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Treatment of Wastewater in the City of Tikrit Using Bacteria Pseudomonas Spp

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Abstract. The study included the ability of pseudomonas aeruginosa to reduce pollutants in the wastewater of Tikrit under different ventilation conditions (aerobic, anaerobic, facultative) for three treatment periods (2,4,6 hours) and controlled temperature (25 ° C). Physical and chemical measurements of water were performed before and after treatment. The results showed the efficiency of pseudomonsa aeruginosa in the removal of contaminants during the long treatment period (6 hours) in achieving the best results for PO4, NO3, SO4 COD, Zn and Ni in treated wastewater (60.4,43.5,61.4,82.5,87.4, 87.8%). Respectively, with significant differences from other interventions.The results of the study showed the effect of the quality of the bacteria and the different ventilation conditions and the time spent on the treatment in giving the best rates for all studied properties of wastewater and the long period of 6 hours as the best time to reduce all the studied properties.

INTRODUCTION

The world in general and third world countries in particular face one of the most serious pollution problems, lack of drinking water. This problem has been exacerbated by the increase in population and increased daily consumption of drinking water, reflecting increased social and health awareness. Water and its validity and its negative impact on human health and increase this phenomenon day after day [1, 2].

Wastewater is a major threat to both the physical environment and human / animal life due to inefficient management processes. Without sufficient drinking water, it is necessary and imperative to treat wastewater and effluents. There are many techniques used to manage wastewater. Among them biological treatment methods are widely used because they are cost effective, simple in application, less in chemical use, less energy-consuming and environmentally friendly. One of the most famous of these treatments is biological wastewater treatment through aerobic and anaerobic methods [3, 4]

Microorganisms have the ability to remove and treat briefly and this encourages the use of bacterial treatment instead of other living organisms as they have the ability to reduce nutrients and increase biomass [5], and those that have a role in the treatment Water is the Pesudomonas spp. Which have a clear role in the treatment of wastewater as well as the ability to consume hydrocarbons and the consumption of a wide range of polycyclic, polycyclic, aromatic and single-ring compounds, pesticides and reducing the BOD and COD chemical requirements for having a variety of mechanisms such as enzymes for consumption of this range Wide range of vehicles, thereby avoiding the use of hazardous chemicals [6, 7].

Microorganisms play a key role in the thawing of dissolved solids and colloids that are unable to precipitate and stabilize organic matter. This leads to the conversion of these substances into new cellular gases and tissues of microorganisms. Because these tissues are a little more dense than water, they are easily deposited by gravity, leaving behind almost empty water. The bacteria are psudomonas spp. Bacteria are important because they are widespread in nature because of their human, animal and plant habitats. These bacteria have the ability to live in a variety of free living environments living in soils and marshes, which are accepted by low temperatures [8]. For optional chroma, aerobic or anaerobic dye [9]. It is a bacteria that has the ability to move through a single polar

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whip. , As well as in single bacteria or in pairs, and sometimes in short chains, most breeds grow at 42 m and some 4 m [10]. So pseudomonas spp. To identify its ability under aerobic and anaerobic conditions in the removal of contaminants present in wastewater.

MATERIALS AND METHODS OF WORK:

Description of the study area Description of study area: The study area is located in the city of Tikrit, the center of Salah al-Din province, in the valley of Shishin, and the percentage of the population served in the city sewerage network is 18%, which represents 25% of the city area where the length of the household drainage network heavy (204 km) while the length of the drainage network Rainwater (71 km) The design capacity of the treatment plant (20000 m 3) per day [11].

FIGURE 1. A picture showing the location of the main sewage collection plant in Tikrit in the Sheshin Valley.

Physical Characteristics

Water Temperature

Water temperature was measured using the enclosed mercury thermometer. Water temperature was measured by immersing the mercury-containing end directly into the water for two minutes until the reading stabilized and recorded.

2- Electrical conductivity

The electrical conductivity of the samples is measured using a WTW Digital Conductivity device manufactured by HANNA Germany [12].

3- Suspended Materials for Solid Solid Total Solid Suspended (T.S.S)

After the filtration, the filter paper and its residue were then placed in the desiccator drying chamber to cool and then weighed. The concentration of the suspended material was calculated by the unit of mg / l [13].

