Analysis of Water Quality Using Physico-Chemical Parameters of Kolura Pond in Post- Monsoon Season, October 2012

PAGARIYA S. K. [1]

[1] Department of Chemistry, Jawaharlal Darda Institute of Engineering and Technology M. I. D. C. Lohara, Yavatmal (M. S.) 445001. e-mail: sushilpagariya@gmail.com

Abstract

Quality of water is an important criterion for evaluating the suitability of water for irrigation and drinking.This paper deals with the study of physico-chemical parameters of pond water near village Kolura, Taluka Nerparsopant, District Yavatmal, Maharashtra. The study was made in the month October 2012.The samples of water were collected using standard procedural methods. The physiochemical analysis was extensively carried out on each sample using known standard methods. The results of this analysis point out the fact that all the parameters are within the permissible limits prescribed by WHO, ICMR and BIS drinking water standards which indicate that the water quality of Kolura pond is good and can be used for domestic, irrigation and drinking purposes.

Key Words: Kolura Pond; Physico-Chemical Parameters; Post-Monsoon; Permissible limits.

Introduction

The water is one of the most important compounds of the ecosystem. Living things exist on the earth because of this is only planet that has the existence of water. It is necessary for the survival of all living things be it plant or animal life.It is the most abundant commodities in nature but also the most misused one. Although earth is a blue planet and 80% of earth's surface (80% of the total 50,000 million hectares in area) is covered by water, the hard fact of life is that about 97% of its locked in oceans, sea which is too saline to drink and for direct use for agricultural or industrial purposes.2.4% is trapped in polar icecaps and glaciers, from which icebergs break off and slowly melt at sea.< 1% (i.e.33,400 m3) water is present in ponds, lakes, rivers, dams etc. which is used by man for industrial, domestic and agricultural purposes1. India receives about 1400-1800 mm of rainfall annualy.About 96% of this water is used for agriculture, 3% for domestic use and 1% for industrial activity. An analysis revealed that about 70% of all the available water in our country is polluted due to the discharge of effluents from the industries, domestic waste, land and agricultural drainage2. This results in the degradation of water

quality of these water resources. Due to use of contaminated drinking water, human population suffers from water borne diseases. Also due to increased human population, use of fertilisers in the agriculture and man-made activities, the natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to depletion of aquatic biota3.

The present study involves the analysis of water quality in terms of physico-chemical parameters of pond water near Kolura village of Ner Taluka, District Yavatmal in Vidarbha region of Maharashtra State. This water source is vital for maintaining the ground water level of this area. It is located on MSH No-6 in between Amravati and Yavatmal at 20o29'27"North latitude and 77o52'08"East longitude. This pond is having an area of 10 acres surrounded by numerous tiny hilltops, trees and the area is having 100 acres of command. This pond water is used basically for agricultural irrigation, nurseries, fisheries and partially for domestic activities.Gram-Panchayat has got a main source of supplying drinking water to Kolura,Pimpalgaon (Dubba) which has located near to this pond. Hence it is very important to checked quality of water by quantitative study of physico-chemical characteristics of Kolura pond4.

Experimental

Five water samples (S1, S2, S3, S4, and S5) were collected in cleaned polyethylene bottles without any air bubbles from different points of pond in morning hours between 8 a.m. to 10 a.m. in the month of October 2012 and preserved according to APHA5. The temperature was recorded at the time of sample collection by using Pocket Digital Thermometer while other water quality parameters were estimated using standard analytical methods6-7. AR grade reagents, distilled water and Borosil glasswares were used for preparation of solutions.pH was estimated by Digital pH –meter (Systronics Type-335). EC and Turbidity were measured by multirange Digital Conductivity meter (Systronics Type-304) and Digital Nephelo-Turbidity meter (Type-132) respectively. TDS was estimated by Digital TDS meter (METZ-701).DO was determined by volumetric titration using Alkaline Iodine Azide reagent and Starch as indicator. BOD was determined by volumetric titration by standard Magnesium Sulphate using Alkali-Iodide-Azide reagent. COD was estimated by volumetric titration with standard Ferrous Ammonium Sulphate using Ferroin as indicator.

