods for Measuring the Toxicity and Bioaccumulation

of Sediment- associated contaminants with freshwater invertebrates

Second Edition. Washington