

Assessing The Water Quality At Shatt Al-Hillah/ Iraq, Using The Biological Oxygen Requirement BOD₅

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Abstract

Biological oxygen requirement (BOD₅) is of irreplaceable importance as a comprehensive indicator for assessing water quality. This study focuses on studying seasonal changes in biochemical oxygen demand and the relationships with water quality in the Shatt al-Hilla, Five sites along the river were chosen to collect seasonal samples. The results of this research showed the BOD₅ values ranged between (1.49 mg/L) as the lowest value in winter 2019 in the (ST1) site and the highest value (4.78 mg/L) in summer 2019 and in (ST4) site were due to domestic sewage and industrial waste. The current study's biochemical oxygen demand (BOD₅) results were relatively high when compared to previous studies on Shatt Hillah. However, they remain within standard limits and do not exceed the permissible international limits (WHO).

Keywords: Biochemical oxygen demand(BOD₅), Shatt al-Hill, pollution, water quality.

Introduction

The Biochemical oxygen demand (BOD₅) is one of the most important water quality indicators. It is a rough estimate of the amount of degradable organic matter present in an aquatic ecosystem[3]it reflects the degree of water pollution, and it is the overall indicator of the relative content of organic matter [5] because it is the most comprehensive indicator of organic pollution. BOD₅ can also be used as a biomarker for phytoplankton diversity the water body [7].

Rivers are major sources of surface water still polluting because diverse types of high organic waste, unprocessed or partially treated, like agricultural, industrial and municipal waste, have been disposed of. causes This waste water has a negative impact in the aquatic life, and has a negative impact on the behavior of dissolved oxygen (D.O) and Biochemical oxygen demand (BOD₅),This change necessitates a significant amount of time and distance for the river to self-purify [2]. Biochemical oxygen demand levels are significantly increased by high organic effluents from untreated waste that can be discharged into rivers. The excreted

BOD₅ causes a change in the physical and chemical properties of the water body, which in turn affects its biological properties[3]. Shatt al-Hilla is the source of fresh water for all of the major cities in the region. The high level of pollution causes a large deficit in dissolved oxygen concentrations. This affects aquatic life such as fish wealth and also causes a slew of other healthy environmental issues. Purpose of the assessment It is contamination and investigation of the biochemical properties of the oxygen demand of Shatt al-Hilla water To assess the health of the body of water for human uses.

Materials and Methods

1-Description of the location

Shatt al-Hillah is a branch of the Euphrates River at Hindiya Dam in the town of Babylon. Shatt al-Hillah is 104 km long, and 100 km south of Baghdad, and the width of a section in most parts of the Shatt al-Hillah is approximately 50 meters and irrigates about 2,366,000 dunums of agricultural land in city [14]. Five sites were chosen along the river's course for about 5.35 named kilometers (S1, S2, S3, S4, S5) between Longitude (32.29 05N44'26 3222" E) and Latitude (32 30 66N44 25 34E). During each season, river samples were collected from those locations (January 2019 to December 2019). Biochemical oxygen demand was calculated after incubation at 20 °C for 5 days and additionally calculate temperature of water[10][16].



Figure 1. The Map of the Study Shatt al-Hillah in al-Hillah City Displaying the Five Sampling Sites [Source; Google (2021)]

2-Results and Discussion

Assessing the water quality of river water is a critical step in determining pollutant trends and their impact on living systems in today's developing world [15]. This research looked into the impact of various waste sources on biochemical oxygen demand and water quality of Shatt al-Hilla inside-Hillah city, BOD₅ values ranged from (1,49 mg/L) at the (ST1) site

Winter 2019 to (4,78 mg/L) at the (ST4) site (summer 2019) according to the calculated range. As shown in Table 1, the deviation mean at each location ranged from 1.93 to 2.97 mg/l at the lower location (ST2) at the highest location (ST1). The Biochemical oxygen demand is the amount of oxygen required by organisms during aerobic degradation and transformation of organic molecules into inorganic compounds and A measure is a popular statistic used to determine the ability of a water body to absorb wastewater and industrial waste. It is also used to assess the efficacy of river self-purification systems. It is proportional to pollution and temperature, but inversely proportional to dissolved oxygen concentration [5] [11][15]. The current investigation's findings show of the vital oxygen requirement reached the highest values in June 2019 at the site (ST4) The reason for this may be due to the fact that it is located near residential areas and agricultural areas, It's possible that this is due to the fact that it's one of the larger rivers with relatively high drainage compared to the amount of rubbish produced. continual organic waste discharge into the river and the river's ability to self-purify [13].

Table 1: Biochemical Oxygen Demand values variation seasonal BOD₅ (mg/L) all site in Shatt al-Hillah

Seasons	Biochemical Oxygen Demand BOD ₅ values mg/L				
	ST ₁	ST ₂	ST ₃	ST ₄	ST ₅
Winter	1.49	1.53	1.63	1.88	1.78
The Spring	2.44	2.47	3.12	3.34	2.96
Summer	4.46	3.90	4.15	4.78	4.67
The autumn	3.43	3.46	3.58	3.54	3.55
Std. Deviation± Mean	1.27±2.95	1.82±2.61	1.03±3.08	1.16±3.26	1.18±3.10
Range	2.97	1.93	2.3	2.90	2.89

The temperature of a body of water is one of the most important physical factors that determines its physicalchemical and life characteristics, as it affects the formation and decomposition of substances such as gases and salts[15], the lowest temperature was recorded in the winter season, and it was about 7 °C, and the highest temperature was recorded in the summer in ST1 and it was about 36°C in ST4. Figure 2. Temperature variation for Shatt al-Hillah. A study has shown that with increasing water temperature there is an increase in biological oxygen requirement and decrease in dissolved oxygen level. These

results are consistent with Sneh Lata, et al. (2020) and Ahmed Abbas, M. M. (2021) who also studied the phenomenon [15][2].

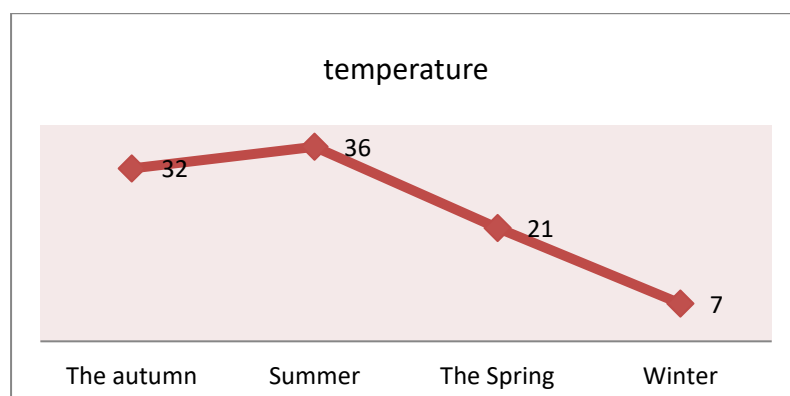


Figure (2) Temperature variation season for alShatt al-Hillah

Conclusion

Based on laboratory analysis data, there is variation in values between stations. The current study's biochemical oxygen demand (BOD₅) results were relatively high when compared to previous studies on Shatt Hilla. We conclude that some sites in Shatt al-Hilla are slightly to moderately polluted with organic matter. However, they remain within standard limits and do not exceed the permissible international limits (WHO).

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