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Assessment of the water of the general estuary project for irrigation purposes through the study of the physical and chemical properties of the water and river deposits in the city of Nasiriyah and their comparison with the global determinants

Ali Hussein Mohammed Alwan

General Directorate of Education of Dhi Qar Governorate, Specialist Supervision Department, IRAQ

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ABSTRACT: The study involved collecting samples from five stations located on the main river mouth to study their physical and chemical characteristics in order to assess their suitability for irrigation compared to international irrigation standards. Temperature, pH, electrical conductivity, total dissolved solids, and concentrations of calcium, magnesium, bicarbonates, chloride, nitrates, sulfates, phosphates, sodium, potassium, and lithium were measured. The results were as follows: temperature ranged from 32-33°C, pH ranged from 7.4-8.3, electrical conductivity ranged from 2620-2930µS/cm, total dissolved solids ranged from 1620-1990mg/L, calcium ranged from 460-577mg/L, magnesium ranged from 210-273mg/L, bicarbonates ranged from 214-238mg/L, chloride ranged from 629-688mg/L, nitrates ranged from 15-36mg/L, sulfates ranged from 187-260mg/L, phosphates ranged from 0.2-0.6mg/L, sodium ranged from 398-510mg/L, potassium ranged from 184-230mg/L, and lithium ranged from 3.2-6.4mg/L, respectively. The content was evaluated for salinity risk, sodium risk, bicarbonate risk, chloride toxicity, and boron toxicity. The results indicated a high salinity risk and sodium risk in those waters. The study also included an analysis of some physical and chemical characteristics of river sediments. These characteristics were studied at five selected sites northeast of the city of Nasiriyah, chosen based on the likelihood of pollution. The studied characteristics included electrical conductivity, pH, total alkalinity, calcium, magnesium, chloride, phosphate, nitrate, sulfate, sodium, and potassium. The pH values recorded were slightly alkaline, ranging from 7.7 to 8.9. The highest increase in electrical conductivity values was observed in 1938 microsiemens/cm, while the lowest decrease was 1460 microsiemens/cm. The total alkalinity values ranged from a minimum of 182 mg/L to a maximum of 340 mg/L. Regarding calcium, magnesium, chloride, phosphate, nitrate, sulfate, sodium, and potassium, their values in river sediments ranged between (172-340), (108-175), (102-34), (6.2 – 9.1), (14-55), (99- 170), (50-133), (40- 86) mg/L, respectively.

Keywords: Assessment of the water, physical and chemical properties of the water, river deposits

1. INTRODUCTION

The impact and direct effect of good quality water on obtaining the best possible crop under good soil conditions and suitable agricultural operations is significant. As the water quality deteriorates, agricultural productivity decreases, in addition to expected side problems that must be addressed with special agricultural measures to maintain productivity. Plants are inversely affected by the increase in salts in irrigation water, resulting in an increase in the osmotic pressure of the soil solution, making it difficult for plants to absorb it. Harmful effects on plants may also be due to the presence of salts that have a toxic effect on plants [1]. Therefore, the current study aims to determine the possibility of utilizing the general outlet river water for irrigation purposes, which wastes 220 m3/s of water into the Gulf [2], whether this water is suitable for irrigation in terms of not causing the creation of saline or alkaline soil, and whether it provides an indication of whether this type of water causes toxicity to plants and agricultural crops during irrigation. There are five main factors that must be taken into consideration before determining the suitability of water for irrigation purposes: the chemical composition of the water, the crop, the soil, the climate, and the management of irrigation and drainage systems. The

