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Original Research Article

Evaluation of Physiochemical Parameters of Al- Hamza City River South Irad for Argicultural Irrigation

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Abstract: This paper provides an overview of the evaluation of the physicochemical properties of the AL-HAMZA City River in South Iraq, focusing on its suitability for irrigation. Samples were gathered at three stations along the river, each 1 km apart, for this research. The analysis included the following parameters: temperature, pH, total hardness, and electrical conductivity. The findings indicate that water quality is subject to seasonal fluctuations and affected by upstream industrial operations as well as local agricultural methods. The results are interpreted within the framework of international irrigation water quality standards and provide an insight into their potential impacts on the health of the soils. Some useful recommendations on water management strategies, with a view to optimizing the use of Al-Hamza city River for sustainable agriculture in South Iraq, are given in the review.

Keywords: Water Quality, Al-Hamza City River, Physico Chemical Properties.

Introduction

Water is a natural resource and serves as a vital source in urban and suburban regions of Africa and Asia; due to the low availability and quality of surface-water resources, it is utilized for domestic and agricultural purposes [1]. According to Al Mussawi [2], In Iraq, especially in rural areas of the western desert, water is a vital resource for agricultural irrigation and human consumption. Irrigated agriculture relies on a sufficient supply of water that is of usable quality. Concerns about water quality have frequently been overlooked due to the abundance and easy availability of good-quality water supplies. One of the key factors influencing agricultural productivity and environmental sustainability is water quality. The quality of irrigation water has a significant impact on crop yield, land feasibility, and agricultural productivity [3]. The swift deterioration of clean water resources, the enforcement of water supply measures, and the rise of water poverty have now become the most significant challenges confronting the globe. Climate change, droughts, and misguided industrialization lead to rapid pollution and depletion of water resources. In order to prevent this issue, the waste and wastewater generated by production and other activities must have their pollutant properties diminished. Subsequently, the water quality must be improved to meet the standards for water being discharged into rivers. All these factors, due to human activities, irregular industrialization, and population growth, cause rapid pollution of drinking water resources and other natural resources. As a result, it is necessary to carry out actions that will raise awareness of such resources among people, enhance the quality of these resources, and identify areas of use based on their quantities. Physical and chemical assessments are conducted to ascertain the quality of the water and disclose the level of pollution [4]. As a result of growing urbanization, surface water is becoming excessively contaminated, necessitating more rigorous treatment for it to be safe for drinking. Consequently, it is necessary to examine the physio-chemical characteristics of surface water to determine its suitability for drinking or other beneficial purposes [5]. Murhekar had determined the physiochemical parameters and conducted analyses for various water qualities. The water samples collected from different sites exhibited very poor quality, likely due to domestic waste being discharged into the river. The elevated levels of total dissolved solids, total alkalinity, and sodium content indicated that treatment was necessary to reduce these parameters. Some sampling sites, however, showed that certain physiochemical parameters fell within the water quality standards, indicating good water quality [6]. In the Third River, located in South Iraq, the physicochemical

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properties of interest include temperature, pH, total hardness (TH), and electrical conductivity (EC) levels. In fact, properties were evaluated for their appropriateness and the possible dangers impacting irrigation for agriculture, the yield of crops, and the quality of soil. The physicochemical characteristics of river waters are thus crucial. The Third River serves as one of the primary water sources in South Iraq; hence, it requires evaluation to ascertain if its water conforms to the standard specifications for agricultural use. This paper aims to identify certain physical and chemical parameters of the Third River by gathering data on water quality and its suitability for irrigation purposes. This will ultimately contribute to a better understanding of the physicochemical properties necessary for sustainable agricultural planting in the region.

MATERIALS AND METHODS

The Way of Samples Collection:

Using clean and dry plastic bottles with a capacity of 1 liter, the samples were collected directly from the Al-Hamza river. Prior to taking the sample, the bottles were cleaned to prevent contamination. Three different locations along the river were used for sampling. The distance between each sampling point was 5 km. At each point, the sampling was carried out 30 cm from the riverbed and in alignment with the river's flow. At each point, two samples were gathered to guarantee that the data was representative.

