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Evaluation of Organic and Microbial Contamination in The Sediments of Euphrates River at The Center of Al- Nasiriya City , South of Iraq

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Abstract :

The present study was conducted to assess the organic pollution and microbial contamination in the Euphrates River sediments in AL-Nasiriya city, southern Iraq, four station were selected in the 6 km long study area for the period from autumn 2017 until summer 2018. sediments samples were collected during these period. The first station was 1 km ahead of the power plant. The second station is located at the power station. the third was located at the wastewater treatment plant.it is about 4km away from the second station ,the fourth station was located at the third station by 1km for from third station. The study included the measurement of some physical and chemical characteristics of the river water. It also included measuring the concentration of some trace elements (cadmium, copper, lead and zinc) in sediments. The total organic carbon was also analyzed. And expressed as pecentage coliform and Fecal Coliform (*Escherichia coli*) as evidence of fecal contamination and total number of air bacteria were estimated.

Keywords: organic pollution and microbial contamination ,Sediments.

1-Introduction:

Water covers an area of 71% of the Earth's surface and the oceans account for about 98% of this area Freshwater accounts for about 2% of this amount, and this small proportion is invested for various human purposes and at the same time is polluted as a result of these human uses Water contains many types of bacteria, microorganisms and many compounds. Scientists believe that 80% of diseases in developed countries are due to polluted water and lack or lack of procedures that contribute to water sterilization (Hutzinger, 2018).The World Health Organization refer that Water pollutants cause about 250 million injuries annually and 10 million deaths(WHO, 2006). Household, industrial, and organic wastes discharged to river and stream water as a result of different uses of life are a major source of degradation of rivers and streams due to the increase in salts, nutrients and nutrients, the increase of trace elements and toxins, and the growth of harmful microorganisms, thus negatively affecting the development joints of the region Water source affected by these flows(Al-Mayah *et al* . 2017). which exacerbates environmental problems in natural waters as a result of these pollutants (Koleva *et al*. 2018) Water has the ability to purify itself by impurities and by other environmental factors if the impurities are within the water source's ability to tolerate and treat them (AL-Zaidi, 2016). However, if their concentrations increase significantly, signs of

deterioration in water quality begin to appear on that water source (Al-Rifai, 2005), that water pollution with different types of pollutants has become a concern because of the risks to human water sources as well as to the destruction of the aquatic environment (Polat *et al*. 2016). Many researchers agree that the most polluting groups of water are vehicles Membership and elements For cleaning, detergents, phosphorus compounds, manufactured organic compounds and radioactive materials (Beer, 2017).

2-practical part :

2-1. Description of the study area:

The Euphrates river is one of the most important sources of water for human use, such as the irrigation of crops, human consumption and other industrial purposes. Several important dams, beside several irrigation channels to irrigate the agricultural areas(Asaad *et al*., 1986) . Four stations were selected in Euphrates river. (Fig .1) shows the Euphartes river . The geographic position of four studied stations between alitude (East) and latitude (North) are :N= 31°.0060177°E=45°.7744147,
N=31°2′74.35"E=46°11′63.69",N=31°02'04582",E=46°16'24.629",
N=31°01'54.161"E=45°17'40.863".The first station was 1 km ahead of the power plant. The second station is located at the power station. the third was located at the wastewater treatment plant.it is about 4km away from the second station ,the fourth station was located at the third station by 1km for from third station.