**Corresponding author:* al.hu_ch@utq.edu.iq

interaction between these five factors largely determines the suitability of water for agricultural purposes [3]. There is no disagreement about the importance of the public drainage project as it is the key to agricultural success in the region. It serves an area of six million acres and helps to open river navigation for the central and southern parts of Iraq. It also works to improve the quality of the Tigris and Euphrates rivers by reducing their salinity concentrations, as well as lowering the water table for agricultural lands and preserving reclamation projects. The project also contributes to freeing agricultural lands in Iraq from salts, estimated at around 80 million tons annually, which flow into the Arabian Gulf through the Shatt al-Basra along with drainage water [4]. The nutritional balance of plants comes from the suitability of the necessary nutrients for absorption, resulting in the plant appearing in good condition and giving a bountiful yield in the end. The plant requires major and minor nutrients in relatively large quantities, but increasing their amounts in the soil can be harmful to plants, animals, and humans [5]. As the elements and salts in irrigation water increase, plants are inversely affected, resulting in an increase in osmotic pressure of the soil solution. This makes it difficult for plants to absorb water. Additionally, the harmful effect on plants can be attributed to the presence of certain salts with toxic effects [6]. Studies conducted on the project or its components have focused on the environmental factors of the project, while the current study specifically examines and assesses the project's water for irrigation purposes. Sediments serve as the primary indicator of various pollutants [7] and act as the direct recipient of pollutants in the aquatic environment [8]. They are the main and final repository for natural materials, household waste, agricultural waste, and industrial waste carried by water [9]. The sudden change in the quality of the water covering the sediments may result in the release of significant amounts of accumulated substances in the contaminated area [10]. In addition, river water filtration processes carry contaminated sediment to a new environment, leading to the release of pollutants into that environment [11]. The entry of ions and elements into the sediments, and the subsequent release of some of them into the aquatic environment, can occur either directly through their release and dissolution in the water column or indirectly through the feeding of fish and various benthic organisms on the surface layer of sediments, which facilitates their accumulation within the tissues of living organisms and their transfer to other consuming organisms. Sediments play a crucial role in controlling the dissolved elements in the aquatic system [12]. The chemical composition of river sediments is influenced by various environmental factors that act simultaneously with different effects and efficiencies. These factors include soil composition, rock composition, climatic conditions, appearance, time, and human activities. All these factors and their influences control the chemical properties of water and sediments [13,14].

A pH range of 6.3-8.5 is considered the optimal range for ion absorption, which is a very rapid process. As the pH value increases, the concentration of dissolved elements in the water also increases, which are then absorbed by organic and inorganic matter [15]. The chemical equilibrium between different forms of elements in sediments depends on multiple variables, including the concentration of H^+ ions, the concentration of certain mineral ions, the amount of weathering experienced by the bed, and the presence of plants that absorb these elements [16]. This indicates that sediments serve as an archive for many elements present in the water, as these elements deposit and can be released back into the water under suitable conditions, creating an exchange between water and sediments [17].

study area

The General Estuary Project is one of the huge and important strategic projects and one of the infrastructure bases for agricultural development in Iraq as it covers large areas in central and southern Iraq. It is one of the most important irrigation projects launched in recent decades with the aim of diverting drainage water to adjacent agricultural lands and water bodies to the sea for civil and industrial activities. Its length extends about (665) km from the north. from the city of Baghdad through the city of Al-Ishaqi to its end in Khor Al-Zubair. All studies that dealt with the river or parts of it are studies specialized in environmental determinants, while the present study specializes in the study and evaluation of the river water from an agricultural perspective by comparing the river water with the global determinants of irrigation water. The river flows through an estimated 5,620 agricultural areas.330) Leave [18]. The study area was divided into five main stations over a length of about (50) km from the final parts of the river to the crossing of the Euphrates south of the city of Nasiriyah. The locations were determined using a Global Positioning System (GPS) device, Figure No. (1).

2. WORKING METHODS

2.1 SOIL SAMPLING:

2.1.1. Water sampling

Water samples of study sites were collected during June 2002. These samples were collected from the river surface layer at a depth of 30 cm, and at a distance of one to three m from the river edge of the five stations shown in figure 1, starting with the area of 179 km through the sites indicated below, the models were taken at a three-bis rate per station and taking the total rate of readings.

The 5-litre clean bottles were used to collect water samples for physical and chemical tests. The bottled nozzles were sealed so as to prevent air entry after the collection bottles had been sprung with the sample water before filling them. A few drops of chloroform were added as a preservative and required information was recorded on each bottle. It was kept at low temperature in a cooler preservative until access to the laboratory for chemical and physical analysis [19].

