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Seasonal Changes of Physico-Chemical Parameters of Gandigudem and Kistareddypet Water Bodies Hyderabad, Telangana, India.

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ABSTRACT:

After the water samples were obtained, some physico-chemical properties of the water were determined at the sampling location, such as water temperature, pH, BOD, COD, DO, TDS, total hardness, chlorides, nitrate, phosphate and total alkalinity. All samples were transported in ice cartons to the lab for analysis. They were sampled and then analyzed within a certain time frame.The anthropogenic activities such as disposal of sewage and industrial effluent, recreational activities, excess fertilization of land and the use of pesticides have threatened environmental health of surface water. Deterioration of water quality and the fast depletion of water resources is the main challenge which needs an immediate solution.It not just goes about as an enhancement to the physicochemical and bacteriological qualities, yet additionally gives valuable data about the general soundness of a water body.Temperature values between 20°C and 38°C, pH 7.0 to 8.5, BOD values 1.2 to 215, COD values 3 to 842, DO values 1.2 to 11.1, TDS 434 to 6622 mg/l, Total hardness 222 to 1702 mg/L, chlorides 113 to 2911 mg/L, nitrate 3 to 45 mg/L, Phosphate 0.11 to 9.2 mg/L and Total alkalinity 96 to 1451 mg/L.

Keywords:Drinking water,Sewage effluent,Excess fertilization,Water quality,Anthropogenic activities

INTRODUCTION:

Water is unquestionably the most fundamental and important of all-natural resources. It is the source of life, a priceless gift from nature to humanity and a vast array of other species on the planet. Water gave birth to life and keeps it alive. It is a common solvent that provides ionic equalization and nutrients to all sorts of life (Biswajit, 1998). Water Physico-chemical investigations provide a good indication of the oceanic system's chemical nature, but they don't account for environmental elements such as changed riparian vegetation or a modified stream district, and so don't accurately reflect the system's condition (Karr and Benke, 2000). Toxicological impact data is obtained through chemical observation. Water is also necessary for agriculture, industry, and human existence. The Physico-chemical properties of water are essential

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to the solid amphibian environment (Venkatesharaju et al 2010). In any case, knowledge of water's physicochemical properties is required for proper use of riverine resources (Kumar, 1997). It not only improves the physicochemical and bacteriological properties of a water body, but it also provides useful information about its overall health. Man's relationship with the environment dates back to the dawn of time (Mahajan 1985). The interaction between man and the environment has significantly evolved in the last few centuries. Every now and then, quick industrialization has an impact on the environment (Vikal and Tyagi, 2007; Panda et al., 2009). The main riverine system is becoming increasingly contaminated (Patil et al 2003). Man's relationship with the environment dates back to the dawn of time (Mahajan 1985). The interaction between man and the environment has significantly evolved in the last few centuries. Every now and then, quick industrialization has an impact on the environment (Vikal and Tyagi, 2007; Panda et al., 2009).

MATERIALS AND METHODS:

The present investigation was made for the assessment of physico-chemical characteristics of Gandigudem tank and Kistareddypet tank at Hyderabad, Telangana, India. The study was conducted during January 2013 to December 2013.

Physico-chemical Parameters

1. Temperature - Temperature of river water was recorded by means of Celsius thermometer at the time of sampling and expressed in degree centigrade (0C).

2. pH- By pH meter

3. Alkalinity - Titration method was used to estimate the dissolved alkalinity of water samples. 100 ml of sample is taken in two conical flasks. 0.5 ml of phenolphthalein indicator is added to one flask, other flask being control. If the sample becomes pink, titrate it with N/50 H_2SO_4 until the pink colour just disappears. Add two drops of methyl orange indicator in both the conical flasks and titrate one with N/50 H_2SO_4. The end point is orange (compared with control). Record the ml of acid used both in phenolphthalein and methyl orange titration.

Total Alkalinity (mg/l) = No. of ml of N/50 H_2SO_4 consumed X 1000

ml of sample

4. Dissolved Oxygen (DO) - Titration method was used to estimate the dissolved oxygen. Manganous sulphate (1 ml) and alkaline iodide (1 ml) reagent mixed to the 100 ml sample bottle. A flocculent precipitate formed. 1.0 ml of conc.H_2SO_4 added to dissolve the precipitate. 50 ml of this solution is transferred to a conical flask and titrated by 0.025 N $Na_2S_2O_3$ till the colour turns pale yellow. Then added starch solution (1 ml) to give a blue colour and the titration is completed by turning it colourless.