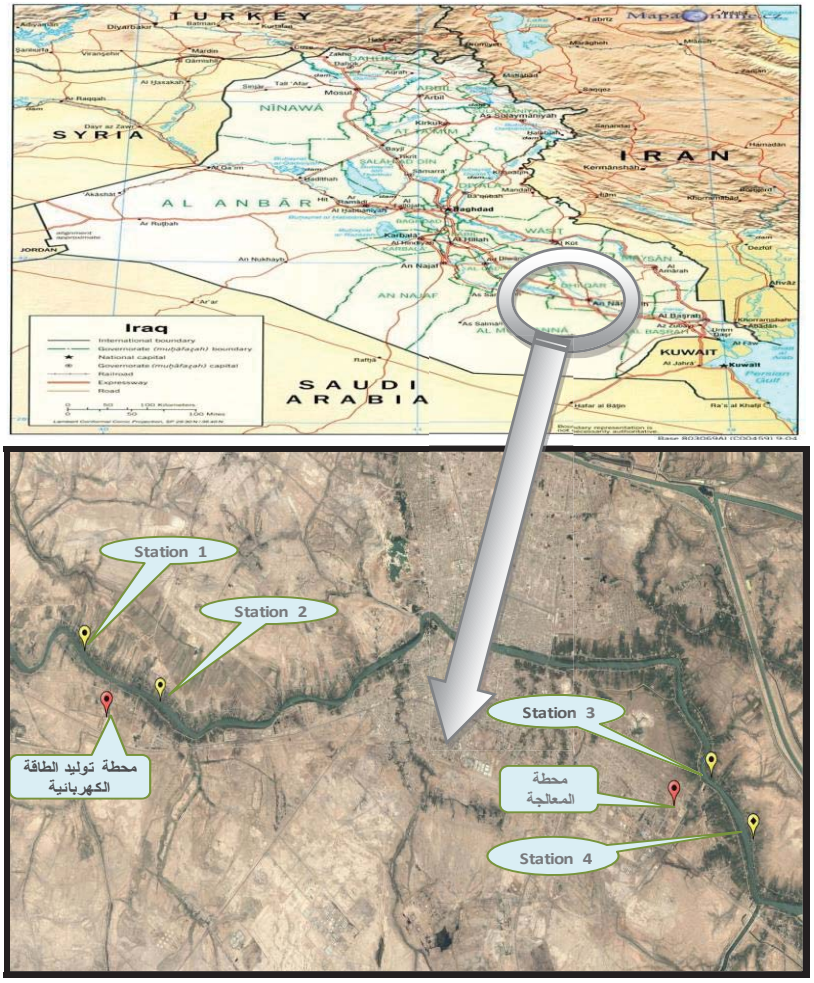


Figure (1) Map of the river Euphrates in the city of Nasiriya, indicating the study stations.

2-2. Collect Samples

Samples of sedimentary sediments were collected using the Van Veen Grab Sampler (located in the Dhi Qar Environment Department). Samples were taken from continuously covered areas from the center of the river and stored in plastic bags marked until the laboratory was reached. To measure some physical, chemical and bacteriological properties.

2-3- Physical and chemical properties:

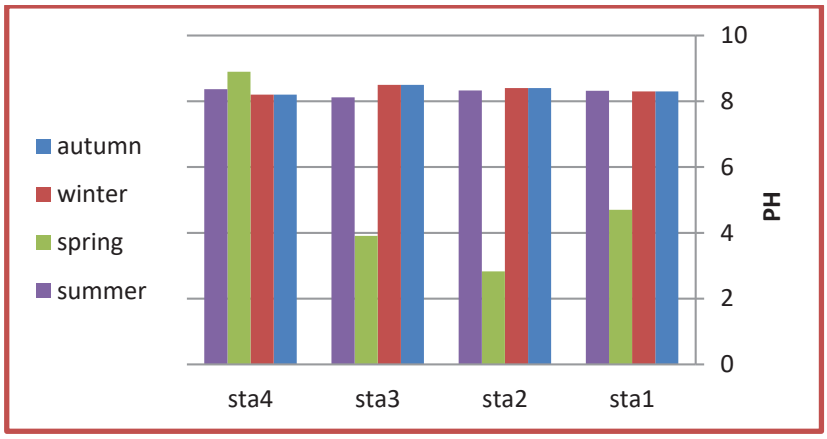
water temperature was measured using the indicated mercury and field scales from (0-100) ° C, repeated several times. pH of sediments was measured using a pH-meter device made by Hanna. The total organic carbon content in the sediments (TOC) was estimated as the incineration method was used to measure total content Of carbon in sediments (Weaver & Clements, 1973). Total Nitrogen, Phosphate and Total Sulphate were measured in the sediments using a Multi direct Photometer and expressed results in mg / kg. Trace elements were measured in the sediments using a Flam Atomic Absorption Spectrophotometer. The total number of air bacteria in the sediment was detected by the method of casting the dishes by making a series of decimal decomposition. The total number of colon bacteria was calculated using the Method Tube Multiple and by the most probable number (MPN) American Public Health, (.APHA, 2005), As for the fecal coliform bacteria, the number of E. coli bacteria calculated by the American Health Association (APHA 2005).