2.1.2. SECTION HEADINGS

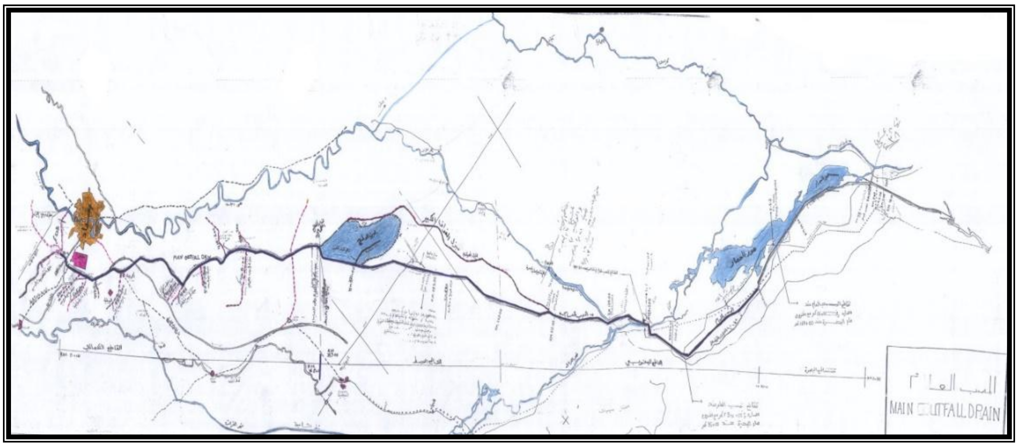
Bottom sediment samples were collected from the five stations shown in figure 1. The first station is located approximately 30 km north of Nasiriyah, while the two stations (2.3) are located outside Nasiriyah and approximately 10 km from Nasiriyah, while the fourth station, when the river exits from Nasiriyah, is located in project area 5 km from the city, while the fifth station, approximately 5 km from the river above the project, is located by using the sediment collector Van ven grap sampler from the surface sediment layer (0-10 cm) and from 1 to 3 m from the cliff. Samples were taken from water-covered areas on a continuous basis, and kept at low temperature in a cooler portfolio until access to the laboratory for chemical and physical analysis. The samples dried up an antenna and then grinded and came into the palms of its 2-millimeter holes to dispose of gravel and large impurities.

2.2.1. Physical and chemical tests: -

I measured the temperature of the water using the mercury and field heat listed from 0-100 m, repeated the process several times to confirm the reading. The pH-meter level of the water was measured using the PH-meter of Hanna, and the electrical delivery of the water was measured using the field electrical delivery metering device of the same company above at 25 m6 by the results in microsimmons/cm-1. The base was measured with a standard acid using the orange example index and the phenaphthalene index, the chlorine measured using silver nitrate [20]. Calcium is measured by removing a certain volume of the water model with EDTA-2Na solution and using Murexid as evidence, and the results are expressed in mg/l units [6]. Magnesium is measured in the manner described in APHA (2003), 20 and the results are expressed in mg/L units. Sulphurs were measured using a 6-ray method, which was measured using the PG-made Spectrophometer (PG) optical spectrometer, along the 420-nanometer wavelength, and the results were expressed in a mg/L, phosphate and nitrate, which were measured using the spectrometer and the results in a mg/L [20]. Sodium, potassium, lithium and boron were measured using the flame emission method (20) using the Flame photometer device made by Jeanouy after calibration of the device with standard solutions processed by the manufacturer, and the results were expressed in mg/L. The hazard of salinity, sodium, bicarbonate hazard and chlorine toxicity and boron were also calculated, as explained in FAO 2004 [21].

2.2.2. Physical and chemical studies of the sediment

The pH was measured using a Hanna Company pH meter to suspend the sediment with water in a ratio of 1:2.5 in the form of a saturated paste, as well as the electrical conductivity. was measured using a field electrical conductivity meter from the above-mentioned company at a temperature of degrees and a temperature of 25 °C in the saturated bulk extract [22]. Report the results as (microsiemens/cm). µS.cm-1, basicity was measured by neutralizing the samples with standard acid using an orange indicator and a phenophthalein indicator, and chloride was measured by the plating method using silver nitrate [22]. The calcium concentration of the clear solution was estimated from the sample after making a paste with a water ratio of 1:5 by spraying a certain volume of the water sample with EDTA-2Na solution and using Murexide dye as a guide, and the results were expressed in units of mg/L [23]. Magnesium values for the clear solution were estimated from the sample after preparation of a 1:5 water paste [23] and the results were expressed in mg/L. Sulfate was measured in soil filtrate using the turbidity method [24], where the measurement was carried out with a PG Company spectrophotometer instrument at a wavelength of 420 nm and the results were expressed in mg/L. Nitrate, were measured on the soil filtrate using a spectrophotometer. Results were expressed in mg/L [24]. Sodium and potassium were measured by the flame atomic emission method [24] using a Jeanouy model AS23 flame photometer after calibrating the device with standard solutions prepared by the manufacturer on the soil filtrate. The results were expressed in mg/. L. In addition, a statistical analysis of the results was carried out according to the SSPS program to determine correlation coefficients between the studied characteristics.