Measuring of Physical Parameters

1. **Temperature (T):** In the field, a calibrated thermometer was used to measure the temperature. Due to seasonal and spatial fluctuations, the temperature changes, which could impact the water's quality.
2. **pH:** A pH meter was utilized to determine if the water was acidic or alkaline.
3. **Total Hardness (TH) and Electrical Conductivity (EC):** TH and EC were determined to find out the content of minerals and salinity of river water, hence indicating its agricultural appropriateness.

Lab Analysis

The samples were subsequently transported to the laboratory for additional chemical analysis. The analyses encompassed ions, metals, and pollutants that may indicate non-compliance with irrigation standards and could potentially contaminate field water. The samples were directly obtained from the river using a clean and dry plastic bottle. The bottles were cleaned properly before filling the samples at each point. The bottles were tightly closed and labelled after sampling. The two samples were collected at each point. The river was divided into three points at an interval of 5 km and the samples were tested locally for both physical and chemical properties. The physical parameters were assessed for temperature, pH, TH, and EC, which may alter with a climatic change. The samples were then transported to the laboratory for chemical analysis. Chemical parameters that been tested were Calcium ion, Magnesium ion, Sulphate and Chloride ion.

RESULT AND DISCUSSION

Physiochemical properties of 4 parameters were measured during the sampling that collected of present study period in 3 different stations of Al-Hamza river. The physical parameters included a range of locational measurements that provide the first indications of the quality of river water., as shown in Table 1. All these measurements were done locally with instruments such as a thermometer, a pH meter, and a TH and EC instrument for temperature, pH, total hardness, and electrical conductivity, respectively.

Table 1: Physical parameters range and reading

Parameters	Range	Between
PH	7.78	7.4 – 8.17
E.C.	15.40	14.80 – 16.00
T.H.	14.5	13 - 16
Temperature	23.5	23 – 24.1

Chemical parameters that been tested were lead ion, Cadmium ion, iron and copper ion.

Water Physical Parameters

Temperature (T):

Although river temperatures are often most affected by atmospheric conditions, streamflow changes also significantly impact water temperatures, especially during warm, dry periods with low river flows. As a result, when estimating the impact of future climate change on river water temperature, it is important to take into account both the effects of atmospheric warming and changes in river flow. (7) Temperature is one of the parameters that determines most of the characteristics of the water environment and controls its activities. Results indicated that temperature values varied at all the selected locations from 23°C to 24.1°C, as shown in Figure 1 and Table 1.

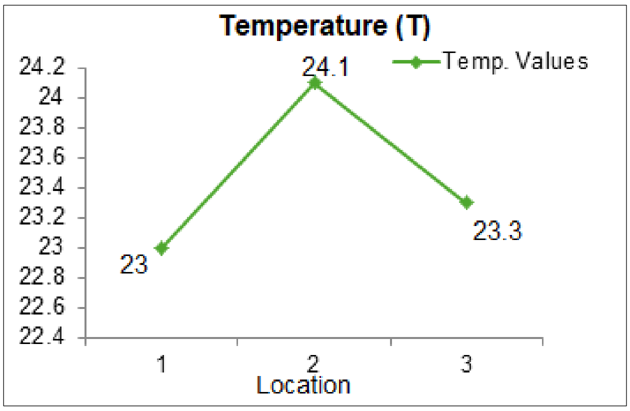

Figure 1: Temperature's values during collection samples (on June – 2024)

The temperature is 23°C at location 1 and increases to 24.1°C at location 2 and dropped back at 23.1°C at location 3. The temperature at locations 1 and 3 is almost the same at 23°C, showing no change. These slight variations across the sample records show that the samples were collected throughout brief time intervals.

pH Value:

The power of hydrogen, particularly the power of hydrogen ion concentration, is represented by pH. The presence of bicarbonates and carbonates formed from the dissolution of atmospheric carbon dioxide makes most natural water alkaline. Common metabolic processes occurring in water can cause significant changes to its pH levels. (7) As shown in Figure 2, the pH records are nearly identical in value across all locations, while they range from 7.4°C to 8.8°C, as indicated in Table 1.