3- Results :

3-1 physical and chemical properties

1-PH of sediments

PH of the sediments, the results recorded the highest value of 8.9 in the fourth station during the spring, while the lowest value of 2.83 in the second station during the same Season. The results showed that there were no significant differences between the stations at the level of probability (P <.05). There were no significant differences between the seasons at the same level.



(Fig)2 Quarterly and Spatial Changes of pH of Sediments at Study Stations**.**

2- Total organic carbon

The results showed the highest total organic carbon in the sediment 5.4% in the third station during the winter season, while the lowest rate of 0.87% in the fourth station during the summer (Table 1). The results of the statistical analysis showed significant differences between stations except the third station at the level

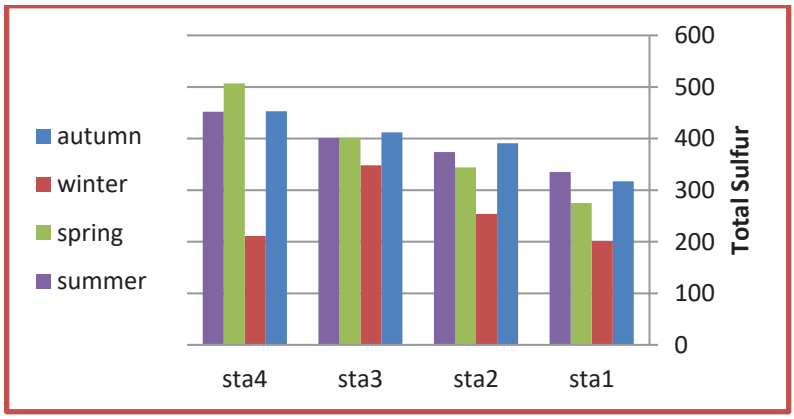
of probability (p< 0.05) and also significant differences between seasons except spring and summer at the same level.

(**Table 1)** Average Value and spatial values of total organic carbon (%) TOC in the sediments of the studied stations.

LSD For stations	summer2018	2018spring	winter 2018	autumn 2017	seasons The station
0.001*	0.91	1.12	1.69	0.9	1
0.001*	0.98	2.65	2.01	1.9	2
0.001*	1.12	2.9	5.4	1.54	3
0.001*	0.87	1.36	1.5	1.02	4
	0.767	0.503	0.658	0.882	LSD For seasons

3-Total Sulfur in the sediments

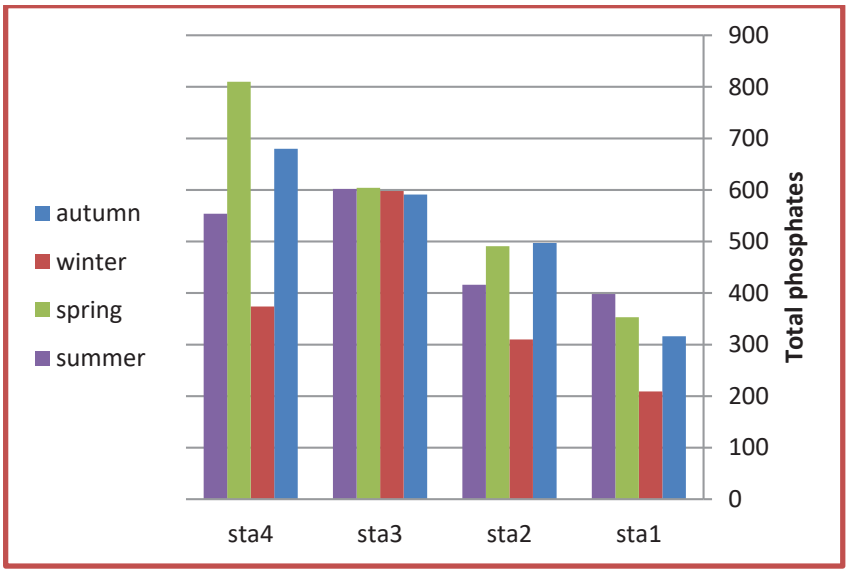
The highest sulfur concentrations were recorded at 507 mg / kg in the fourth station during the spring season and the lowest of 201 mg / kg in the first station during winter. The results of the statistical analysis showed that there were significant differences in total sulfur values between the stations except the first station compared to the second and third stations at the level of (P <0.05). There were also significant differences between the seasons except the fall compared to the spring and summer at the same level.