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Dissolved Oxygen (mg/l) = No. of ml of $Na_2S_2O_3$ solution X 4

5. Biological Oxygen Demand (BOD) - BOD is the amount of oxygen taken up by microorganisms that decompose organic waste matter in water. It is, therefore, used as a measure of the amount of certain types of organic pollutant in water. Standard BOD determination is done by incubating samples for 5 days at 200C.

BOD (mg/l) = DO (initial) – DO (5 days)

Decimal fraction of dilution

6. Chemical Oxygen Demand (COD) – The COD of the water represents the amount of oxygen required to oxidize all the organic matter both biodegradable and non-biodegradable by a strong chemical oxidant ($KMnO_4$).

50 ml of water sample and 50 ml of distilled water (blank) taken in conical flask and 5 ml of $KMnO_4$ is added to both flasks. Both the flasks were heated on a waterbath at boiling point for one hour. After cooling 5 ml of potassium iodide (10%) and 10 ml of H_2SO_4 (25% v/v) were added to both flasks. Both flasks titrated with 0.1 N sodium thiosulphate using starch as indicator.

COD (mg/l) = (B-S) X N X 8 X 1000

Sample volume in ml

B = Volume of titrant used in blank

S = Volume of titrant used in sample

N = Strength of the titrant

7. Chloride – Mohr's method was applied for the determination of the chloride present in the sample water. The water was titrated with silver nitrate using potassium chromate as an indicator. The chloride content was calculated using the following formula

Chloride (mg/l) = (a-b) X N X 35.45 X 100

ml sample

a = volume of $AgNO_3$ used for the sample

b = volume of $AgNO_3$ used for the blank

N = normality of $AgNO_3$ (0.0141 N)

8. Phosphate – 50 ml of the sample taken and 2 ml of acid- ammonium molybdate reagent added. Then added 2 drop of stannous chloride, and waited for 5 minutes and the blue colour developed is matched with standards prepared in phosphate free distilled water.

Phosphate (mg/l) = No of ml of standard phosphate X 0.01 X 20

9. Nitrate – The phenol disulphonic acid method was applied for the analysis of nitrate-nitrogen. The steam dried water samples were dissolved in phenol disulphonic acid (2 ml). The alkaline medium was made by adding ammonium hydroxide (10 ml). The development of yellow colour denoted presence of nitrate-nitrogen. The colour intensity

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was proportional to the amount of nitrate-nitrogen and was measured with the help of colorimeter at 410 nm in terms of optical density. The final calculations were made with the help of standard graph.

10. Total Dissolved Solids- Presence of total dissolved solids in the sample water was estimated by evaporation dish at 103o c. The amount of total dissolved solid was calculated by determining residue. The calculation was carried 49 out by the following formula –

Wt. of residue X 1000 Total Dissolved solids (mg/lit.) = ml. of Sample

11.Total Hardness- Hardness of water was determined by EDTA method as described in APHA (1989). The pH of the sample was increased to 10 with the help of ammonium with the buffer solution. Erichrome Black T indicator was added in this alkaline water sample, which forms a wine red complex of calcium and magnesium. The solution was titrated with std. EDTA solution. The EDTA breaks the complex and forms blue colored complex. The end point was permanent blue color. The amount of EDTA solution required was noted. The hardness of water sample was calculated by using following formula.