Total Hardness was determined by complexometric titration using Eriocrome Black-T as an indicator (EDTA method).The 250 ml water sample was boiled to reduce the volume to 100 ml. It was filtered through ordinary filter paper. This results in removal of Temporary Hardness. The filtrate was diluted to 250 ml with distilled water. Permanent Hardness was determined as like above (i.e.EDTA method) by using this filtrate. Now it is possible to evaluate the Temporary Hardness by substrating Permanent Hardness from Total Hardness. Ca2+ and Mg2+ Hardness were also determined by EDTA method using Murexide indicator. Alkalinity of water was determined by titrating it against standard acid

solution using Phenolphthalein and Methyl Orange as indicators. Chloride was estimated by Mohr's method using AgNO3 solution and Potassium Chromate as indicator. Fluoride was estimated by Digital Fluoride meter Model HI-93729. Sulphates and Nitrates were estimated by UV-Visible Spectrophotometer. Metals Fe and Cu were estimated by titrating with Potassium Dichromate using Sodium Diphenylamine Sulphonate indicator and Iodometric method respectively.

Results and Discussion

Results obtained during the analysis were shown in the Table-1 and compaired with values of WHO8, ICMR9 and BIS10 drinking water standards.

Table-1: Physico-Chemical Parameters of Different Sampling Points of Kolura Pond.

S.N	Parameter	WHO	ICMR	BIS	S1	S2	S3	S4	S5
1.	Temp 0C	------	------	------	21.2	21.5	20.6	21.8	20.8
2.	pH	6.5-9.2	7-8.5	6.5-8.5	7.5	7.9	8.2	8.4	7.8
3.	EC (us/cm)	300	300	300	245	252	248	264	257
4.	Turbidity (NTU)	10	10	10	2.90	3.00	3.50	3.30	3.10
5.	TDS (mg/l)	500	500	500	236	244	235	232	240
6.	DO (mg/l)	4-6	4-6	4-6	5.48	4.86	5.54	5.62	5.16
7.	BOD (mg/l)	06	------	------	5.14	5.08	5.12	5.16	5.20
8.	COD (mg/l)	10	------	------	9.2	9.6	9.8	9.1	9.4
9.	Total Hardness	600	600	600	220	222	217	235	235
10.	Temporary Hardness	------	200	------	140	143	140	148	144
11.	Permanent Hardness	------	100	------	80.0	79.0	77.0	87.0	91.0
12.	Calcium Hardness	200	200	200	140	137.0	130.5	147.0	147.5
13.	Magnesium Hardness	150	150	150	80.0	85.0	86.5	88.0	87.5
14.	Total Alkalinity	600	600	600	160	165	162	168	165
15.	Chlorides (mg/l)	250	250	250	40.85	38.90	40.30	40.55	41.10
16.	Fluorides (mg/l)	1.5	1.0	1.5	0.034	0.034	0.037	0.041	0.053
17.	Sulphates	500	200	400	48.0	42.2	48.5	46.4	47.2

	(mg/l)								
18.	Nitrate (mg/l)	50	50	45	08.25	08.90	08.02	08.10	08.56
19.	Iron (mg/l)	1.0	1.0	1.0	0.062	0.075	0.071	0.072	0.080
20.	Copper (mg/l)	2.0	1.5	1.5	0.38	0.42	0.42	0.44	0.34

All the water samples were clear, colourless and odourless. The air temperature ranges between 240C to 28 0C and water temperature ranged from 20.60C to 21.80C in all samples. pH is term used universally to express the intensity of acid or alkaline condition of water. It plays important role in the grouth of flora and fauna and also indicate whether the water is safe or not for drinking and irrigation purpose. The pH of the pond water was ranged between 7.5 to 8.4 which is slightly alkaline due to the presence of carbonates and bicarbonates. Electrical conductivity is a measure of water capacity to convey electric current. It signifies the amount of total dissolved solids. Electrical conductance values ranged from 0.245 to 0.264 mMhos/cm and indicates the presence of some dissolved inorganic substances in ionized form in water. The most of the turbidity is due to colloidal and extremely fine dispersions. Turbidity of pond water fluctuates from 2.90 to 3.50 NTU. TDS indicate the salinity behaviour of water and describes all solids (mineral salts) that are dissolved in water. The value of TDS was found in the range 232-244 mg/litre. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies11. Dissolved oxygen is very important parameter in water quality assessment, low dissolved oxygen gives bad odour to water due to anaerobic decomposition of organic waste. But in the present study dissolved oxygen values of water samples ranged from 4.86 to 5.62 mg/l which were within permissible limit by WHO, ICMR and BIS.BOD and COD values were ranges from 5.08 to 5.20 mg/l and 9.1 to 9.8 mg/l respectively which are within permissible limit12.