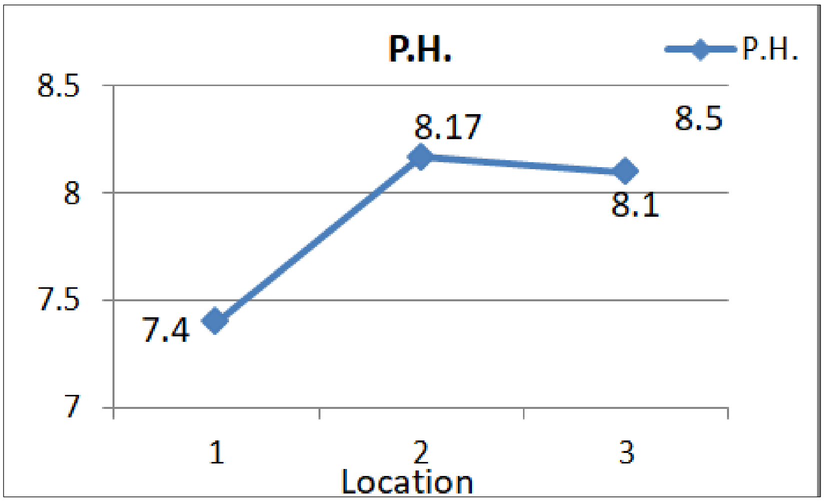

Figure 2: pH values

As shown in figure 2, the pH level is 7.4, which is slightly acidic to neutral at location 1 while at location 2, the pH level sharply increases to 8.17, indicating a basic (alkaline) environment. The pH level drops to 8.1 at location 3, still in the basic range but lower than at Location 2. From location 1 to location 2, there is an initial increase, followed by a gradual decline with minor fluctuations from locations 3 through. The value never drops below 7, so all the locations are on the basic side of pH, except for location 1. The pH value is crucial for the adjustment of biological functions, moderation of microbial activities, control of nutrient availability, and regulation of chemical behaviour.

Electrical Conductivity (EC):

The ability of water to carry current is known as electrical conductivity, and it is brought on by the presence producing cations and anions. As the conductivity of salt, acids, and bases known as electrolytes, which can produce cations and anions. The conductivity's magnitude can provide a reasonable estimate of the amount of dissolved solids because it is directly correlated with the presence of dissolve salts [8].

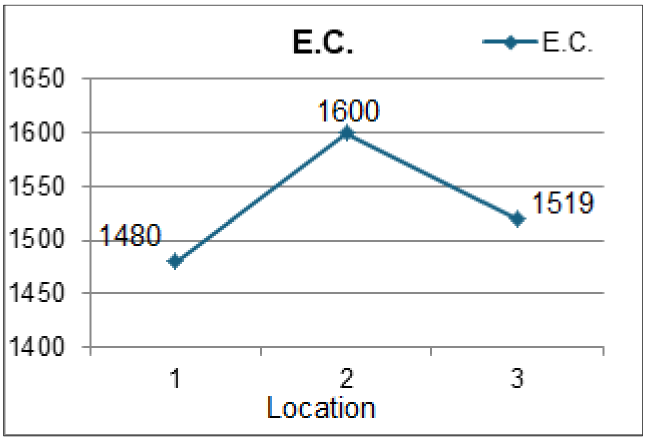

Figure 3: Electrical Conductivity value

Figure 3 shows the E.C. value is 40.2 at location 1 while the value increases to 50 at location 2. At Location 3, the E.C. value peaks at 56.3, which is the highest point on the graph, and the value slightly decreases to 53.4 at location 4. The E.C. value drops further to 43 at location 5, the lowest point, and rises slightly to 46 at location 6. The general trend is an increase in E.C. from Location 1 to Location 3, a decrease to Location 5, and a slight increase at Location 6. The values obtained at Locations 3 and 4 are higher, thus more conductive; therefore, this may indicate more ions or different material composition. This decrease at Location 5 may further point to a change in material composition or environmental factors that affect conductivity. High E.C. values indicate a high concentration of dissolved salts or ions, which make the results of electrical conductivity measurements in various fields associated with environmental monitoring, agriculture, or material science potential. Both variations within a location over time and fluctuations between locations show that conditions, or indeed, the composition, may be different between places that some places are more conductive than others [9].

1. Total Hardness (TH):

Hardness is caused by divalent metallic ions, which can react with sops to create ppt. The main source of temporary hardness, also known as carbonate hardness, is the presence of calcium and magnesium carbonate and bicarbonates, which are removed by boiling [8].