3. RESULTS AND DISCUSSION

3.1. River water

The study showed that in most cases water temperatures tend to follow the high air temperatures in summer (at the time of the study) because water has a high heat capacity and a low diurnal variation, which gives it a great ability to retain heat despite fluctuations in ocean temperature [25]. The pH results showed that the river water was slightly alkaline, with most values above 7.4 for all stations (Table 1), which was expected since the pH of Iraq's inland waters is close to (8 .0) was [26]. Table 1 shows the most important physical and chemical properties that give a comprehensive idea of the assessment and viability of these waters in Dhi Qar governorate for irrigation, where the above table shows that the electrical conductivity values are high. This means that the water in this area is very salty. The high values of electricity delivery for water, enhanced by the high values of TDS, which fall within the medium salinity classification of Table 2 and are affected by different sources of pollution at the study stations, as well as the rise or decrease of water levels during the seasons and the increase in mixings due to waves where materials from the lower layers rise to the surface [27].The results show that calcium ions exceed magnesium ions in water. This is consistent with several studies, including a study of the general estuary water that attributed the high calcium concentrations to the nature of the river ' s land. [27]. The difference in calcium values between the stations considered may be due to different amounts of sewage released in the river as well as the rise and decrease in water levels due to the presence of 12 discharge pumps, resulting in rapid or low deposition rates or the impact of temperatures and other climatic factors such as rainfall, evaporation rates and dust storms, of which 40% are calcium compounds [26]. So river water is a very difficult type of table 3.The magnesium values in river waters may be due to the mixing of the water of the demersals with the water of the study area by releasing quantities of CO_2 gas when oxidized, resulting in an increase in the concentration of dissolved magnesium ion in the water. Or because the concentration of magnesium in river waters at those stations was influenced by various factors, including water relief and the contribution of agricultural areas on both sides of the river to this ion.The source of sulfur in the river water may be due to the trophic nature of sedimentary soil, which is a direct source of dissolved sulfur in natural water [28]. It is also due to the river ' s passage through agricultural lands where fertilizers containing sulphur are used, especially during the planting season, to increase productivity. Phosphate concentrations in the river may be attributed to the passage of large agricultural areas and exposure to the addition of fertilizers and plant nutrients as well as human and cleaner waste in the river [29].The oscillation of the sodium component at the various stations is indicative of the different amounts of domestic and industrial waste and pea water added to the river, and the decrease in sodium concentrations in some study areas may be due to the removal of this element by absorbing, depositioning or consumption by the living [29].Table (1).Potassium concentrations showed an unmarked distribution system during the stations, clearly influenced by the amount of pea water being released to the river to the waters of the study area, as well as the use of chemical fertilizers that increase potassium ions in running water. Potassium ion is much lower than the rest of the positive ions except lithium, which may be due to the fact that the river Tigriss water that feeds the river does not contain high concentrations of this element, which may be due to the difficulty of freeing it from the rocks containing it. It has also been observed that during the current study lithium trixies are the lowest concentrations of the positive ions studied in river waters, which may be due to the lack of natural sources equipped for this element and that the concentrations found in the river are mostly from external sources, as they fluctuate depending on the residential and industrial pollutants that are dumped in the river, which are less than in the case of the water of the pelts. The high level of chloride was observed as a result of increased evaporation rates in the classroom as well as the flow of chlorine-borne salts from neighbouring agricultural lands. The pattern of cultivation tends to be summer rather than winter in those areas. In order to estimate the risk of chloride, the chlorine concentrates were estimated, which are values that cause minor to moderate damage to the resistant intermediate plants. SAR values ranged from 1.93 at Station 2, which is a low sodium hazard, to 4.4 at Station 5, which is a high sodium hazard, to the rest of the regions. To determine the seriousness of the bicarbonate, the residual values of the calcium carbonate (RSC) for all areas were based on the fact that irrigation water in those areas was not hazardous because of high calcium and magnesium concentrations in river waters and low carbon and bicarbone concentrations in those areas.The boron estimate was between 6.3 mg/l at Station 5, which is safe for sensitive crops to 14.3 mg/l at Station 1, whose values cause minor to moderate damage to sensitive crops. The values of the rest of the stations ranged from these two.

