Journal Homepage: -www.journalijar.com
INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)
Article DOI:10.21474/IJAR01/6790
DOI URL: http://dx.doi.org/10.21474/IJAR01/6790

RESEARCH ARTICLE

COMPARATIVE CHEMICAL STUDIES OF PONDS IN AND AROUND VARANASI CITY.

Sanju Dwivedi.
Dept. of Chemistry, S. M. W. College Lohta, Varanasi, India.

Manuscript Info

Manuscript History

Received: 20 January 2018
Final Accepted: 22 February 2018
Published: March 2018

Keywords:-
Physico-chemical parameter, Pond water, Pollutants.

Abstract

Scarceness of water, pollution lode, political issues and increasing population has drawn a great attending for proper direction of water resources such as surface water in 21st century. India is one of the developing country having halcyon fresh water resources in the form of rivers, kunds or pool, ponds and lakes etc. Varanasi is a spiritual city and is popularly known for its mythic ponds & kunds. The evolution, urbanization and lode of the various pollutant sources lead to deterioration of the ponds. In the present paper physico- chemical quality parameters of five major hallowed ponds existing from past time at the Varanasi city studied in the year 2008- 2010. The important water quality parameters studied were temperature, PH, electrical conductance, total dissolved solid (TDS), total solid (TS), total hardness , chloride, acidity, alkalinity, dissolved oxygen(DO), chemical oxygen demand (COD) and biochemical oxygen demand (BOD) etc. The experimental results suggests that DO (745mg/L), TS (24432mg/L), Total hardness (30327mg/L), Chloride (3057mg/L),EC (7054µscm^{-1}) were very high as compared to the allowable limit of drinking and irrigation water quality standards in water sample (WA_{1}- Ramnager pond) while lower in sample (WA_{5}- Bhabhniaw pond, WA_{3}- Kapildhara pond,WA_{4}- Control pond). Among all five ponds the Ramnagar ,Ashapur, Kapildhara ,Control and Bhabhniaw pond site have objectionable water quality especially with respect to human health, biotic life and integral ecosystems. The drainage area study to find out the major subscriber of the deterioration in water quality of these ponds various expose rite activities, domestic waste water, industrial polluted water, discharge of effluents from tabernacle and agricultural waste etc.

Introduction:-

Water, is a canonical requirement of our life. The main sources of water is river, well, ponds or kunds. R.S et al[1] water present in nature is not totally pure in the chemical point of view, but regarded as polluted Mohd. M., Bhat et al[2]. Quality of water N.J.Raju et al[3] effected by the activity of men such as domestic, agricultural, irrigation and pilgrim, slowly reduces its purity and become polluted. When it's physical, chemical and biological characteristic i.e. its quality deteriorates A.K. Gupta et al[4] and becomes harmful to man, aquatic life and affects man's domestic needs. Such a situation is called pollution. In recent years water pollution has been increased due to industrialization Adak M.P. et al[5] urbanization and increasing population growth.

Corresponding Author:- Sanju Dwivedi.
Address:- Dept. of Chemistry, S.M.W. College Lohta, Varanasi, India.

In India, man-made ponds have been used as an alternate source of drinking water and employed for washing of clothes and bathing purposes by washer men and local people (Prakash et al, 2009). In Varanasi ponds are typically situated near temples Sachin Mishra et al[6] 2014, industrial side, agricultural side and domestic side etc. Therefore few major sources of pollutants are bathing especially the people coming to temple for worship purpose Chaturvedi and Kumar[7] 2011, discharging of garbage from houses, pesticides runoff from land area and untreated water from industries. Rapid growth of urban areas directly or indirectly affected existence of the ponds such as over victimization of resources and improper waste disposal practice (Murhekar 2011).

The physico-chemical parameters have important significance in determining the trophic status of aquatic habitats Sharma et al[8], 2009. The accumulation of various kinds of pollutants and nutrients through the domestic sewage, municipal effluents, and agricultural runoff in to the ponds leads changes in the physico-chemical characteristics of fresh water. These ponds are covered by domestic or low level living people, lots of garbage, including Kitchen article, plastic bag and polythene, dumped near these ponds Chand Umesh et al[9].

Current study was under taken to investigate water quality of Varanasi pond because of its importance in ground water recharging, irrigation and drinking purpose. Study of physico-chemical characteristic of any water body largely depends on its existing meteorological conditions and structural status of its catchment area Arya et al[10],

Sampling sites and Sample Collections:-
Water samples were collected from five ponds in different areas of Varanasi city for the analysis of physico-chemical parameters. The standard methods of APHA 2005 Clesceri et al[11-14], standard methods of APHA,(American public health association) were followed for the analysis of samples. Samples were collected in fives liters of plastic containers previously rinsed by double distilled water. During sampling, containers were dipped at a depth of two feet below the surface of the pond from each of the five sampling sites after agitation. The water samples were carried to the laboratory and stored at 4^0C in the refrigerator for analysis of selected parameters.