(Fig)3 Quarterly and spatial changes of total sulfur rates in sediments at study stations.

4-Total Phosphates in the sediments

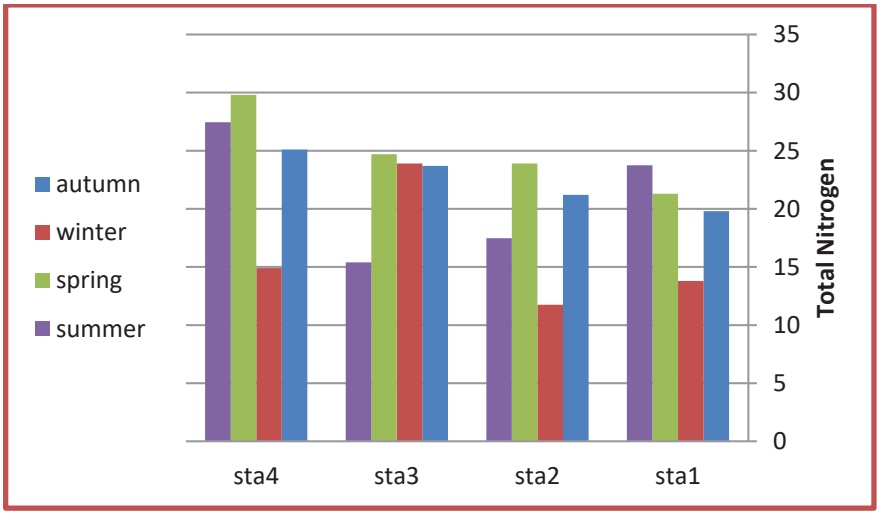
The results showed the highest levels of total phosphate concentrations in the sediment 810 mg / kg in the fourth station during the spring and the lowest rate of 209 mg / kg in the first station during winter. The results of the statistical analysis showed significant differences between the values of total phosphate and all stations at the level (P <0.05) and significant differences between all seasons at the same level.



(Fig4) Quarterly changes in total phosphate rates in the study stations.

5- Total Nitrogen in the sediments

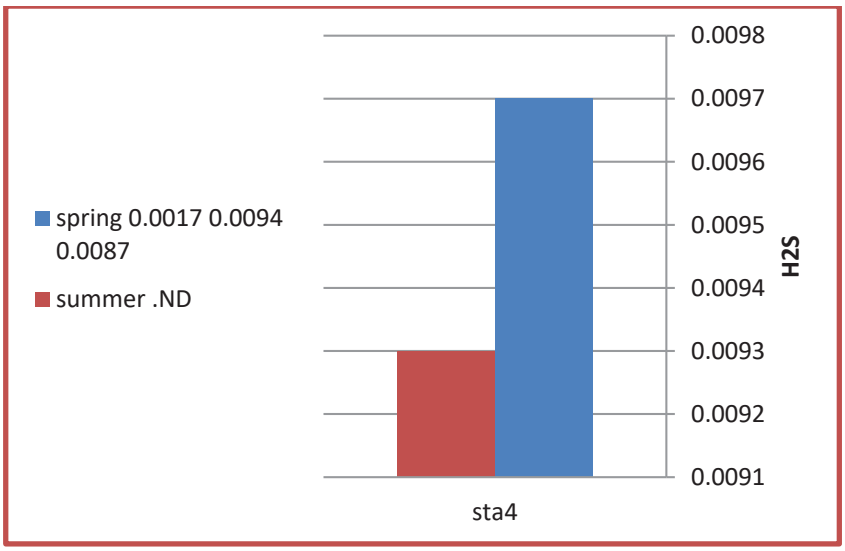
The results showed the highest total nitrogen rate in the sediment 29.8 mg / kg in the fourth station during the spring season while the lowest rate of 11.75 mg / kg in the second station during the winter. The results of the statistical analysis showed significant differences in the total nitrogen values between the stations except the second and third stations at the probability level (p <0.05). Significant differences were recorded between the seasons except for the spring and winter at the same level.



(Fig)5 Quarterly and spatial changes of total nitrogen levels of sediments at study stations.