)4-Total Dissolved Suspended (T.D.S

The concentration of soluble solids in household waste water was estimated according to [14]. Precise filter paper (0.45 Mm) was used to filter the sample and take 100mL of leachate into a dried and biodegradable ceramic jar and was subjected to evaporation and drying as indicated in the material estimate And the amount of dissolved solids was also calculated. As in the following law and results are expressed in units of mg / l.

Chemical Characters

PH

The pH of the solutions and samples was measured using pHmeterRomania, AD1000ADWa [15]

Dissolved Oxygen (D.O)

The azide malification method was used for the Winchpande method [16]. Results are expressed in mg / l.

Chemical Oxygen Demand (Cod)

The oxygen chemical requirement was measured using the CSB / COD-Reaktor COD-Reaktor [17].

Ion Nitrite No2

The methods described in [18] were followed to measure the concentration of effective nitrite ion. Using the UV-Visible, Spectrophotometr9200 spectroscopy at a wavelength of 543 nm to measure the concentration of nitrite and to express the results in a microgram of nitrite / l.

Ion Nitrate No3

For the purpose of measurement of nitrate, nitrate used the method of chromotropic acid, and expressed the results in microgram / l. [19].

Determination of Phosphorous

The total phosphorus concentration in the wastewater was estimated based on the Stannous chloride method, and the results were recorded in mg / L [20].

Determination of sulfur concentration Determination of sulphate

The concentration of sulphate in sewage was estimated using a spectrophotometer in the turbidity method with the addition of barium chloride as reported in [21]. The concentration of sulphates is in milligrams per liter.

Estimation of concentrations of some heavy metals

The concentrations of heavy metals (Zn, Ni, Cu, Co, Hg) in wastewater were determined using the Atomic Absorption Spectrometry (AAS) technique, which is the reference method for determining elements in wastewater [22, 23].

• Microbiological analysis

1 - preparation of the agricultural communities, including nutirent agar and nutrient broth and McConkey broth and the center of Aspargane broth and calculate the total number of bacteria

2 - isolate the bacteria pure and then injected with sewage water.

RESULTS AND DISCUSSION:

Biological treatment is one of the most important stages of wastewater treatment. It involves the use of specific microorganisms such as bacteria, fungi or algae to reduce concentrations of toxic pollutants and nutrients that are present in high concentrations in wastewater. These include types of aerobic, anaerobic and optional treatment based on available dissolved oxygen, and the importance of bacteria in the oxidation of organic matter in aerobic, anaerobic and elective conditions where the air bacteria oxidize dissolved organic matter to the initial factors enzymatically with dissolved oxygen [24].

Chemical Oxygen Requirement (COD):

The chemical oxygen test is used to measure organic and mineral substances in domestic and industrial waste water containing toxic compounds for biological life and can not be accurately calculated for the presence of toxins and conditions that are not suitable for the presence of bacteria [25]

