Evaluation of Concentration of Phosphate and Sulphate by Analytical Technique

Momin Shaziya Mohammed Irfan

Research Scholar, JJT University, Chudela, Jhunjhunu, Rajasthan, India
E-mail: shaziyamomin79@gmail. com

Abstract—*The concentration of phosphorous as phosphate and concentration of sulphur as sulphate were estimated in the lake water. The water samples were collected from Varal Devi lake in Bhiwandi city. The sampling done from three different sites of lake. These three sites are mainly used for Idol immersion activities. The concentration of this compounds were determined pre,during and post idol immersion activities by turbidimetric measurement and spectroscopic measurement. The results were compared with standards prescribed by WHO (1973) and ISI (10500-91). It was found that the water samples collected from three sites of Varal Devi Lake in Bhiwandi city were contaminated with Phosphate to a very less extent and there is no hazard of sulphur as sulphate concentration is less than the standard water quality value.*

Keywords: Lake water, Sulphate, Phosphate, Turbimeter, Spectrophotometer, Festival Period.

1. INTRODUCTION

Natural resources are the important wealth of our country, water is one of them. Water is a wander of the nature. There is no life without water on the earth, is a common saying depending upon the fact that water is one of the naturally occurring essential requirement of all life supporting activities[1] Since it is a dynamic system, containing living as well as nonliving, organic, inorganic, soluble as well as insoluble substances. So its quality is likely to change day by day and from source to source. The immersion of idol of Lord Ganesh during month of August to October is a major source of contamination and sedimentation to the Varal Devi lake water. The idol are made up of clay, plaster of paris, cloth, paper wood, thermocol, jute, adhesive materials and synthetic paints etc. Any change in the natural quality may disturb the equilibrium system and would become unfit for designated uses. The availability of water through surface and groundwater resources has become critical day to day. Only 1% part is available on land for drinking, agriculture, domestic power generation, industrial consumption, transportation and waste disposal. [2] In India, most of the population is dependent on surface water (damp water) as the only source of drinking water supply. The groundwater is believed to be comparatively much clean and free from pollution than surface water. Economy of Bhiwandi is mostly dependent on the power loom industry. Aim of the present research work is to analyse the lake water of one area of Bhiwandi and determine amount of phosphate and sulphate in lake water. The rapid growth of urban areas has further affected ground water quality due to overexploitation of resources and improper waste disposal practices. Hence, there is always a need and concern over the protection and management of surface water and groundwater quality. [4] The lakes have complex and fragile ecosystem, as they do not have self cleaning ability and therefore readily accumulate pollutants [6]. The consequence of urbanization and industrialization leads to spoil of water. The release of pollutants and harmful substance due to idol immersion activity changes the original characteristics of water which could be rather harmful to human health after consumption. Hence it is very essential to maintain the quality of water for human consumption, for the aquatic life and for other subsequent uses. The analyzed data were compared with standard values recommended by WHO and IS. [11]

Total Phosphorus - Phosphorus is usually present in river water as phosphates, and is in very small amounts unless there has been human-caused enrichment of the water. The natural scarcity of phosphorus can be explained by its attraction to organic matter in soil particles. Generally the lower the total phosphorus value in the water, is the better. Total phosphorus includes organic and inorganic phosphate. Phosphorus is considered to be a limiting factor in aquatic systems, meaning that it is not freely available for easy consumption by aquatic organisms. The amount of phosphates that water can hold without polluting it, varies. In a river draining into a natural lake, the phosphate level should not exceed 0. 05 mg/L. Natural lake level phosphates should not exceed 0. 025 mg/L. A river that is not flowing into a lake should not exceed 0. 1 mg/L. Phosphorus is the major contributing factor in the process of eutrophication. Inputs of phosphorus come from erosion, fertilizers, detergents, and the draining of wetlands [9].

Sulphur is a non-metallic element that occurs naturally in numerous minerals, including barite ($BaSO_4$), epsomite ($MgSO_4 \cdot 7H_2O$), and gypsum ($CaSO_4 \cdot 2H_2O$). Hexavalent sulphur combines with oxygen to form the divalent sulphate ion (SO_4^{2-}). The reversible reaction between sulphide and

sulphate in the natural environment is often referred to as the "sulphur cycle".

Natural sources of sulphur include volcanoes, decomposition and combustion of organic matter and from sea salt over the oceans. The atmosphere is the main vehicle for transport of sulphur from various sources.