6 -Hydrogen sulfide (H2S)

The results showed the highest rate of hydrogen sulfide in sediments 0.0017 mg / l in the first station during the spring season and the lowest rate of 0.0011 mg / L in the third station during the autumn. This gas was not detected in stations (1,2,3) 1,2,4) during the winter. The results of the statistical analysis showed no significant differences between the stations at the level of probability (P <.05). There was also no significant difference between the seasons at the same level.

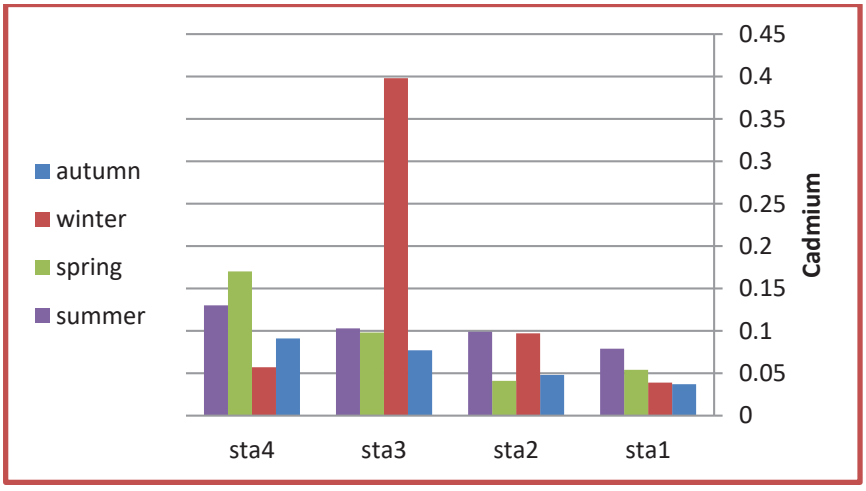


(Fig)6 Quarterly and spatial changes of hydrogen sulphide rates in sediments.

3-2Trace Elements in the sediment

3-2-1 Cadmium

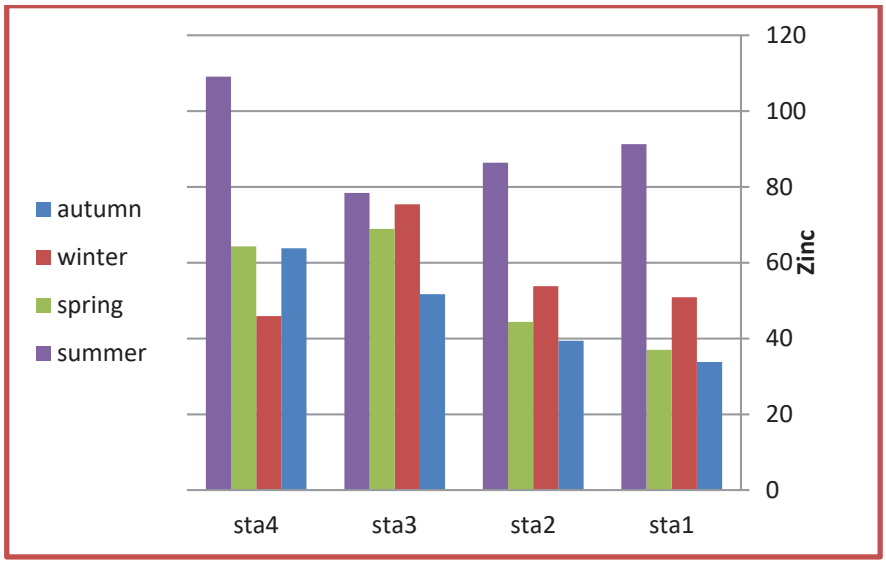
The results showed the highest concentrations of cadmium in the sediments 0.398 µg / g dry weight in the third station during the winter and the lowest rate 0.037 µg / g dry weight in the first station during the fall. The statistical results showed that there were significant differences between stations from the first station (P <0.05) and significant differences between the seasons except for the fall, winter, winter and spring at the same level.



(Fig)7 Quarterly and spatial changes of cadmium of sediments.

