Study of Physical and Chemical Characterization and Pathogenic Microbial Pollution in Euphrates River in Al-Nasiriya City during 2018-2019

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Abstract:
This study was conducted to assess the physical, chemical properties and pathological microbial contamination in the Euphrates River in Nasiriya city, southern Iraq, and three stations were chosen in the study area of 6 km for the period from the fall of 2018 until the summer of 2019. Samples were collected during this period. The first station was north of Nasiriya governorate. The second station is located in the center of the governorate. The third is located in the south of Al-Nasiriya Governorate, about 4 km from the second station. The study included measuring some physical, chemical and microbial properties of river water. It also included measuring the concentration of some physical analyzes including color, odor, temperature and turbidity. Chemical analysis included pH, BOD5, and COD. Pathogenic bacteria analyses included Salmonella enterica, E. coli pseudomonas aeroginosa, Streptococcus pyogenes, Staphylococcus aurous, and Klebsiella spp. AST in our study revealed high levels of resistance to ampicillin (100%), nalidixic acid (90%), sulfamethoxazole- trimethoprim (80% (Tetracycline and ciprofloxacin (55%) and Chloramphenicol (45%).

Keywords: Pathological microbial pollution, Physical and Chemical Characterization.

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 with different types of pollutants have 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). As Nasiriya is an Iraqi city located in southeastern Iraq on the Euphrates River, it is the center of Thi- Qar Governorate. The aims of this study are determinant of Physical and Chemical Characterization and Pathological microbial pollution in Euphrates River in AL-Nasiriya City during the fall of 2018 until the summer of 2019.

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 (Assad et al., 1986). This study aims to determine the microbial load and the physical and chemical properties of the Euphrates River in the city of Nasiriya. Three stations were selected in Euphrates River. North of Nasiriya (Al-Sakhiyyin), Nasiriya Center and South of Nasiriya (Sindawi). 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

2.2 Samples Collection
Samples were taken from continuously covered areas from the center of the river during 2018-219 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 water was measured using a pH-meter device made by Hanna. Biological Oxygen Demand (BOD₅). The biological requirement for oxygen was measured using the (Oxi method in an opaque bottle, which was then transferred to an incubator at 20 °C for 5 days to complete the device reading. Chemical Oxygen Demand (COD). Followed by multi direct method using the (Tento meter) using two tubes of LR solutions as one of the tubes was added 2 ml of the sample and the other 2 ml of distilled water and then they were placed inside the device. Turbidity was measured using a Turbidity Meter.

2.4 Pathological microbial pollution
1. Bacterial cultures
1 ml of water was spreading on XLD,TCBS, on MacConkey agar plates and Blood agar then incubate at 37°C overnight (18-24 hours) and read the plates.

2. Biochemical tests
The important biochemical tests were achieved according to (Winn et al., 2007). The tests are (Kligler iron (KI), Oxidase test, Urease test, Indole test, Citrate utilization test).

3.Api-20E system (Analytical profile index for Enterobacteriaceae test)
Api-20E system is used clinically for the rapid identification of the isolates this test done according to (Leboffe and Piercr, 2005).

4-Antimicrobial susceptibility test:
The antimicrobial susceptibility test to antibiotic has been done by disc diffusion method according to Bauer et al. (1966).

3. Results
3.1 physical and chemical properties
3.1.1 Color and odor
The Color and odor rates in the studied water were green in the center of Nasiriya and odor were swage in the center of Nasiriya as table (1)

3.1.2 Temperature
The seasonal changes in water temperatures were higher in the summer of 2019 and were 29 °C in south of Nasiriya that the increase in water temperatures was noticeable with the progress of the summer and the lowest value was in the center and North of Nasiriya is 28 °C. As shown in table (1).

3.1.3 Turbidity
The turbidity rates in the studied water ranged between the highest rate in the center of Nasiriya and the lowest rate in the south and north of Nasiriya as in table( 1)

Table (1):-The Temperature and turbidity rates

| Physical parameter | south of Nasiriya | Center of Nasiriya | North of Nasiriya |
|--------------------|-------------------|--------------------|-------------------|
| Color              | Colorless         | Green              | Colorless         |
| Odor               | Odorless          | Sewage Oder        | Odorless          |
| Temperature        | 29°C              | 28°C               | 28°C              |
| Turbidity          | Translucent       | Turbid             | Transparent       |

3.1.4 pH
The results recorded the highest pH rate of 9 during the summer 2019 in South Nasiriya and the lowest rate in the North and the Nasiriya Center as in table( 2).

3.1.5 Chemical oxygen demand (COD,)
The highest rate of the chemical requirement for oxygen was 47 mg / liter in southern Nasiriya during the summer 2019, while the lowest rate was 41 mg / liter in recreating the Nasiriya center, as shown in table(2).