Total hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. It is due to the salts of Ca2+ and Mg2+.In the present study Total hardness was found in the range 220-235 mg/litre. Temporary Hardness refers to the concentration of bicarbonates (HCO3-) and carbonates (CO3--) dissolved in water.Temporory and Permanent hardness were ranged from 140-148 and 77-91 mg/l respectively. Ca2+ and Mg2+ hardness were also ranged from 130.5-147.5 and 80-88.0 mg/l respectively.The Alkalinity of water is its capacity to neutralize a strong acid and it is normally due to the presence of carbonates, bicarbonates and hydroxides compounds of Ca2+,Mg2+ and Na+.Total Alkalinity values for all the investigated sample were found in the range of 160-168 mg/l. Chloride occurs in all natural waters are in widely varying concentration. It in excess (>250 mg/l) impart a salty taste to water.Choride values ranged from 38.90 to 41.10 mg/l of all samples which are well within the permissible limit. Excess Fluoride intake through drinking causes dental,

skeletal and non-skeletal fluorosis. In all samples fluoride concentration was found below the standard limits. The Sulphates and Nitrates in the study area were found in between 42.2-48.5 mg/l and 8.02-8.90 mg/l respectively which are in permissible limits. The level of Fe and Cu were found to be between 0.062-0.080mg/l and 0.34-0.44 mg/l respectively.

Conclusion

In the present study the concentration of all the parameters in all samples were found within the permissible limit as prescribed by WHO, ICMR and BIS standards8-14. The concentration of metals like Fe and Cu were also found well below standard limits. There are no any industries around this pond. It is also interesting to know that it is pollution free even from fertilizers and pesticides. The results indicate that water of Kolura pond is non- polluted and is suitable for fisheries, drinking and irrigation purposes.

Acknowledgement

Author is thankful to the Principal Dr.Avinash W.Kolhatkar,Dr.D.A.Pund Head of Chemistry Department, Jawaharlal Darda Institute of Engineering and Technology, Yavatmal (Maharashtra) for providing necessary facility and also thankful to Dr.Anand.S.Aswar (Prof.& Head),Department of Chemistry,Sant Gadge Baba Amravati University, Amravati for fruitful discussion and kind support.

References

1. S.S.Dara, A Textbook of Engineering Chemistry, 12th ed., (2010).
2. D.D.Mishra,S.S.Dara,A Textbook of Environmental Chemistry and Pollution Control,9th ed.,(2011)
3. Basavaraja Simpi, S.M.Hiremath, KNS Murthy, K.N.Chandrashekharappa, A.N.Patel, E.T.Puttiah, *Global J. Sci.Frontier Res.*2011, 11(3).
4. Fuledar M. H. and Dave J. M., *Ins. J. Environ. Studies*, (1983), 21, 179.
5. APHA, Standard Methods for Examination of Water and Waste Water.21st ed.American Public Health Association,Washington,DC,(2005).
6. R.K.Trivedi and P. K.Goel, Chemical and Biological methods for Water Pollution Studies, Environmental Publications Karad (1984).
7. S.S.Dara, A Textbook on Experiments and Calculations in Engineering Chemistry, 8th ed., (2001).
8. WHO. World Health Organisation, Guidelines for Drinking Water Quality-I, Recommendations, 2nd Ed, Geneva, (1993) 1, 56.
9. Manual of Standards of Quality of Drinking Water Supplies, Indian Council of Medical Research, New Delhi,(1975).
10. Indian Standard for Drinking Water, Bureau of Indian Standard, New Delhi, India, (1991) 1-9,179.

11. G.H.Murhekar, *Int.J.Res.Chem. Environ*, (2011), 1(2), 183-187.
12. S.D.Jadhav, R.S.Sawant, A.G.Godghate, S.R.Patil and R.S.Patil, *Rasayan J.Chem.* (2012), 5 (2), 246,
13. N.R.Prasad and J.M.Patil, *Rasayan J.Chem.* (2008), 1 (4), 943.
14. D.Garg, R.Kaur, D.Chand, S.K.Mehla and R.V.Singh, *Rasayan J.Chem.*, (2008) 1 (4), 743.

-- -- -- -- --