The results of the present study show that in Dhi Qar governorate, the waters of the general estuary are highly salty and sodium high-risk and are also highly permeable in some areas as a result of the rise in SAR values. The risk of bicarbonate, chloride and boron is low. When compared with the American classification of irrigation water, a table 4 was found to be between medium to good salinity, giving a significant indication that it could be used in the cultivation of crops that bore high salinity, such as wheat and barley crops, and taking measures to reduce salinity, such as repeated diesel, etc. [30].

Table (1). Physical and chemical characteristics of river water at study stations in Dhi Qar governorate during the month of June 2022

Location	Molular conductivity	SAR	Rsc	Ca mg/l	Mg mg/l	Na mg/l	T.H mg/l	HCO3 mg/l	CL mg/l	B mg/l
1	2930	2.613	0.12	460	210	437	320	228	629	14.3
2	2820	1.935	0.1	486	224	420	318	222	630	12.6
3	2733	3.412	0.3	577	273	490	360	214	688	12.8
4	2620	4.41	0.41	498	270	510	342	236	655	7.2
5	2844	9.44	0.27	475	212	398	375	238	634	6.3
Global determinants	3000>	0.5>	0.5>	500>	150>	250>	300>	300>	400>	50>

Table (2) Shows the physical and chemical characteristics of river water at study stations in Dhi Qar governorate during the month of June 2022.

Location	T C°	PH	TDS mg/l	$SO_4^{=}$ mg/l	NO_3^{-} mg/l	$PO_4^{=}$ mg/l	K^{+} mg/l	Li^{+} mg/l
1	32	7.8	1990	260	22	8.4	210	3.3
2	33	7.9	1690	187	36	6.7	197	6.4
3	32	7.4	1635	230	18	2.5	184	3.2
4	32	8.1	1620	246	17	11.4	188	4.9
5	33	8.3	1828	248	15	5.1	230	4.8
Global determinants	-	8.5- 6.5	1000>	250>	50>	50>	250>	10>

Table (3) American classification of water based on total total dissolved solids

Water quality	TDS mg/L concentration
Good.	1000>
Salinity	10000 – 1000
Salty.	35000 – 10000
Very salty.	35000 <

Table (4) American classification of water by total hardship

Classify water	Total hardship with a mg/L unit
Ease	75 – 0
Relatively hard	150 – 75
Hardship	300 – 150
Very difficult	300 <

Table (5) American classification of irrigation water based on electrical conductivity and total dissolved solids values

Classify water as its measured			characteristic
good	Average - good	bad	
Less than 0.7	3 – 0.7	Greater than 3	Electrical conductivity µS/cm
Less than 450	2000 - 450	Greater than 2000	TDS ppm

