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Research Article

Determination of Bacterial Contamination and Some Chemical Parameters in Basrah Governorate Rivers

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ABSTRACT

The current study included measurement of chemical parameters such (alkalinity, calcium, dissolved oxygen, phosphate, magnesium, Nitrate and sulfate) As well as the research include the evaluation of bacterial contamination by means of use the indicators bacteria (total and fecal coliforms) for samples of the Shatt al-Arab estuary from Al-Jubaila river to Al-Sarragi river. The chemical parameters results showed that the alkalinity range between 233-553, Ca+2 and Mg+2 ranged between (172-257) and (67-178) ppm respectively, and DO ranged between (0.3-9.96) ppm ,PO4+3 and NO-3 (0.26-3) ppm and (2.9-6.02) ppm respectively,. The maximum value of the SO4-2(550) ppm while the minimum (350) ppm. Generally all the collected samples were contaminated with indicator bacteria, the results of bacterial tests shows that the highest bacterial contamination levels were recorded in Al-Ashar's river while the lowest levels were recorded in Al-Sarragi's river.

Keyword: Water quality; bacterial contamination; Shatt Al- Arab

INTRODUCTION

Pollution resulting from increased human activities is intimidating , its effects being characterized by eutrophication and the occurrence of intensely low dissolved oxygen ranks [1]. Water resource's pollution is an important issue due to the increasing in pollution sources like agricultural, industrial and domestic resources [2]. Shatt Al-Arab estuary is the conjunction link of freshwater from Iraq into the Arabian Gulf. This estuary has been subjected to several pollution activities, mostly from domestic waste discharge, industrial waste and agricultural and as put this waste directly into the river without any handle them and this waste be loaded mostly pollutants may pose serious health and can adversely affect the use beneficial to the river [3].Changes in the land cover and land management practices have been regarded as the key influencing factors behind the alteration of the hydrological system, which lead to the change in runoff as well as the water quality [4] .Shatt Al-Arab is polluted by some different sources of pollutants including power stations, paper industry, oil refineries, petrochemical industry, chemical fertilizer companies and the sewage system and overfishing and the application of pesticides [5]. The aquatic environment such as temperature, salinity and pH value and other characteristics, as well as have an important impact on the accumulation of these elements in the tissues of

aquatic organisms, and also it affects the presence and distribution of neighborhoods in the aquatic environment [1] .

Bacterial indicator test is relatively cheap, and is one of the main manners of water quality management used today. Fecal bacteria are dependable indicators of fecal contamination; they are present in the feces of humans and warm-blooded animals. Total coliforms (TC), fecal coliforms (FC) and enterococci (EC) are indicator bacteria used for decades the presence of other possibly harmful pathogens in recreational waters. When indicator bacteria are present in the water, it is supposed that there is a greater chance that pathogens are present. Infection as a result of pathogen-contaminated recreational waters includes gastrointestinal, respiratory, eye, ear, nose, throat and skin disease [6]. The higher, the level of indicator bacteria, the higher, the level of fecal contamination and the greater, the risk of water-borne diseases [7].

A wide range of pathogenic microorganisms can be transmitted to humans via water contaminated with faecal material. These include enteropathogenic agents such as salmonellas, shigellas, enteroviruses, and multicellular parasites as well as opportunistic pathogens like *Pseudomonas aeroginosa*, Klebsiella, *Vibrio parahaemolyticus* and *Aeromonas hydrophila* [8].

SAMPLES COLLECTION

For twice periods, 3 replicates of water samples were collected from 6 sampling locations distributed at the main rivers of Shatt Al-Arab estuary in Basrah governorate as shown in (Fig. 1) .One of each 3 replicates from each station assigned for bacterial analysis, the other two replicates assigned for chemical tests water samples for bacterial analysis were collected in previously sterile screw cup glass container size 500ml and kept in an ice box until reaching the laboratory.

Table 1:coordinations of sampling stations

Stations	Station description	E	N
1	Al-Jubaila River	770134.00	3382574.00
2	Al-Khandaq River	771998.00	3380717.00
3	Al-Ashar River	772361.00	3380035.00
4	Al-Rebat River	771464.00	3378072.00
5	Al-Khora'a River	773541.00	3378681.00
6	Al-Sarragi River	774306.00	3376699.00

Fig. 1: Sampling stations

Standard methods which described by [9]were conducted to detection of bacterial contamination in the collected water samples. Filtration technique (SM9222B method for total coliforms while SM9222D method for fecal coliforms), the results were expressed in terms of

colony forming units per 100 ml of sample (cfu/100ml).

Due to the presence of high numbers of total and fecal colonies, tested samples have been diluted and then the numbers of colonies were calculated to get the final results.

EQUIPMENT

All chemicals used were from chemical Reagents grads and distilled water has been doubled distillated.