Sulphates are discharged into the aquatic environment in wastes from industries that use sulphates and sulphuric acid, such as mining and smelting operations, kraft pulp and paper mills, textile mills and tanneries. Iron sulphides (e. g. , FeS) may be exposed to water and atmospheric oxygen by mining or rock excavation, producing sulphuric acid, which contributes sulphate to ground and surface waters. Sulphates are also released during blasting and the deposition of waste rock in dumps at metal mines. The burning of fossil fuels is also a major source of sulphur to the atmosphere. Most of man's emissions of sulphur to the atmosphere, about 95%, are in the form of SO_2. Sulphate fertilizers are also a major source of sulphate to ambient waters. Seasonal fluctuations in dissolved sulphate concentrations are obvious in most rivers. [13]

2. MATERIAL AND METHOD

The water samples were collected from lake during morning hours from First Ganpati Vicersion point, Near Lake View Restaurant (Site S1),Second Ganpati Vicersion Ghat,Kamat Ghar Gaon,Chandan Baug,Near Peace Park (Site S2) and Third Ganpati Vicersion point,Phenapada,Phulegaon (Site S3) idol immersion point and the site of idol immersion at different intervals i. e. pre immersion, during immersion and post immersion in the period of Ganesh chaturthi festival from the month of July to December respectively. Pre idol immersion samples were collected a three week before the commencement of the immersion activities. During idol immersion samples were collected during the immersion activities. Post idol immersion samples were collected till six week after the completion of immersion activities. The water samples collected and analysed for phosphate and sulphate[8,11].

The sample were collected (pre, during and post idol immersion) from all the three points at 08. 00 am in the morning for analysis, standard procedure for sampling were adopted. The samples were collected in plastic canes of two liters capacity without any air bubbles. The samples were kept in refrigerator [5].

Analyses were carried out for water quality parameters such as Phosphate and Sulphate using standard method. All the reagents used for the analysis were AR grade and double distilled water was used for preparation of solutions [11].

2. 1. Determination of Phosphate (PO_4^{2-})

Phosphorous react with Molybdate reagent and blue colour Phosphomolybdate complex is formed which is measured spectrophotometrically. Calibration curve plotted from series of standard solution is given below [12].

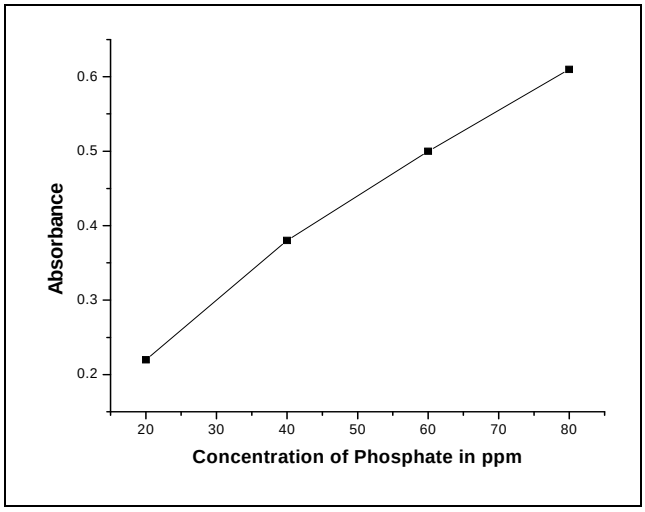

Fig. 1: Graph of OD Vs Concentration of PO_4^{2-} in ppm

Table 1: Concentration of Phosphate in ppm

Period	Conentration of Phosphate in ppm		
	S1	S2	S3
BI	2. 41 ±0. 596	2. 755 ±0. 5969	2. 406 ±0. 528
DI	4. 73 ±0. 346	3. 222 ±1. 2215	4. 90 ±0. 346
PI	4. 90 ±0. 34	5. 24 ±0. 819	5. 78 ±0. 520

± (Standard Deviation)

2.2. Sulphate (SO_4^{2-})

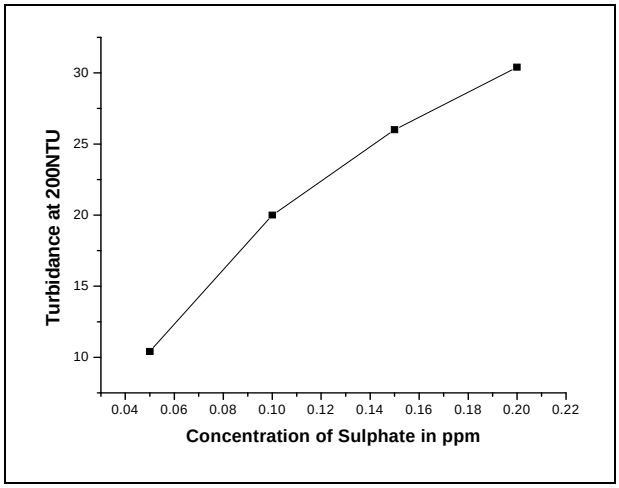

Fig. 2: Graph of Turbidance Vs Concentration of SO_4^{2-} in ppm

Sulphate is detrmined by measurement of Turbidance of a series of standard solution of potassium sulphate. Turbimeter is used for measurement of Turbidity. Caibration curve for series of standard solution is given below [8].