Materials and Methods:-

The samples were analyzed for twelve major parameters shown in table-1. Each of the Ponds water samples were analyzed for pH, Oxidation reduction potential by pH meter and Electrical conductivity was analyzed by using conductivity meter. Hardness, Acidity, Chloride and Total Alkalinity were estimated by titrimetric methods. Total dissolved solid and Total suspended solid were estimated by calculation method. Dissolved Oxygen and Biochemical Oxygen Demand, chemical oxygen demand value were estimated by Winkler's Method. The experimental results were compared to the permissible limit of drinking and irrigation water quality standard. (WHO- 1971)

Result and Discussions:-

The result obtained envisaged that PH value of water samples ranged from 532 to 6867. These value are the maximum permissible limit set by WHO (i.e. 9.0) The electrical conductivity of water samples varied from 123 μscm^{-1} to 7054 μscm^{-1} The higher value of electrical conductivity for sample no. WA1 may be due to increase in the concentration of ionic constituents (Trivedy, Goel). The temperature values of the water samples were found to be ranging from 189^0C to 3283^0C. The changes in the temperature may be due to change in climatic conditions. The total dissolved solid were found to be in the range of 2.96 mg/L to 657.25mg/L. The lowest and highest value was recorded for sample WA3 for the year 2010 and WA1 for the year 2009. This may be due to enrichment of water due to pilgrim activities. The value slightly exceeds the permissible standard limits i.e. 500 mg/L.

Dissolved oxygen (DO) is the most important parameter which indicated the water purity. DO value varied from 237mg/L to 745mg/L. The variations in DO value cleanly indicates the lower DO values in water WA5 in the year 2008 and higher value in water sample WA1 in the year 2008. The DO values show fluctuation in different years. DO content in water is influenced by sources, water temperature and chemical or biological process taking place.

Total solid recorded ranged from 201 mg/L to 24432 mg/L. In agricultural pond sample WA_5 value lower and in industrial pond WA_1 higher value observed. Total hardness of water sample under study ranges between 21476 mg/L and 30327 mg/L. The values are within the tolerance limit of 500 mg/L set by WHO. The Chloride contents were reported in the range of 2195 mg/L to 3057 mg/L. The lowest value was recorded for sample WA_4 in the year

2010 and highest value for sample WA_1 in year 2009. The lowest concentration increases in industrial ponds due to the presence of higher level of ion in pond water.

The acidity value ranges from 320 mg/L to 6586 mg/L. The slower value recorded in water sample WA_1 and higher value in water samples WA_5. The variations in acidity values may be due to agricultural runoff. The alkalinity content was reported in the range of 5620 mg/L to 6586 mg/L. The variations in alkalinity value may be higher in sample WA_3 and lower in sample WA_5. These increments due to agricultural activity.

The chemical oxygen demand value recorded from 425 mg/L to 47652 mg/L. Higher COD level observed during winter season as compare to summer season and followed in rainy season at various samples.

The Biochemical oxygen demand value ranges from 362 mg/L to 3211 mg/L. These variations in sample water due to increment of degradable organic material in the sample.

Table 1:- Physico-Chemical characteristic of water samples

Sampling Site	**Years 2008 – 2010**	**PH**	**EC μscm^{-1}**	**Temp ^0C**	**TDS mg/L**	**DO mg/L**	**TS mg/L**	**Total Hardness mg/L**	**Chloride mg/L**	**Acidity mg/L**	**Alkalinity mg/L**	**BOD mg/L**	**COD mg/L**
WA1	2008	6867	6854	2169	435.25	745	12078	29052	2894	2423	362	6032	754
	2009	80.64	7054	189	657.25	52.47	12278	29090	3057	2053	562	5830	954
	2010	645	6675	2424	571	332	11055	21476	2954	320	741	6539	1254
WA2	2008	637	5877	2199	608.75	545	12329	29090	2707	2369	421	6188	600
	2009	787	7004	1887	357.25	295	11978	29840	2857	2419	462	5632	712
	2010	495	6675	2276	358.37	382	9755	24396	2604	2546	205	6489	425
WA3	2008	678	6596	2169	332.75	545	11953	29091	2873	2419	512	6019	754
	2009	778	6904	2369	557.25	349	12178	29090	2882	2216	716	5620	954
	2010	532	6425	2423	296	407	10842	24234	3035	2458	566	6319	779
WA4	2008	736	6654	257	307.75	645	11928	28985	2444	6031	5980	654	412
	2009	936	6854	2219	507.25	445	12128	4510	2268	5781	5782	154	612
	2010	1045	6725	2324	508.3	332	24434	3153	2195	6139	6139	854	647
WA5	2008	727	179	3283	351	237	427	30327	2704	6545	6545	47652	32211
	2009	776	147	3182	301	287	379	30281	2650	6586	6586	47652	32160
	2010	881	123	3260	324	391	201	24851	2638	5900	5900	47377	31666