3.1.6 Biological oxygen demand (BOD5)
The results indicated that the highest rate for the biological requirement of oxygen was 30 mg / liter in southern Nasiriya, while the lowest rate was at 25 in the governorate center, as in table (2).
Table (2):- The results of pH, BOD₅, and COD

| Samples          | pH | COD mg/L | BOD mg/L |
|------------------|----|----------|----------|
| North of Nasiriya| 8  | 41       | 26       |
| Center of Nasiriya| 8  | 42       | 25       |
| South of Nasiriya| 9  | 47       | 30       |

3.2 Pathological microbial pollution
The highest rate of *Salmonella* bacteria was recorded in North Nasiriya, while the other types of pathogenic bacteria were higher in North Nasiriya, as shown in table (3). The antimicrobial sensitivity test (AST) revealed high levels of resistance different types of antibiotic as in figure (1).

Table (3):- Types and number of Pathological bacteria in studies area

| Organisms                  | North   | Center  | South   |
|----------------------------|---------|---------|---------|
| *Salmonella enterica*      | 5×10⁴   | 643     | 1×10⁵   |
| *E. coli*                  | 10×10³  | 2×10²   | 5×10⁴   |
| *Pseudomonas aeruginosa*   | 3×10⁴   | 1×10⁴   | 8×10⁴   |
| *Streptococcus pyogenes*   | 2×10³   | 1×10⁴   | 4×10⁵   |
| *Staphylococcus aurous*    | 1×10⁴   | 650     | 4×10⁵   |
| *Klebsiella spp.*          | 3×10²   | 2×10²   | 6×10⁵   |
4. Discussion

The temperature effectively affects the solubility of substances, including gases in the water, especially oxygen and carbon dioxide. It is also an important factor in determining the activity and effectiveness of aquatic organisms, including analyzers such as bacteria. It is an important factor in determining some water properties such as density (Al-Ani, 1997). Temperature is an important environmental factor affecting the presence and distribution of aquatic organisms through their influence on the vital activities of these organisms in addition to their effect on other physical and chemical properties in the aquatic environment (Weiner, 2000). As for the studied water temperature, it was the highest during the summer and the lowest during the other seasons due to its distance from the surface and its low vulnerability to the air temperature. The water has a high quality temperature, which enables it to maintain its temperature. The results show the temporal differences in the values of turbidity, which are due to the possibility of rain and increased erosions due to erosion down to the waterway or may be due to algal bloom and increased decomposition of the water column due to microorganisms (Hussein, 2009; Rosalofomanana, 2009) in addition to a high level Water, especially in hot months, is the cause of increased water movement, which has caused an increase in the amount of suspended solids such as silt and clay that increases with the increase in the volume of organic materials added to water and to increased water discharge due to rain or due to drainage of sewage from agricultural lands (Al-Yasiri, 2007). The pH values recorded in the current study were of minor seasonal and locational variations, and they fall within the basal side, especially the weak basal one, which is what, is known about Iraqi waters most, and this is maintained by the presence of regulatory susceptibility to carbonate and bicarbonate (Lind, 1979). A high pH value was observed during the summer in well water and a decrease in the value during the fall and winter seasons. This may be attributed to the high temperatures that play an important role in the solubility of gases, which are directly proportional to the value of pH, and this explains the relative decrease in the pH value during the fall season. And winter, which is consistent with (Al-Azzawi, 2004). The results of the current study showed that the highest rate of the chemical requirement of oxygen in the summer season. The reason may be the presence of organic pollutants (Almeida et al., 2012) resulting from human and agricultural activities and this causes a lack of dissolved oxygen that is inversely related to the chemical requirement of oxygen.
for use in oxidation. This material (Mahazar et al., 2013). Thus, the increase in the value of the COD in the lesser heat seasons may be attributed to the decrease in the processes of decomposition of organic matter with lower temperature. The results showed that there were significant differences between the sites, as the values of the biochemical requirement for oxygen increased due to the increase of organic waste in the river in these sites, which causes increased activities of microorganisms (breathing) to analyze the organic materials (Amadi et al., 2010). It is vital for oxygen in March and some cold months that may return to rain and the contamination of soil loaded with pollutants into the river, especially agricultural lands. In addition, precipitation of atmospheric pollutants due to wind and rain increases their presence in the river. While the increase may return in some hot months, there is a rapid increase in oxygen consumption with increasing temperature (Usharani et al., 2010) and an increase in carrying organic materials to the river with less treatment for household waste. As I said in other months, it may be due to increased operations Photosynthesis by primary products and the abundance of oxygen due to direct contact with atmospheric oxygen, especially in the surface layers, and this depends on the depth of water, temperature and water movement (intimate, 1986) The results of this study were close to what Al-Karawi recorded, 2014) on the Kufa River, The highest rate of Salmonella bacteria was recorded in North Nasiriya, while the other types of pathogenic bacteria were higher in North Nasiriya less than what he recorded (Al-Fatlawi, 2007) and (Salman, 2006) on the Euphrates. AST in our study revealed high levels of resistance to ampicillin (100%), nalidixic acid (90%), sulfamethoxazole-trimethoprim (80%) (Tetracycline and ciprofloxacin (55%) and Chloramphenicol (45%).

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