For analyses, the material used is Laboratory current equipment. A pH meter (JENWAY,3320) equipment with a combined electrode, a built-in thermometer and magnetic stirrer. Dissolved oxygen was measured using (THERMOSCIENTEFIC ORION 3 STAR) .A conduct meter livobond (SD 320 CON) equipped with automatic temperature compensation. A PRIMA INGREDIENTS,S.L UV-Visible spectrophotometer (PRIMA) has been used for colorimetric methods. Flame photometer model BWB XP have been used to determination of calcium.

RESULTS & DISCUSSION

During the period of analysis, most parameter fluctuated from the first sample to another. Fig. 2 represents the Alkalinity: maximum and minimum during the stations. Calcium level did not exceed 257 ppm during the study. pH is a parameter of importance to the quality of water and to aquatic life. Natural water must have a pH between 6.5 and 8.5. In most natural water bodies with a rate in high calcium, the pH value is fixed around 7.3 to 8.4 due to equilibrium between the concentrations of low acid carbonate (hydrogen carbonate) ions and carbonate resulting from dissociation of carbon dioxide in the water.

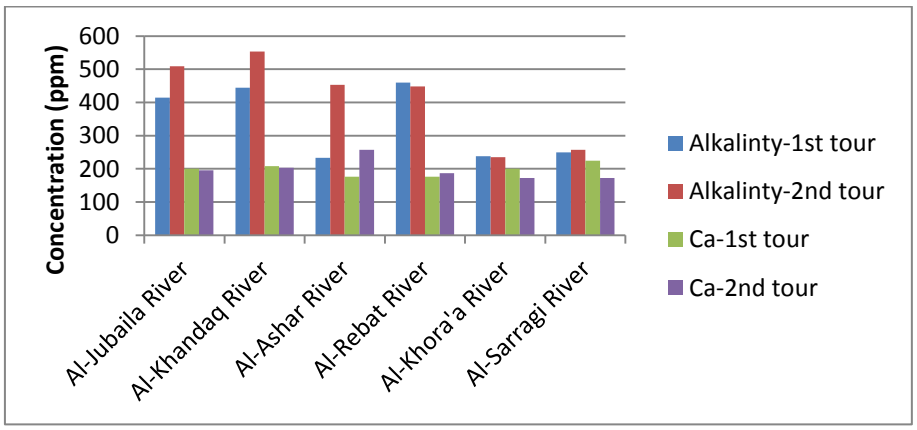

Fig. 2:Alkalinity and Calcium levels

The rates of dissolved oxygen in the resent study were oscillated from place to place; (Fig. 3) shows the variable value of DO. These values are due to microbial activities in waters contaminated by sewers, stagnant in the dry season and weakening of the water level. The largest decreases of the river dissolved oxygen concentration appear in Al-Jubaila river from urban waste discharge. Calcium is an essential compound for living bodies: skeleton of animal, teeth, shell eggs etc. Calcium level in the water was 176 to 256 ppm.

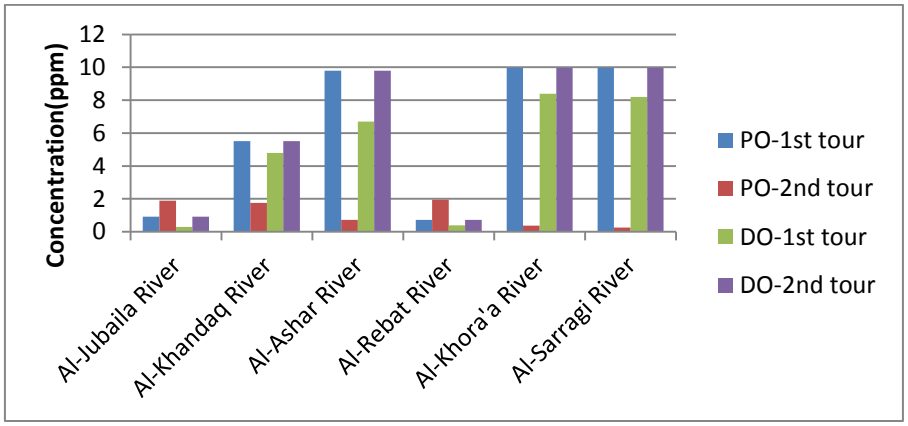

Fig. 3: Concentration of phosphate and Dissolved oxygen

Magnesium components are widely used in industry and agriculture. The presence of cations of calcium and magnesium in river water allows reducing the toxicity of metals due to the formation of metal complexes (by substitution of hydroxides) as shown in (Fig. 4).