3-2-2 Zinc (Zn)

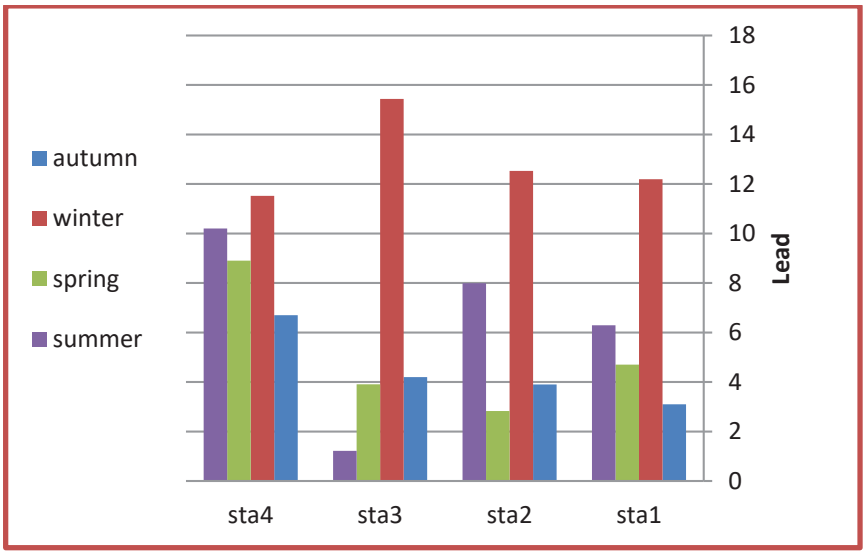
The highest concentrations of zinc in the sediment were recorded in 109.1 µg / g dry weight in the fourth station during the summer of 2018 and the lowest rate of 33.8 µg / g dry weight in the first station during the fall of 2017 (The statistical results showed differences (P <0.05). There were also significant differences in the values of zinc between all seasons for the studied plants at the same level.



(Fig)8 Quarterly and spatial changes of zinc of sediments.

3-2-3Lead (pb)

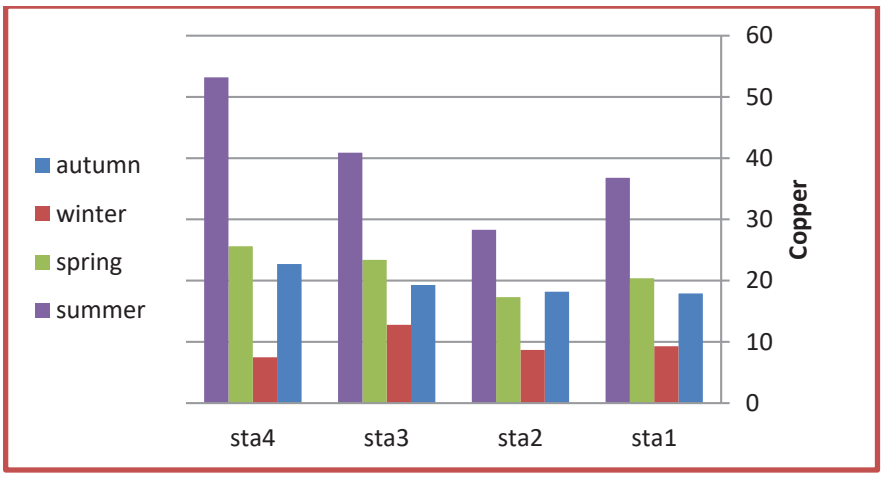
The highest concentration of lead in the sediment was recorded at 15.44 µg / g dry weight at the third station during the winter and the lowest 1.22 µg / g dry weight at the third station during the summer. The results of the statistical analysis showed significant difference in the lead values between the stations except the second station compared to the third station and the fourth station at the probability level (P <0.05). Significant differences were recorded between seasons except summer and spring at the same level



(Fig)9 Quarterly and spatial changes of lead of sediments.

3-2-3 Copper cu

The results showed that the highest copper content in the sediment was 53.2 µg / g dry weight in the fourth station during the summer of 2018 and the lowest rate of 7.48 µg / g dry weight in the fourth station during winter 2018. The results of the statistical analysis showed significant differences in the copper values between the stations at a probability level (P <0.05). There were also significant differences between seasons at the same level.