Table 2: Conentration of Sulphate

Period	Conentration of Sulphate in ppm		
	S1	S2	S3
BI	0. 129 ±5. 3*10-4	0. 129 ±5. 787*10-4	0. 129 ±5. 3*10-4
DI	0. 434 ±5. 3*10-4	0. 434 ±5. 3*10-4	0. 434 ±5. 9*10-4
PI	0. 15 ±5. 8*10-4	0. 15 ±5. 83*10-4	0. 15 ±6*10-4

± (Standard Deviation)
BI (Before Immersion)
DI (During Immersion)
PI (Post Immersion)

3. RESULTS AND DISCUSSION

The concentration of Phosphate and Sulphate of the above mention sites in Varal Devi Lake can be determined and it is described as below.

Phosphate

Table 3: Amount of Phosphate

Sr. No	P	Amount of Phosphate in µg/ml			WHO µg/ml
		S1	S2	S3	
1	BI	2. 41 ±0. 6 V=0. 35	2. 75 ±0. 59 V=0. 355	2. 406 ±0. 52 V=0. 279	5. 0
2	DI	4. 7 ±0. 346 V=0. 19	3. 22 ±1. 22 V=1. 492	4. 90 ±0. 34 V=0. 199	
3	PI	4. 9 ±0. 346 V=0. 19	5. 24 ±0. 81 V=0. 67	5. 78 ±0. 52 V=0. 270	

P=Periods
BI(Before Immersion)
DI(During Immersion)
PI(Post Immersion)

Phosphate concentration is increases after idol immersion, because of addition of organic matter. Range of phosphate in the water sample from all three stations are 2. 410 µg/ml to 5. 780 µg/ml ,within this range all three sites have different amount of phosphate. After idol immersion concentration of phosphate is nearly equal to or greater than the standard set by WHO.

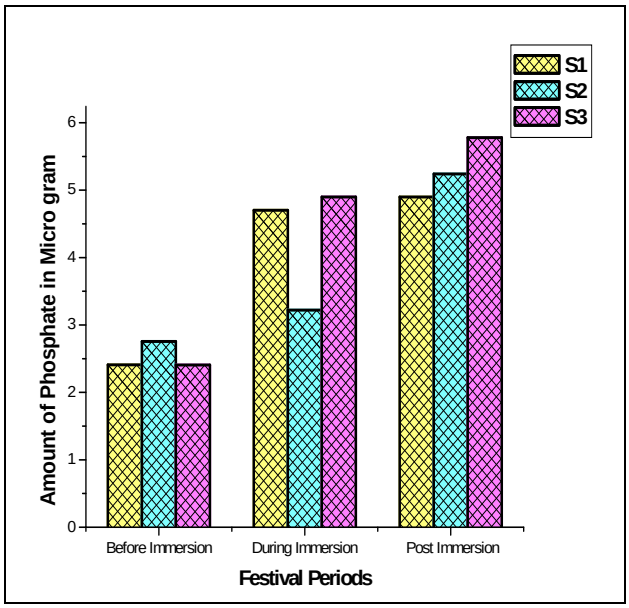

Fig. 3: Graph of amount of Phosphate in µg/ml Vs Festival Periods

Amount of Sulphate

Concentration of sulphate is less than the standard set by BIS and WHO in all three water sample and it is in the range of 0. 1296 µg/ml to 0. 4346 µg/ml. Sulphate concentration is very less than BIS and WHO value . Beyond this concentration it causes gastro intestinal irritation when magnesium or sodium are present.

Table 4: Concentration of Sulphate

P	Amount of Sulphate in µg/ml			WHO µg/ml	BIS µg/ml
	S1	S2	S3		
BI	0. 129 ±5. 39*10-4 V=2. 90*10-7	0. 129 ±5. 7*10-4 V=3. 34 *10-7	0. 1296 ±5. 399*10-4 V=2. 90*10-7	500	200
DI	0. 434 ±5. 39*10-4 V=2. 90*10-7	0. 434±5. 39*10-4 V=2. 90 *10-7	0. 434 ±5. 966*10-4 V=3. 55*10-7		
PI	0. 150 ±5. 83*10-4 V=3. 39*10-7	0. 15 ±5. 8*10-4 V=3. 39 *10-7	0. 1505 ±6. 012*10-4 V=3. 614 *10-7		