3.2. River deposits

PH values have been recorded as light base values and no physical correlation between the pH of the sediment with its physical and chemical properties has been recorded except for the excretive mental correlation with electrical conductivity r = 0.6 Table 2. This stems from the rise in base salt concentrations that lead to the rise of pH values. The relative variation in sediment pH values between stations is due to the factors influencing them, as their values control the relationship between the separated H+ hydrogen ion from the carbonic acid and the hydroxyl root. (-OH) resulting from the degradation of bicarbonate. Sediments where the range of pH between (5-8.5) is usually within the natural range compared to the sediment of pH is higher or lower. When the pH is less than 5, this may be indicative of a lack or absence of elements such as calcium, magnesium and phosphorous or may contain toxic elements due to increased solubility. The values above 8.5 indicate the presence of sodium carbonate or a high mutual sodium [32].The sediment has recorded high value for connectivity as it is the final recipient of organic and inorganic salts and living materials, as well as mud communities and quartz granules, which together with salts are a mixture of special efficiency that is not similar to melted ingredients in water [15]. Base values are affected by many factors, such as carbon dioxide, microbiology, the process of melting of bicarbonate, as well as the water content of salts [33].Carbons and bicarbons are the source of alkaline and their chemical balance generally helps or works for pH to fall within range (5-9) and therefore the whole base term is used to denote carbon ion and bicarbone.The rise in base values may be due to the passage of the river into the sediment plain area, which is naturally sedimentary soil [34]. However, these values fall within the normal range of base range in the saturated soil extract for river deposits ranging from 50-300 mg/L [33]. As calcium carbonate is usually deposited in two basic crystals, i.e., argonite, where the thumping of calcium carbonate in the form of argonite is very low, Ksp = 5x10-9, as well as the calcite 23. Consumption of carbon dioxide in water as a result of the photo-building process of plant and algae increases the sedimentation of cacao3 at the bottom. Some sources of calcium carbonate in sediment are the product of biological processes [35]. A weak correlation has been observed between the values of chlordide and the electrical conductivity of sediment as 0.12 r = Table 2. This is due to the high solubility of chlorine salts in water and its weak tendency to deposition [36]. The rise in calcium values due to several factors, including CO2 deficiencies, increased temperatures, river water disturbance and the sudden prosperity of plant plankton into calcium deposition in the aquatic environment, has been observed. Also observed is an excretive mental relationship between calcium ions and sedimented sulphur ions at the bottom of the river, which may indicate the presence of calcium in the form of calcium sulfate salt and which is supported by the positive moral correlation between calcium ions and the electrical conductivity of sediment solution r = 0.58 table (2) where calcium salts are high-sedimentible salts [36]. The high concentration of magnesium ion in sediment may be attributed to the adsorption process, which obtains surfaces of mud deposits that are increasing in river sediment [37] or to the absorption processes by aquatic organisms that, at the time of their death, decompose magnesium ion at the bottom, often in the form of glaconite [38]. Magnesium has an inverse relationship with calcium ions in river sediments r = -0.32 Table 2. This shows the interrelationship between calcium and magnesium ions carrying the positive binary charge with other negative ions in the river, such as sulfonate ion, which has a weak inverse relationship with magnesium ions r = -0.1 Table (2). Table (1) shows a rise in sulfur concentration in sediment, as many factors, whether environmental or human-induced, play an important role in the degree of sedimentation of these ions from the water column to the sediment or their release from sediment to the water column. These factors include pH, organic and inorganic concentration, and surface area of absorption [39] . At summer temperatures and as a result of bacterial degradation of animal and plant organic residues, dissolved oxygen is reduced, resulting in the production of toxic hydrogen sulfide (H2S) gas and depositions of pyrete, and sulfur bacteria converts sulfur into sedimentary sulfate at the bottom. Successive evaporations as a result of high temperatures lead to sulfur depositions in the form of CaSO4.2H2O. The presence of phosphate concentrations in the sediment may be due to absorption by soil components where the phosphate element is not easily released. The phosphorous element is characterized by a lack of solubility, low mobility and the difficulty of preparing its compounds.16 Phosphates are stabilized at the bottom as a result of loss of light and low temperatures.20 Ca5(PO4)3 calcium phosphate is one of the most famous phosphorous salts deposited in the aquatic environment as a result of the rise of pH and the rise of phosphorous concentration at the bottom. This is confirmed by the moral excretive correlation between phosphate and calcium in sediment r =0. 7 Table (2) [22]. It was also observed that there were concentrations of nitrate that might return to the river's passage through agricultural land and thus increase the deposition of ion salts in the river, but that there was no correlation of nitrate with other studied characteristics. The relatively high sodium concentration in sediment may be due to the mud structure of water-pressure deposits as a half-permeable membrane. Through this mechanic, water runs up while ions remain concentrated in sediment, as the main source of sodium in sediment is the rocks containing the halit, as well as alkaline fludebar metals and certain mud metals such as the Ilite. An inverse relationship has emerged between sodium ion trixies and sulphur ion concentrations in river deposits r =- 0.31 Table 2. This indicates that sedimented sulphur salts do not belong to sodium sulfate, which is considered to be a rare soluble salt in water.It was also observed that an exotic mental relationship between sodium ion trixies and the base in sediment r = 0.7 table (2) means that base sodium salts are found with high concentrations in sediment.One of the most important sources of potassium in the aquatic environment is the erosion of the metal of the Feldspar (KAlSi3O8O8) and the peatite KMg3 (AlSi3O8H2O) Bioite). Vaporization is a particularly important source after water degradation, such as potassium sulfate and nitrate [23]. Stuck materials in rivers play an important role in the deposition of potassium into the aquatic environment, with benthic sediments showing high levels of potassium [24].