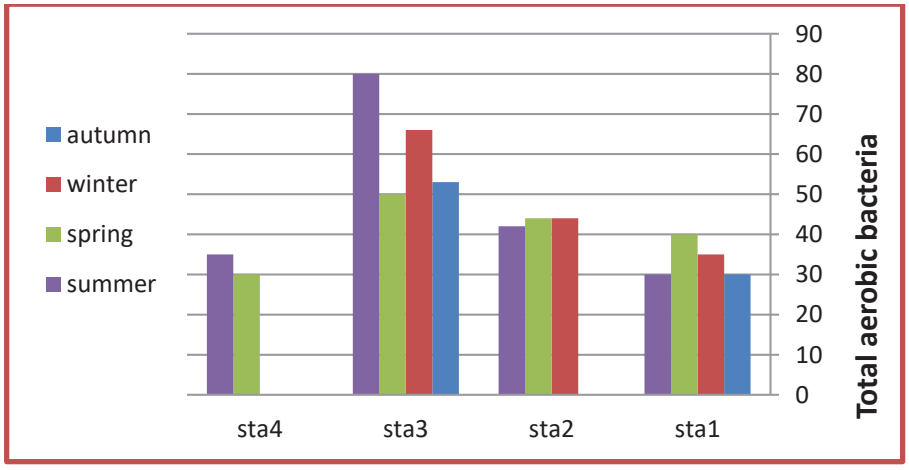


(Fig)10 Quarterly and spatial changes of copper of sediments.

3-3 Biological Factors

1 -Total aerobic bacteria

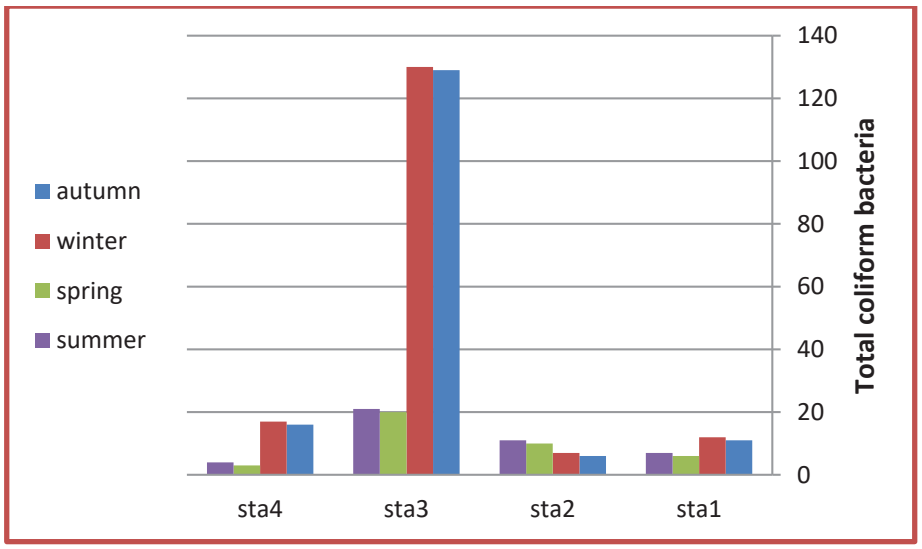
The total number of total air bacteria was 100.80 * 10-2 cell / 100 ml in the third plant during the summer, and the lowest level of 30 * 10-2 cell / 100 ml in the first station during the fall and summer and the fourth station during the spring, The fourth station during the fall season and the fourth station during the winter during the study period.). The results of the statistical analysis showed that there were significant differences between the stations except the fourth station compared to the first station and the second station at the probability level (P <0.05). There were also significant differences between the seasons except the fall compared to the spring and summer The same level.



(Fig)11 Quarterly and spatial changes of total bacteriological bacteria in study stations