P=Periods
BI(Before Immersion)
DI(During Immersion)
PI(Post Immersion)

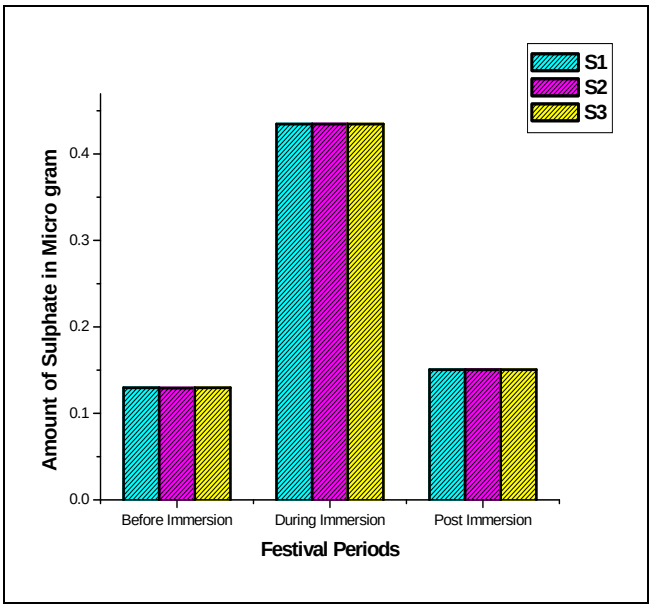

Fig. 4: Graph of amount of Sulphate Vs Festival Periods

4. CONCLUSION

As concentration of Phosphate is nearly equal to WHO standard water quality value . This indicate that there is not much release of phosphate by Idol immersion activity. Therefore there is no harmful effect of phosphate on human health after consumption of Varal Devi lake water. Concentration of Sulphate is also very less than the standard value prescribed by WHO and BIS. Hence there is no hazards of sulphur on human health after consumption of this water . This indicates that idol immersion activity does not increases the concentration of sulphate in the water.

REFERENCE

[1] Watker AM and Barabate M P. ,"Impact of idol immersion on water quality of kolar River in Saoner , Dist Nagpur ,India", International research journal of environmental sciences, 3,3, March 2014 ,pp39-42.

[2] Kaur. R. ,"Effect of idol immersion on marine and fresh water bodies", Advances in applied science research , 3,4,2012,pp1905-1909.

[3] Kumar Das . K. , Panigrahi. T. , Panda. R. B," Idol immersion activities cause heavy metal contamination in river Budhabalanga,Balasore, Odisha, India", , International Journal of Modern engineering research ,2,6, Nov-Dec 2012, pp 4540-4542.

[4] Kaur. R. , Dhavale . O. ," Comparison of immersion effects of idols made of different materials on the water quality parameters",Indian journal of Fundamental and applied life sciences ,ISSN 2231-6345, 13,1, online2013, ,Jan-March, pp16-23.

[5] Vyas. A. ,Bajpai. A. Verma. N. , Dixit. S. ," Heavy metal contamination cause of idol immersion activities in urban lake Bhopal India", J,Appl. Sci. Environ. manage ,11,4, Dec 2007,pp 37-39.

[6] Ujjania . N. C and Mistry . C. H. ," Environmental impact of idol immersion on Tapi river (India)", International Journal of Geology, Earth &Environmental Science ,ISSN, 2277-2081.

[7] Dhote . S. and Dixit. S. ," Hydro chemical changes in two eutrophic lakes of central india after immersion of Durga & Ganesh idol" , Research Journal of Chemical sciences, 1 ,1, April 2011.

[8] Environmental Chemistry, by A K De, International (P) Ltd, Publishers: Fifth edition New Age

[9] Environmental Chemistry by P. S. Sindhu , New Age International Publisher , Chapter Water Pollution , pg 54-59.

[10] Environmental pollution : Water ,Prasad D & Gaur H S (1992.), Venus Publishing House , New Delhi 294 -330.

[11] Standard methods for Examination of Water and waste water , Andrew D Eaton,AWWAChair,LenoreS. Clesceri, WEF,EugeneW. Rice,APHA,ArnoldE. Greenberg,APHA(American Public Health Association),AWWA(American Water Work Association),Water Environment Federation (2005) (21st ed.)

[12] Water Pollution by Prof P. R. Trivedi & Prof Gurdeep. Raj Akashdeep Publishing House,New Delhi

[13] Water Quality -Ambient Water Quality Guidelines for Sulphate, Overview Report, November, 2000, Prepared pursuant to Section 2(e) of the Environment Management Act, 1981