PRELIMINARY STUDY OF WATER QUALITY BASED ON THE PHYSICO-CHEMICAL ASSESSMENT ON THREE SELECTED RIVERS IN BANDAR TUN ABDUL RAZAK JENGKA

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Abstract

The increasing demand for clean water consumption corresponds with the rapid development of population and urbanization. An increasing amount of human wastes, which predominantly come from domestic and industrial wastes, is finally discharged into the water body. Thus, this study was done to identify the water quality based on physico-chemical assessments which are pH, dissolved oxygen, temperature, and turbidity from three selected rivers namely the Jengka River, the Chenerai River, and the Jempul River which are located within Bandar Tun Abdul Razak, Jengka. Water samplings were done by taking a continuous physico-chemical parameter of the three rivers for eight weeks. The results of the study were compared to the National Water Quality Standard for Malaysia (NWQS) which was introduced by the Department of Environment (DOE) Malaysia. The findings showed that all four selected parameters were under optimum value after comparing with the allowable limit by the NWQS. Therefore, the three rivers in Bandar Tun Abdul Razak, Jengka are still safe and clean for daily use.

Keyword: Dissolved oxygen, pH, River, Turbidity, Water quality

Introduction

Industrial and plantation growth as well as urban development are the three factors that can affect the quality of water (Mustapha & Getso, 2014). Good quality of water is continuously decreasing widely all over the world (Robert & Sadler, 2008). Based on the Environmental Quality Report, out of 477 rivers monitored, 219 (46%) were found to be clean, 207 (43%) slightly polluted while 51 (11%) polluted (DOE, 2017). In Pahang, most of the rivers are classified under Class II. According to the report, pollution is identified based on Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen (NH3-N), and Suspended Solid (SS). Based on Kozaki et al. (2016), water pollution is particularly a problem in developing countries, therefore, water quality monitoring is necessary to recognize the suitability of the practice and assistance given for water quality supervision.

The location for the measurement of water quality was carried out in Bandar Tun Abdul Razak, Jengka, which is the main town in the Maran District. It is known for its sites of palm oil plantation. Over the most recent couple of decades, the rapid growth of mechanical advancement and dynamic development of population caused a rising interest in fresh water (Ramakrishnaiah et al., 2009). There is an uptick of concerning issues when river water is easily polluted by contamination from the surface of the river. There is about 77% of palm oil plantation land in Malaysia and the three most regularly used agrochemical pollutants by the planters are fertilizers, pesticides, and rodenticides in palm oil production (Che Nadzir et al.,

2019). According to Noraini et al. (2020), some factors influencing water quality variables in the rivers are natural factors, forest type, and land-use. Natural resources such as air, soil, and water need to be preserved especially for the future generation. Therefore, this study aims to identify the water quality based on physico-chemical assessments which are pH, dissolved oxygen, temperature, and turbidity from three selected rivers namely the Jengka River, the Chenerai River, and the Jempul River.

Materials and Methods

Sampling Site

Three different rivers in Bandar Tun Abdul Razak, Jengka were chosen in completing this study. The chosen rivers were the Jengka, Chenerai, and Jempul River. The rivers are important for the local residents for their agriculture activities such as planting and are also important for their daily use such as drinking and bathing. The rivers flow along the plantation area for the Jengka River site and the Chenerai River site. The Jempul River is located the farthest and is separated from the same sources, unlike the other two areas. The rivers that flow in the Bandar Jengka are from two rivers which are the Jerik River and the Jempul River. The coordinates of sampling sites were tracked by using the Global Positioning System (GPS) as shown in **Table 1**. The system is space-based satellite navigation that provides accurate location and time data anywhere on earth.

Table 1 Coordinate of the sampling site

Sampling River	Coordinate
Jengka River	Longitude E:102°32’52.0”
	Latitude, N:3°44’35.5”
Chenerai River	Longitude, E:102°32’37.7”
	Latitude, N:3°43’01.9”
Jempul River	Longitude, E:102°39’03.0”
	Latitude, N:3°45’09.2”

Sampling Procedures

The equipment was obtained from the Biology and Engineering laboratory in UiTM Pahang Branch. The apparatus that were used include empty bottles of mineral water, buckets to collect the water samples, and YSI 556 Multi-probe for water properties analysis. All the river water samples were collected at the center of the river on the surface of the water (between 0-15 cm from the surface). The Jengka, Chenerai, and Jempul River water samples were collected daily in the morning for eight weeks. A total of eight samples were collected from each river.