Table (6) . Minimum and upper limits in values of studied characteristics of estuary sediments

Property	pH	EC µS. cm^{-1}	ALK mg/L	Ca^{+2} mg/L	NO_3^- mg/L	Mg^{+2} mg/L
minimum	7.7	1460	182	172	14	108
maximum	8.9	1938	340	340	55	175
Property	Cl^- mg/L	SO_4^{-2} mg/L	Na^+ mg/L	K^+ mg/L		PO_4^{-3} mg/L
minimum	43	99	50	40		6.2
maximum	102	170	133	86		9.1

Table (7) Linkage factors* between studied characteristics of river deposits

Correlation coefficients	pH	EC	ALK	Ca^{+2}	Mg^{+2}	Cl^{-}	PO_4^{-3}	NO_3^{-}	SO_4	Na^{+}	K^{+}
Ph	1	0.6	0.2	0.24	0.12	0.12	0.04	0.05	0.34	0.43	-0.23
EC		1	0.39	0.58	0.33	0.37	0.09-	0.21-	0.17-	0.26	0.08-
ALK			1	0.03	0.21	0.12	0.12	0.08-	0.08-	0.7	0.25
Ca^{+2}				1	-0.32	0.05	0.7	0.06	0.52	0.26	-0.36
Mg^{+2}					1	0.02	-0.08	0.06	-0.1	0.05	-0.21
Cl^{-}						1	0.02	0.26	0.06	0.08	0.09
PO_4^{-3}							1	0.02	0.11	0.3	0.2
NO^{-}_3								1	0.02	0.26	0.05
SO_4									1	0.31	0.02
Na^{+}										1	0.12
K^{+}											1

$p<0.05$* Correlation coefficients are within confidence limits $p<0.05$

4. CONCLUSIONS AND RECOMMENDATIONS CONCLUSIONS

1. The study found that river water is wet, as well as hydrogen ass, in general more than 7 and well-ventilated water, with dissolved oxygen greater than 4 mg/L.

2. In situ changes were observed in all considered water characteristics except in the absence of site changes in air and water temperatures.

3. The concentration of calcium ions and locational variations are low in river waters due to population and agricultural activities in the region, while the concentrations of phosphates in the sediment of the river, on the contrary.

4. Sodium and calcium ion are the dominant positive ion in river waters followed by magnesium ion, phalbutacium, olethium, and chlorate and bicarbonate ion, the dominant negative ion and the eighth sulphur ion.

5. The increase in nitrate and phosphate concentrations in river waters has been observed, particularly at the latter stations, as they have a significant impact in determining atmospheric oxygen reconstruction in water and thus creating toxic non-aerobic conditions for the aquatic environment.

6. According to the study, levels of organic pollution are increasing at city centres and the procedures adopted to control them and reduce food enrichment problems are weak and almost non-existent.

7. The river water is potable after the liquidations necessary to rid it of plankton, impurities and other unwanted substances.

5. RECOMMENDATIONS AND PROPOSALS

1. To find quick solutions for and discharge into the river, such as the construction of units for the treatment of household, agricultural and industrial waste, and to make maximum use of such residues through a variety of means, such as organic fertilizers or their use for irrigation purposes, so long as agricultural soils are considered efficient candidates for the removal of pollutants from waste water.
2. Identification of important sources of pollution that cause high pollution for monitoring purposes.
3. Establish strict environmental controls over pollution from rivers in order to avoid and thus be difficult to address.
4. It is preferable to calculate the release rate of sediment-to-water elements and vice versa, in order to determine the potential for sediment to shift from a reservoir of such elements to a water-equipment facility.
5. Identification of greater depths than those adopted in this study to determine the depth of contaminated sediment and to determine methods of treatment.
6. Continued monitoring of the state of the river in terms of bacterial pollution and other potential pollutants such as hydrocarbon compounds and pesticides, study of their residues in sediment and biota and indicate their health effects on humans and animals after doing what can be done to reduce such contamination and as mentioned above.
7. Liquidation and treatment plants are preferred away from city centres.
8. We propose the establishment of artificial environmental reserves on both sides of the river surrounded by permanent green trees such as calptos and salt-resistant walls, which will be located in fish-raising basins, as well as poultry fields, calves and honey-producing shops.
9. Rerouting of the river to the southern Sahara between Basra and Nasiriyah Waste this great national water wealth.

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