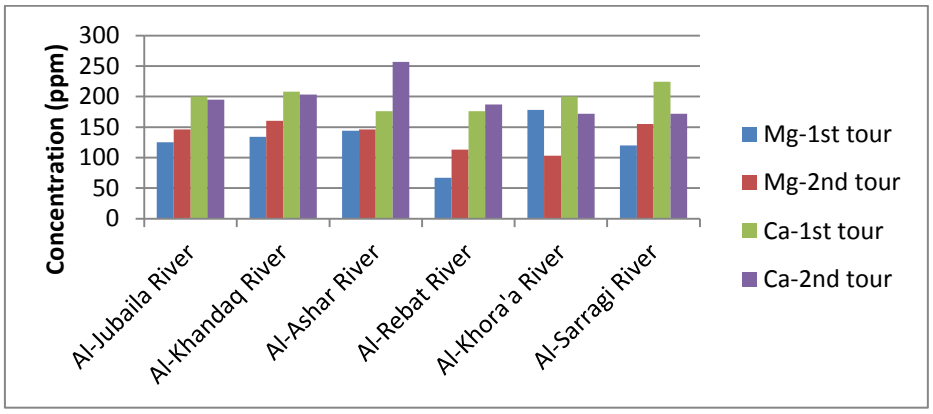

Fig. 4: Concentration of Ca and Mg along the stations

Nitrates are salts dissolved from the oxidation of organic nitrogen in ammonium and nitrite with nitrous bacteria that oxidation under the action of nitric bacteria into nitrate. Wastewater discharged into stations spread on agricultural land bordering it is at the origin of the concentrations found in the analysed samples. The consequences on the balance of ecosystem are of various types: Physical: change in flow rate depending on whether the volume and frequency of releases are major and repeated, Physical-chemical: change of physical-chemical parameters of the original streams (pH, temperature, dissolved oxygen, increased turbidity and suspended material, or even toxic substances eutrophic inputs, etc.), Biological: stress of the biocenosis that could lead to its disappearance and the eutrophication of the water course. In the studied stream nitrate concentrations greatly exceed these values. Nitrate concentrations ranged from 3 to 6 ppm as shown in (Fig. 5).

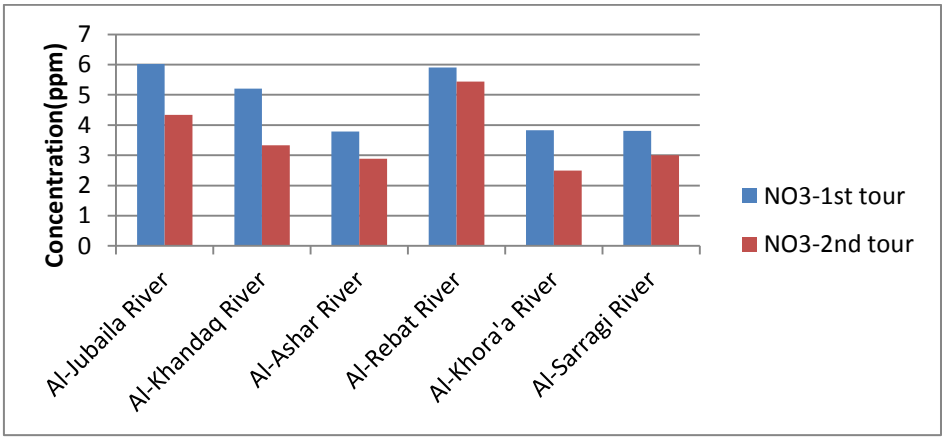

Fig. 5:Nitrates Level

Sulfates (SO_4^{2-}) can be found in almost all waters. The origin of most of the sulfate compounds is oxidation of sulfites, the presence of shale ores, or industrial waste.

Sulfate is one of the major elements of compounds dissolved in rainwater. Important concentrations of sulfate in the water we drink can have a laxative effect combined with calcium and magnesium, the two major components of the hardness of the water. Sulfates can be attacked by sulfate-reducing bacteria, which reduce hydrogen sulfide (H_2S). Some soils and some stones contain sulfate minerals. As groundwater moves through these, some sulfates are dissolved in the water.Among the minerals that contain sulfate include sodium sulfate, magnesium sulfate, and calcium sulfate.Fig. 6 describes different sulphate concentrations along the stations. The values shows high level up to 550ppm.