Sampling sites:-

WA_1- Ramnagar pond, WA_2- Ashapur pond, WA_3-Kapildhara pond, WA_4- Control pond, WA- Bhabhniaw pond

Conclusion:-

Physico-chemical characteristic of Ponds water samples in the present investigation on pond water samples in Varanasi region, the value of water quality parameters revealed that the water quality parameters showed considerable fluctuation in their concentration when compared with the standard limit set by WHO (1971). The water samples under study were found contaminated due to DO [for sample WA_1, (2008)], Total hardness [for sample WA_5(2008)], acidity [for sample WA_5 (2009)], alkalinity [for sample WA_5], COD [for sample WA_5 (2008)] and BOD [for sample WA_5 (2008)]. The higher limits are hazarders to human health so WA_1 and WA_5 water samples should be avoided for domestic purposes.

Acknowledgement:-

The author wish to express their deep sense of gratitude's to Prof. B.N Yadav, Prof N.P Singh, Deptt. Of chemistry, Sri Baldev p.g college , baragaon, Varanasi for his constant inspiration and encouragement and direction of study at every stage of this work. The laboratory facilities assisted by Mr.Pankaj Srivastava and my youngest brother Mr. Ravi Tiwari is thankfully acknowledged for the help in carrying out the chemical analyses.

References:-

1. R.S et al*(2015)* "Effect of idols immersion on anthropogenic influenced Ritual pond water quality at Holy city Varanasi" International Journal of Engineering sciences & Research technology.
2. Bhat Mohd M., et al(2013) "Appornment of pollution loads arising frum catchment in pond water bodies", J. Adv. Appl. Sci. Res 4,44, PP 36-441.
3. Raju N.J., Ram P., and Dey S. (2009). "Ground water quality in the Lower Varuna River Basin, Varanasi District, Uttar Pradesh". J. Geol,Soc. India 73, PP 178-192.
4. Gupta A.K,et al (2011). "Impact of religious activities on the water characteristics of prominent pond at prominent pond at Varanasi (U.P.), India", Plant Arch 11, 1, PP 297 – 300.
5. Adak M.D. and Purohit K.M. (2001). "Assessment of the water quality in Rajganpur Industrial Complex – II, metallic parameters", pollution research 20(4), 575.
6. Mishra S, Singh A.L and Tiwary D. , (2014) "Studies of Physico-Chemical Status of the Ponds at Varanasi Holi City Under Anthropogenic Influences" Int. J. Environ.-Research and Development, Vol 4,No.3,pp,261-268.
7. Chaturvedi V. and kumar A. (2011). "Diversity of Culturable Sodium dodecyl Sulfate(SDS)degrading bacteria isolated from detergent Contaminated ponds situated in Varanasi City" Intel. Biodeterioration Biodegradation,*65,pp.961-971.*
8. Sharma K.K, Shvetambri, Verma P, and Sharma S.P(2009). "Physico-Chemical assessment of three freshwater ponds of Jammu(J&K)" Curr.World Environ 4,2,pp.367-373.
9. Chand Umesh and Singh N.P. (2010) "The role of self purification of River at Jaunpur city in lowering down the pollution level". J. Proc.XI Int. Conference of the International Academy of Physical Sciences Feb 20-22.
10. Arya S , et al (2011) "Physico- chemical Analysis of Selected Surface Water Samples of Laxmi Tal" (pond) in Jhansi City, U.P,Bundelkhand Region, Central India, J.Exp.Sci. 2, 8, pp, 01-06.
11. Clesceri, L.S, et al*(1998)*"Standard methods for the examination of water and wast water (APHA) 20th Edition American water works Association (AWWA) and water pollution control Federation (WPCF).
12. APHA standard methods for the examination of water & waste water.
13. America Public Health Association DC, USA (2005).
14. WHO (1971). "The Guidelines for drinking water quality recommendations, International Standards for drinking water" World Health organization.