2-Total Coli form Bacteria

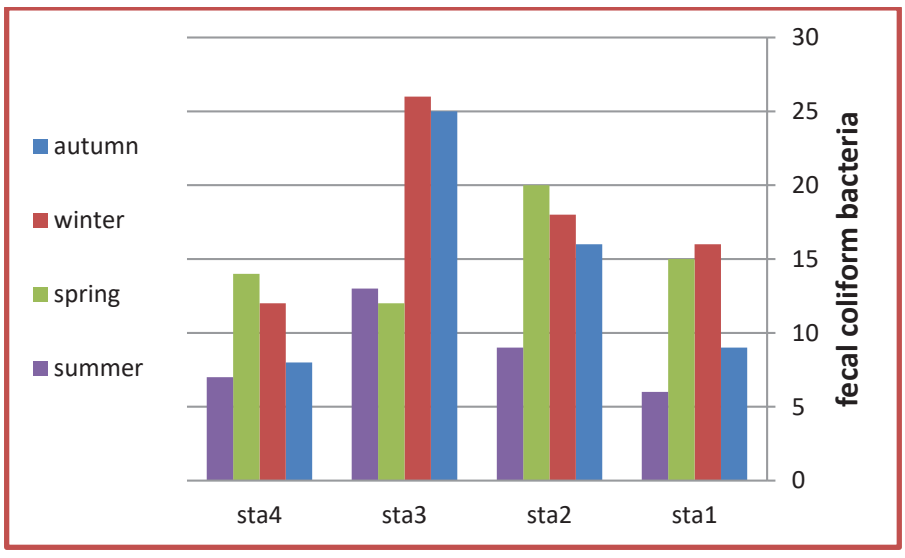
Coliform bacteria recorded the highest concentrations of 130 cells / 100 ml in the third station during the winter and the lowest level of 3 cells / 100 ml in the fourth station during the spring. The results of the statistical analysis revealed significant differences between the stations except the second station and the fourth station at the probability level (P <0.05). There were also significant differences between the four seasons, except for winter and summer at the same level



(Fig)12 Quarterly and spatial changes of Total Coli form Bacteria study stations

3-Fecal Coli form bacteria

The highest rate was 26 cells / 100 ml in the third station during the winter, while the lowest rate of 6 cells / 100 ml in the first station during the summer. The statistical results showed significant differences in the preparation of the bacteria Fecal colitis between stations except (P <0.05) and significant differences between seasons except spring and spring at the same level



(Fig)13 Quarterly and spatial changes of Fecal Coli form bacteria study stations.

4-discussion:

The results of the present study showed that high concentration of basal in the Euphrates River sediment A distinctive feature of Iraqi water (Fahd, 2005; Khalaf, 2013).the total organic carbon values ranged from (0.87 to 5.4)mg / kg. Human activities and natural processes lead to a high concentration of total organic carbon in the sediment. The increase in winter can also be attributed to the nature of domestic flows and waste discharged by the population, As well as some waste such as fats and proteins as well as low temperatures. The increase can also be attributed to the decrease in organic decomposition processes due to the low temperatures (Dejux and Deelstra 1981). Concentration rates were trace elements in sediments for zinc, lead, copper and cadmium (0.101, 22.643, 7.226, 62.16) µg / g dry weight, respectively The reason for the high concentration of heavy metals in the sediments may be due to the percentage of clay within the composition of the sediment Texture, as the atoms are characterized by small size and the volume of surface area, leading to the accumulation of large amounts of heavy metals, and may be due to the river reaches different amounts of trace elements From waste water directly into the river or from agricultural areas or untreated industrial in particular the power plant and its obvious impact on increasing these concentrations. For the purpose of analyzing the dispersion of organic matter in the sediments of the studied stations, we determined total sulfur, total nitrogen and total phosphate in these sediments, which are important indicators that are associated with the spread of organic matter The high concentration of nitrogen is caused by the release of fertilizers and other human waste into water and then sediments ,The reason for its lack of concentration may be due to the poor discharge of animal fertilizers from neighboring agricultural lands. (Caperon, 1976). The results showed that sulfur concentration in the study stations was very high , This increase is correlated with the large quantities of household and industrial waste dumped in the river. Household waste contains sulfuric organic substances such as methionine and cysteine which, when degraded by microorganisms, emit the sulfur element at high concentrations, especially in sediments (Wetzel, 1975). The increase in Phosphate concentrations in the Euphrates River is attributed to the passage of large agricultural areas and its exposure to the addition of fertilizers. The increase in the total phosphate values may be due to human waste and phosphate rich detergents (Ali, 2009).

t is noted that this is due to the fact that the plant has only sewage treatment unit. This may be due to the agricultural land surrounding the area that uses organic fertilizers in the agricultural operations which reach the river, as well as the good ventilation process Water and temperature, which lead to high numbers of bacteria (AL-Obeidi, 2009). An increase in the rates of colonic bacteria in the water of the study stations may be due to the increase in population activities leading to higher water preparation, The increase in their preparation at the third plant during winter 2018 may be due to the abundance of organic materials from the wastewater treatment station (Al-Sudani, 1993). The increase or decrease in the incidence of fecal coliform bacteria among plants may be due to other factors, as well as temperature such as geographical location, type and sources of pollution(Al-Sudani, 1993).

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