CONFERENCE PROCEEDING

Determination Of Physicochemical Parameters And Heavy Metals Contents In Tasik Al-Abrar And Several Lakes In Usim

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Abstract

Heavy metal pollution has been a major concern due to their high potential risks in causing severe environmental and health problems. This study aims to study the mean concentrations of heavy metals in several lakes of Universiti Sains Islam Malaysia (USIM) and their potential to be developed for recreational purposes. The water sample from USIM lakes will first be sampled in a HDPE bottles before their physicochemical properties such as pH, conductivity, and total dissolved solids (TDS) as well as heavy metal concentrations will be studied. The physicochemical properties of water will be measured using total TDS/ conductivity and pH meter while the heavy metals contents will be studied using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP –OES). The types of heavy metals that will be observed are Arsenic (Ar), Cadmium (Cd), Lead (Pb), and Nickel (Ni). It is expected that the physicochemical parameters and the heavy metals concentration will be within the specification range as assigned by the Water Quality Index and National Water Quality Standards for Malaysia because most of the lakes are situated far from any industrial activities. Nonetheless, other factors that may contribute to any abnormal reading of heavy metal concentrations in the lakes also will be studied.

Keywords: *Heavy metals, Lake water, Water Quality Index, National Water Quality Standards, Inductively Coupled Plasma Optical Emission Spectroscopy (ICP – OES)*

INTRODUCTION

Heavy metal is a material that has a high density and toxicity. Heavy metals are considered as the "Environmental health hazards" because they are in the listings of "Agency for Toxic Substances and Disease Registry Priority List of Hazardous Substances" (Gumpu, M.B. *et al*., 2015). Usually people are exposed to these heavy metals via food and drinks. Those who live or work near industrial areas are also likely to be vulnerable to heavy metals hazardness (Martin, S., & Griswold, W. 2009). Heavy metals such as arsenic, cadmium, chromium, copper, lead, nickel and zinc are commonly encountered in the wastewater. These metals are very dangerous to humans. Heavy metals can enter the surroundings either naturally such as volcanic eruptions or due to human activities. In soil, heavy metal accumulation may come from different sources such as soil erosion, industrial waste or pesticides, whereas in water the heavy metal pollution was mainly due to the industrial waste and humans (Jaishankar, M., *et al* 2014).

In this work, the studied heavy metals are cadmium, lead, arsenic and nickel which are considered as the most common heavy metal pollutants. Six lake waters from USIM are collected to determine physicochemical properties and the heavy metal content in each water samples. As stated in Surah Ar-Rum verse 41;

ظَهَرَ ٱلْفَسَادُ فِى ٱلْبَرِّ وَٱلْبَحْرِ بِمَا كَسَبَتْ أَيْدِى ٱلنَّاسِ لِيُذِيقَهُم بَعْضَ ٱلَّذِى عَمِلُوا۟ لَعَلَّهُمْ يَرْجِعُونَ ﴿٤١﴾

'There has been a great deal of damage and disasters on land and at sea for what human hands have done; because Allah wants them to feel some of the recompense of their evil deeds, that they may return (repent)."

Based on Surah Ar Rum verse 41, we can conclude that disasters such as pollution on land and in the sea have occurred and have caused human discomfort. Hence based on this verse, it is also interesting to find out the safety of the lake waters in USIM either it has been contaminated by the heavy metals and suitable to be developed for both future domestic usage and recreational values.

MATERIALS AND METHODS/ METHODOLOGY

The water samples were collected directly from the six lakes in USIM at three random locations (triplicate) by using an extendable pole and were labelled accordingly. The six lakes include Kolam Takungan Abrar, Kolam Takungan Dewan Tunku Canselor, Kolam Takungan 2, Kolam Takungan 3, Kolam Takungan 6 and Kolam Takungan 8, where water samples are taken from the surface of the lake water and kept in HDPE bottles. The physicochemical parameters which are pH, conductivity, and total dissolve solid of each sample is studied. The pH is measured using pH meter and the conductivity and total dissolved solid is measured by using conductivity meter. The heavy metal content is determined by using Inductively Coupled Plasma Optical Emission Spectroscopy (ICP –OES).

RESULTS AND DISCUSSION

The physicochemical parameters of the lake waters such as pH, conductivity, and total dissolve solid as well as the mean heavy metal concentrations of each sample were studied and summarized in the Table 1 and 2 respectively. Interestingly, based on the results, all the collected lake waters samples were categorized as Class 1 as designated by the National Water Quality Standard for Malaysia, meaning that the water was conserved in its natural environment with no treatment is necessary.

Table 1: Physicochemical parameters of six water samples

Location		pH	Conductivity (mS/cm)	Total Dissolved Solid (mg/L)
Kolam Takungan Abrar	Replicate 1	7.13	201	96
	Replicate 2	7.43	131	56
	Replicate 3	7.25	123	58
Kolam Takungan Dewan Tunku Canselor	Replicate 1	6.8	51	24
	Replicate 2	6.65	44	21
	Replicate 3	6.55	64	31
Kolam Takungan 2	Replicate 1	6.36	55	26
	Replicate 2	6.56	53	25
	Replicate 3	6.72	48	23
Kolam Takungan 3	Replicate 1	6.35	59	28
	Replicate 2	6.82	125	59
	Replicate 3	6.69	102	48
Kolam Takungan 6	Replicate 1	7.0	38	18
	Replicate 2	7.20	38	18
	Replicate 3	6.90	38	18
Kolam Takungan 8	Replicate 1	6.64	171	33
	Replicate 2	7.10	127	64
	Replicate 3	7.14	116	55

Table 2: Mean Concentration of Heavy Metals (mg/L)

Location	Mean Concentration of Heavy Metals (Mg/L)			
	Lead	Cadmium	Nickel	Arsenic
Kolam Takungan Abrar	Not Detected	Not Detected	Not Detected	Not Detected
Kolam Takungan Dewan Tunku Canselor	Not Detected	Not Detected	Not Detected	Not Detected
Kolam Takungan 2	Not Detected	Not Detected	Not Detected	Not Detected
Kolam Takungan 3	0.002	Not Detected	Not Detected	Not Detected
Kolam Takungan 6	Not Detected	Not Detected	Not Detected	Not Detected
Kolam Takungan 8	Not Detected	Not Detected	Not Detected	Not Detected

CONCLUSION

The studied physicochemical properties and mean heavy metals concentration for all lake water samples were within the safe range according to National Water Quality

Standard for Malaysia. All the lake water samples were categorized as Class I, meaning that the water was conserved in its natural environment. Practically, it can be used as water supply or recreational purposes with no treatment necessary.

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