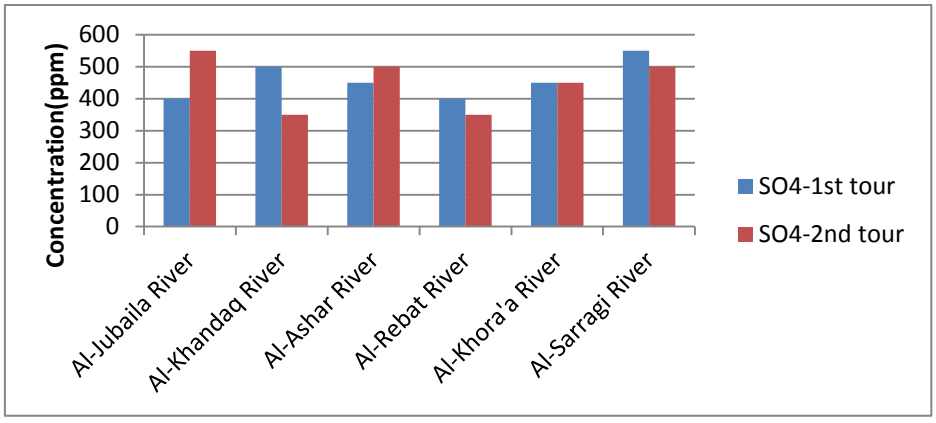

Fig. 6:Sulphate level along the stations

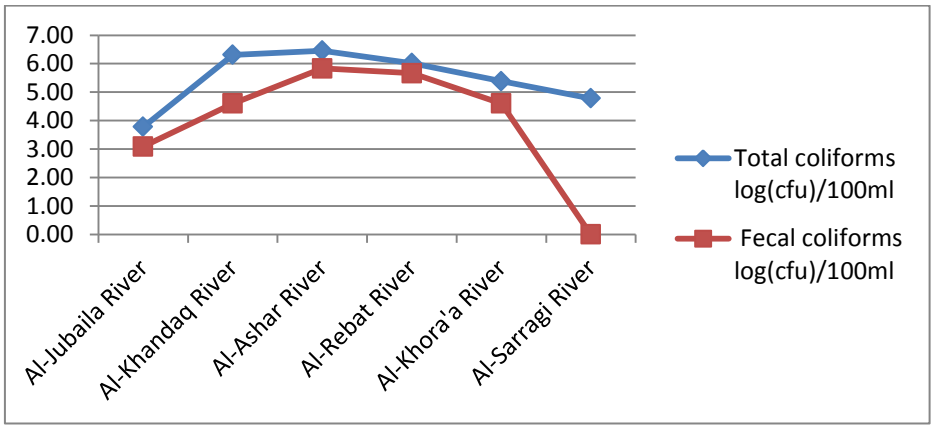

Fig. 7: Fecal and Total coliforms parameters in sampling stations-1st tour

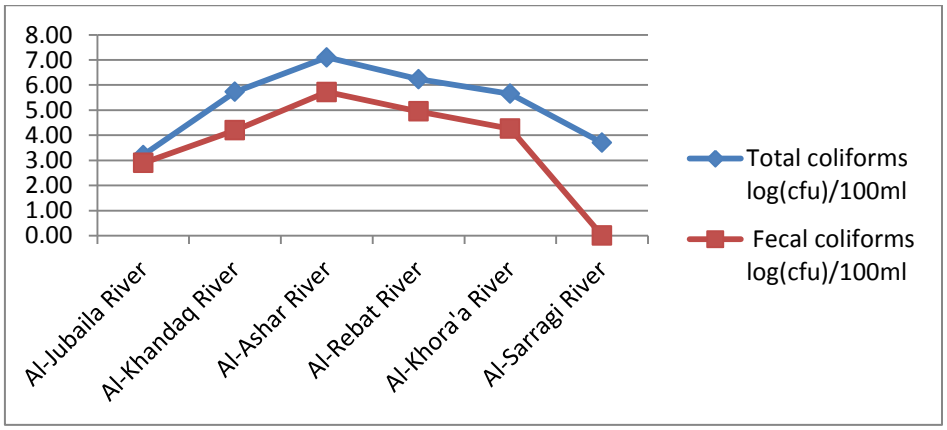

Fig. 8: Fecal and Total coliforms parameters in sampling stations-2nd tour

Bacterial tests results of both tours showed that all the collected samples were contaminated with total and fecal coliforms Fig.(7,8), These results agree with Kifah M. Khudhair [10]the variety of bacterial contamination levels depend on the presence of high population density near the sampling locations .Sewage spill in the rivers leads to contamination with total and fecal coliforms, as well as the presence of cattle slaughterhouses around some regions of Al-Ashar's River that throws the cattle's remains in this river, that make its results at the maximum compare with the other locations.

Low fecal contamination levels in Al-Sarragi's River was related to the low population near the river and high dilution levels of water due to the tide levels in Shatt Al-Arab estuary compares with the other sampling locations.

CONCLUSION

The research concerned discussing the chemical and bacterial contaminants in some important rivers of the Shatt al-Arab in Basra. It was clear that there were high levels of pollutants because of the disposing of many chemical wastes from nearby factories as well as the connection of the sewage system to those rivers compared with faraway rivers from the sources of pollution, the results were less polluted.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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