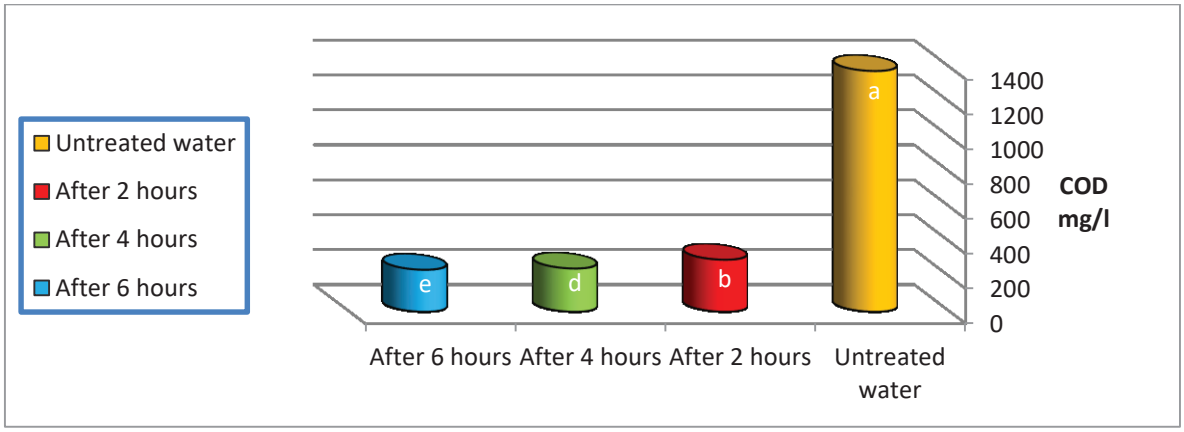

FIGURE 2 Effect of pseudomonas aeruginosa bacteria on the chemical requirement oxygen of wastewater for the city of Tikrit.

It is clear from the above figure that there is a process of consumption of the organic matter in the water as a waste water contains a large amount of different carbonic substances, carbohydrates and proteins as well as detergents that have been consumed by bacteria because they have a number of factors and the ferocity enzymes that dissolve the mineral and organic materials, eg lipase, protenes and others The decrease was limited to 297.6-240.2 mg / l for ps.earginosa and the removal rate (78%, 82%, 82.5%) had a significant effect on the treatment process. Norie Wachron, Is affected by the time it takes to process when water is treated Biodegradable drainage The results for removal were 75% after 24 hours.

Nitrate No-3:

Nitrate is the most oxidized form of nitrogen compounds normally found in natural waters. Important sources of nitrate are chemical fertilizers, degradable plant and animal materials, household effluents, disposal of sewage sludge to the ground, industrial discharges, leachates from landfills and airwashing. Depending on the situation, these sources may contaminate streams, rivers, lakes and groundwater. Non-contaminated natural water contains minute amounts of nitrates [26]. High levels of nitrate in water used for drinking will make it hazardous to infants because it stimulates the syndrome of "blue child" (mithemoglobinemia). Nitrates themselves are not directly toxic but pose a health hazard due to their transformation into nitrite that reacts with hemoglobin blood causing hemoglobinemia [27].

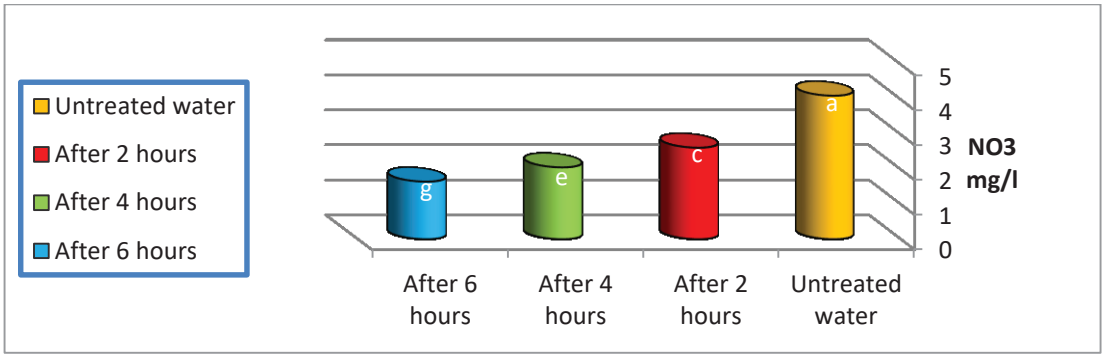

FIGURE 3. Effect of pseudomonas aeruginosa bacteria on nitrite of wastewater for the city of Tikrit.

The ps.aeruginosa bacteria were better at reducing (1.649) mg / L (61.0%) due to the production of protenes by the bacteria, which helps in [28]. When treating household waste water in Jadiriyah - Baghdad for 48 hours, the removal rate (65.2%).

c.Phosphate (PO4):

Phosphorus can be found in natural water in the first place and is an important component of the living cell [29] Phosphates can be introduced into aquatic environments from the natural weathering of metals in the drainage basin, from biodegradation and from surface runoff of human activities in urban and agricultural areas [30].