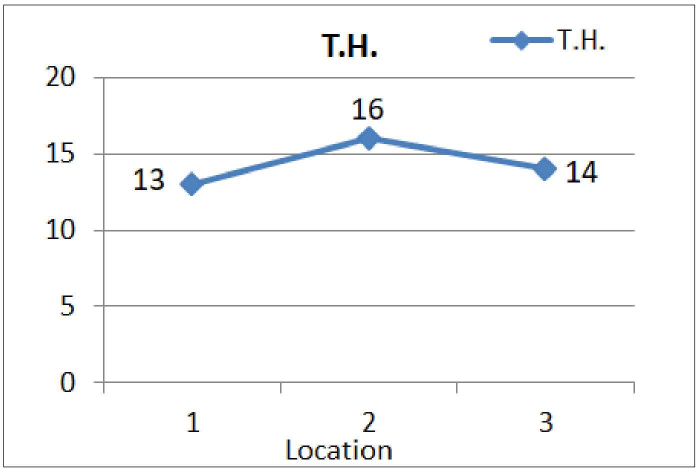

Figure 4: Total Hardness value

As shown in Figure 4, the T.H. value is 13 at location 1, which is the lowest value on the graph, while at location 2, the T.H. value increases to 16. The T.H. value decrease to 14 at location, the value of this indicator increased in the percentage of salinity from the first location. At other places, the value continued to rise for two reasons. The industrial areas or the sewage water from the abandoned settlements are the first causes. The second reason is because of natural processes like soil washing and dissolution caused by rain [22].

Water Chemical Parameters

The right kind and quantity of acid is applied in order to analyze the components in water. Using the incorrect acid causes the metal to be lost from the sample or recover poorly. The concentration of acid must be determined by the expected concentration of the metal.

Prior to sample collection, it is crucial to rinse the sample container with deionized water and wash it with acid. Metals may be lost through adsorption onto the container walls if the sample is not adequately acidified. To identify silver, use dark brown bottles or glass bottles that absorb light. Before usage, glass bottles and filtering equipment need to be acid washed [20, 21]. Water sample have been injected in Atomic absorption spectroscopy to determine the concentration of four heavy metals (Cu, pb, Fe and Cd), the results show that the concentrations of Cu, Cd, Fe and pb are (0.50 , 0.06 , 2.78 and 2.45) µg/L respectively in the first station, The results show that the rates of studied heavy elements of the dissolved phase were within the parameters of the Iraqi maintenance of the pollution of rivers drinking water, and with (WHO),, but in the second station the concentrations of (Cu, Cd , Fe and pb) are (0.7 , 0.15 , 3.6 and 3.1 µg/L) respectively, the results in second station were higher than the first station because the samples have been taken from the river close to sewage water pipe in the center of the city which means sewage water have high concentration of heavy metals which came from cleaner, soap and the others detergents. Finally in the third station the concentrations of (Cu, Cd, Fe and pb) were (0.56, 0.064, 2.9 and 2.61) µg/L, the results in the third station show that the concentration of heavy metals were less than the second station.

CONCLUSION & RECOMMENDATIONS

It is this physicochemical assessment that becomes the great vista through which the suitability of al-hamza river for fish growth in Southern Iraq is viewed. Going through the results of this study show that, against basic water quality standards, the river was suitable for fish growth with localized differences in temperatures, pH, and mineral contents needing to be addressed to optimize the use for helping the fish to growth normally without any effects. The research work accordingly recommends continued monitoring and management practices in dealing with emerging challenges towards the promotion of sustainable water use for fish growth and trying the best to treat the sewage water before release it to the river. The present study adds to the existing literature on methodologies for water quality assessment applicable to similar river systems. Additionally, it requires that communal responsibility and informed decision-making be integral components of water resource management.

Variations and risks detected make it possible to ensure, in the conditions of South Iraq, sustainable fish growth. Water quality can be preserved by halting urbanization and deforestation. We can find the solution through physical, chemical, and biological processes of wastewater treatment. Water conservation and water treatment can save water from being polluted. It can mitigate global warming and protect people from the harmful impacts of water pollution, including cholera, typhoid fever, skin infections, and diarrhea. Water bodies, plants, animals, and people will all stay healthy if the environment is kept clean, preventing these situations. Both individual and group efforts can help reduce water pollution. We can work together to reduce water pollution, clean up our rivers and oceans, and improve the quality of life on Earth. Therefore, in order to control water pollution, the government must implement stringent legislation and treatment technologies including aeration, water treatment plants, and sedimentation. Reducing the quantity of pesticides that end up in the water is another benefit of green agriculture [16-23].

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