Water Quality Analysis

Physico-chemical parameters that were measured involved water temperature, pH, turbidity, and dissolved oxygen (DO). Water samples were collected by using a horizontal water sampler and physical parameter readings were measured and were recorded by using YSI 556 Multi-probe. The results were compared to the National Water Quality Standards for Malaysia as shown in **Table 2**.

Table 2 National Water Quality Standards for Malaysia

Parameter (mg/L)	Class					
	I	IIA	IIB	III	IV	V
pH	6.5 – 8.5	6 - 9	6 - 9	5 - 9	5 - 9	-
Dissolved Oxygen	7	5 - 7	5 - 7	3 - 5	< 3	< 1
Turbidity (NTU)	5	50	50	-	-	-
Temperature	-	Normal+2°C	-	Normal+2°C	-	-

Result and Discussion

Table 3 shows the physico-chemical parameter from three selected rivers in Bandar Tun Abdul Razak, Jengka. The pH values showed different values between rivers and the higher average value of 6.36 was obtained from the Jempul River. However, the results were within the standard range and were classified under class I based on NWQS for Malaysian rivers. According to Gandaseca et al. (2011), the increase of pH is a result of the photosynthetic algae activities that consume dissolved carbon dioxide in the river. Water pH may decrease due to the mineralization of organic matter (Morhit et al., 2013). According to Akmal et al. (2013), pH would be the most stable parameter with small changes and most stable for every three months with no drastic changes. While Muhammad Barzani et al. (2015), mentioned low pH reading was probably due to rainfalls and runoffs from surrounding areas which attributed to the presence of high organic matter.

Dissolved oxygen (DO) in water is crucial for aquatic life. Generally, dissolved oxygen is consumed by the degradation of organic matter in water (Astel et al., 2006) The DO of the analyzed water samples ranged from 5.32 to 6.57 mg/L, while the highest value was noted from the Jempul River. The concentrations of DO in unpolluted waters are usually close to, but less than, 10 mg/L (Noorjima et al., 2018). Thus, the three rivers still recorded DO values within the ranges of unpolluted waters.

Temperature value varied from 25.41 to 26.97 °C. The temperatures were quite low since the data was recorded in the early morning every day. Normally, many factors such as the weather condition, sampling time, and location impact the increase or decrease of temperature (Fawaz et al., 2013). Furthermore, the results are within the standard acceptable levels of NWQS.

The turbidity of the three sampling sites varies from 75.75 NTU to 92.75 NTU. Overall, the turbidity level is higher in the Chenerai River compared to the two other rivers. Rainfall is one of the factors contributing to a higher level of river water turbidity since a large amount of sediment from the land eroded and washed into the river (Yap et al., 2011). The increase of suspended solid also contributes to increasing turbidity, odors, and color of water (Noorjima et al., 2018).

Table 3 Physical parameter of three selected river in Bandar Tun Abdul Razak, Jengka in the morning (mean±standard deviation)

Site	pH	Dissolved oxygen (mg/L)	Temperature (°C)	Turbidity (NTU)
Jengka River	6.18±0.28	5.32±0.22	26.54±0.87	92.13±46.51
Chenerai River	6.14±0.37	6.02±0.54	26.97±0.51	92.75±39.12
Jempul River	6.36±0.35	6.57±0.48	25.41±0.94	75.75±49.50

Conclusion

According to the NWQS for Malaysian rivers, the pH was classified as class I for all three rivers, while DO was classified as class III for the Jengka River and class IIA for the Chenerai River and Jempul River. Although these rivers are still safe for daily usage with treatment provides by Pengurusan Air Pahang Berhad (PAIP), awareness regarding river conservation needs to be highlighted. Efficient fertilizer handling methods are necessary to avoid fertilizer leaching into the rivers since the three rivers are located close to palm oil plantations.

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Conflict of interests

The authors hereby declare that there is no conflict of interest with any organization or financial body for supporting this research.

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