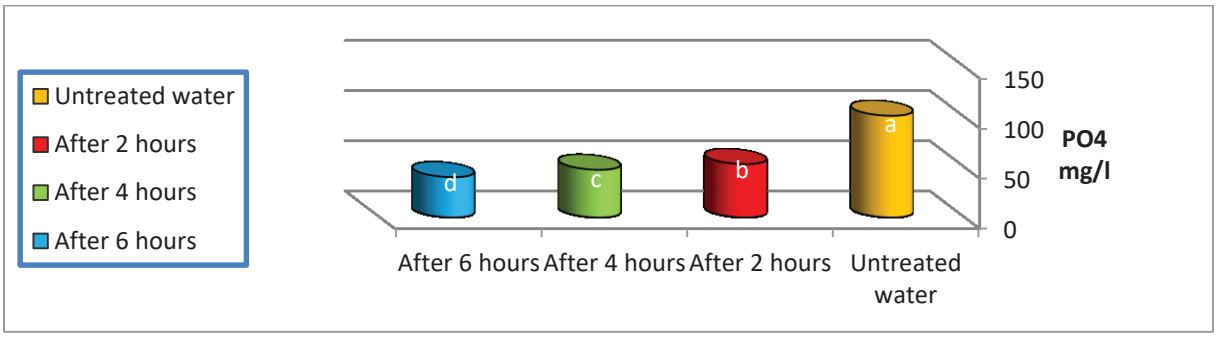

FIGURE 4. Effect of pseudomonas aeruginosa bacteria on the total phosphorus of wastewater for the city of Tikrit.

The above figure indicates a decrease in phosphorus due to the effect of bacteria over time in improving the decrease or consumption of phosphorus. The reduction value was better at the time of 6 hours (40.148) mg / L by removal rate (47.5.53.2,60.4) [31] showed that the treatment of domestic wastewater in the Jadiriya area was the removal rate (93.2%) for the 48 hours time.) The percentage is also affected by the amount of detergents and increases when decomposing Algae and when increasing the pH and thus increase the efficiency of removal [32].

Heavy metals:The contamination of the aquatic ecosystem with heavy metals has been seriously compromised by its toxicity and cumulative behavior. Unlike organic pollutants, natural degradations do not remove heavy metals. Minerals are introduced into the water system due to weathering of rocks and soil, as well as the discharge of industrial wastewater and wastewater, as well as of air sediment. Several studies have indicated that there are hundreds of genes responsible for bacterial resistance to germination and adsorption from the aquatic environment and the treatment of water by the negative and positive bacteria of chromium [33]

A-Zinc Element (Zn): Zinc, in small concentrations, is an essential element of living organisms and essential for the enzymes needed to form red blood cells in living organisms. For plants it is involved in the biological synthesis of nucleic acids and peptides needed for plants. On the other hand, when zinc concentration increases above a certain level, [34]. Zinc toxicity becomes more severe when present with other heavy metals, such as cadmium, in water because it has a synergistic effect with these minerals. The main sources of zinc in the environment are mining, secondary production of metals, burning of coal, batteries, fungicides, dyes and phosphates. And the mineral that can not be stored and has an important role in the work of enzymes as a catalyst and its important role in the production of nuclear acids [35].

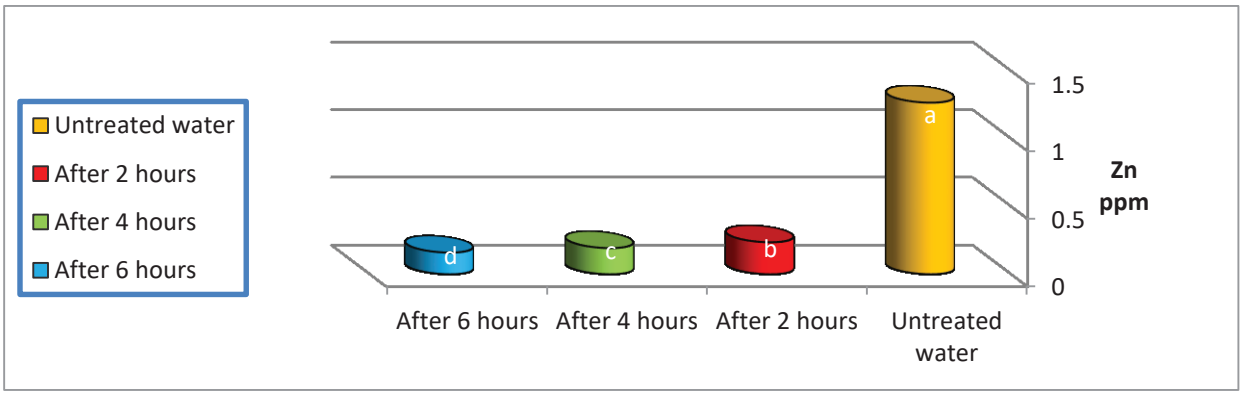

FIGURE 5 Effect of pseudomonsa aeruginosa bacteria on the zinc element of wastewater for the city of Tikrit.

Note that there were significant differences in the value of Pseudomonas aeruginosa. The values ranged from 0.235-0.159 mg to 87.4%, due to the ability of bacteria to adsorption of zinc at the above mentioned rate. 2019) in his research that the bacteria can adsorption of zinc between (1.25-4.2) mg / l. While the removal of bacteria during the research reached by (Al-Rawi and others, 2012) that the waste water at the University of Mosul was the bacteria during the period of (24-24) hours can remove (82%).

B) Nickel element (Ni)

Wastewater contains the following nickel element from industries, factory water, batteries and others, usually found with cobalt, as well as in some animal products and plant foods. In addition, there are deformities in the legs [36]. Nickel is obtained mainly from peritite and garnet. Nickel is used in magnet alloys, coatings, batteries, common aquatic species are Ni2. In some conditions insoluble sulphides can be formed, while in aerobic conditions it can be combined with hydroxide, carbonates, and organic bonds, which is an essential element of some plants and animals. [37].

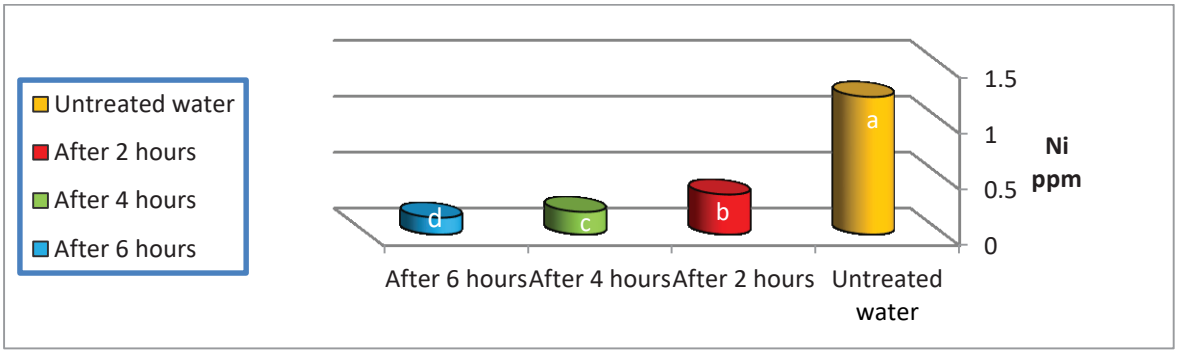

FIGURE 6. Effect of pseudomonsa aeruginosa bacteria in the nickel element of wastewater for the city of Tikrit.

It is clear that the time spent on the treatment is important in determining the efficiency of the bacteria to adsorption of the element. The values were between 0.357-0.150 mg / L for the pseudo-zoster bacteria. The reason is that the best time for the treatment is to take the bacteria for the medium and then the adsorption elements. When the nickel is studied by the researcher [38] and adsorption by pseudomonas bacteria, it can adsorb approximately 1000 mg / L over a period of 2-8 days and is withdrawn by adsorption with different elements [39-43].

CONCLUSIONS

1 - There is a clear and moral effect of the treatment of two types of bacteria pseudomonas spp. In improving the physical and chemical properties of wastewater under study.

2. Treatment periods improved 6 hours of the effectiveness of bacterial treatment in modifying the studied properties of wastewater.

3. The results of correlation coefficient analysis showed that the ideal levels of the studied wastewater characteristics were inversely correlated with treatment periods and ventilation conditions.

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