TABLE 1: PHYSICO-CHEMICAL PARAMETERS OF GANDIGUDEM TANK

	JAN-2013	FEB-2013	MAR-2013	APR-2013	MAY-2013	JUN-2013	JULY-2013	AUG-2013	SEP-2013	OCT-2013	NOV-2013	DEC-2013
Water Temp. (^{O}C)	23	24	29	30	34	36	35	28	25	24.5	30.3	25.1
DO (mg/L)	5.2	5.1	4.5	4.2	4.3	4.2	3.5	3.1	4.6	4.5	5.3	11.1
pH	7.81	7.70	8.5	7.81	7.28	8.15	8.10	7.38	6.73	7.52	0.13	7.1
BOD (mg/L)	1.2	2.4	5.2	7.4	9.3	14	66	75	1.5	19	13	20
Nitrate-N (mg/L)	4	6	5	8	8.4	12	7	6	3	6.8	7	6.4
Total Alk. (mg/L)	194	406	474	278	340	418	126	182	127	---	158	96
Chloride (mg/L)	610	581	530	862	1040	1887	1045	870	113	922	1056	1031
COD (mg/L)	3	16	40	46	64	66	182	194	10	128	20	193
Hardness (mg/L)	482	622	570	686	830	1019	742	908	222	818	842	868
TDS (mg/L)	1552	1628	2180	2244	2712	3340	2622	2868	434	2592	2694	3966

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Phosphate (mg/L)	0.57	0.11	0.41	0.21	0.63	0.45	0.48	0.25	BDL	BDL	6.0	9.2

TABLE 2: PHYSICO-CHEMICAL PARAMETERS OF KISTAREDDYPET TANK

	JAN-2013	FEB-2013	MAR-2013	APR-2013	MAY-2013	JUN-2013	JULY-2013	AUG-2013	SEP-2013	OCT-2013	NOV-2013	DEC-2013
Water Temp. (^{O}C)	22	28	32	34	34	35	32	30	22	23	33	21
DO (mg/L)	2.41	1.82	1.86	0	Nil	Nil	Nil	Nil	0	1.20	8.3	9.4
pH	7.80	7.56	8.20	7.68	7.7	8.30	7.3	7.6	7.2	7.65	8.21	8.4
BOD (mg/L)	35	84	111	143	215	213	95	86	66	70	16	14
Nitrate-N (mg/L)	22	25	45	43	45	40	8	9	9	12	8	7
Total Alk. (mg/L)	742	292	460	1283	1451	1350	362	322	152	1401	375	372
Chloride (mg/L)	936	252	422	1815	2050	2911	2360	1892	163	1342	1247	1820
COD (mg/L)	118	293	413	521	842	811	303	18	22	3	110	20
Hardness (mg/L)	862	883	1376	1491	1688	1568	1702	1688	1482	1213	1351	1248
TDS (mg/L)	2672	2942	4711	4635	5242	4880	5688	5178	4542	4440	4685	6622
Phosphate (mg/L)	0.5	1.2	1.3	1.1	1.1	1	0.6	0.5	0.2	6	7	9

DISCUSSION ON TABLES:

1.WATER TEMPRATURE: Temperature is an important factor regulating Physico-chemical operations in the aquatic environment. water temperature range from 20°C to 38°C at tank-1.Water samples from tank-2 found the temperature to be varied, From 21°C to 36°C.The water temperature has changed seasonally. Water temprature value are given in(Table -1,2).

2.pH (APHA 1998): The pH values ranged from 7.0 to 8.5, where most samples were found to be within the permissible pH range of values, which were recommended by various health and pollution control agencies, such as WHO, CPCB, BIS i.e 6.5 to 8.5, at both locations, tested in the study. During the study period the pH of the water was alkaline in all two sites. In most raw watersourcesthe pH tank-1 (2013-14) is between 7 to 8.5 pH value (Table n.o-1), tank-2 ranges from 7.0to 8.4 (Table n.o-2).

3.Biological Oxygen Demand (BOD):A measure of the amount of oxygen in water required by aerobic organisms is known as the Biological Oxygen Demand (BOD) measurement. The

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biodegradation of organic materials results in an increase in oxygen tension in the water, as well as an increase in the biochemical oxygen requirement (Abida, 2008. The biological oxygen demand (BOD) is the amount of oxygen required by living organisms engaged in the utilization, destruction, or stabilization of organic water at the end of the process (Hawkes 1993). BOD value at tank-1 ranges from 1.2 to 75, tank-2 ranges from 14 to 215.(Table n.o-1,2).

4.Chemical oxygen demand (COD): Chemical oxygen demand the measuring of the oxidation of the reduced chemical in water. Chemical oxygen demand (COD). The amount of biological compounds in water is commonly measured indirectly. The COD measurement determines the amount of organic matter found in water. This makes COD an indicator of organic surface water pollution useful (King et al., 2003 and Faith, 2006).The COD measurement determines the amount of organic matter found in water. This makes COD an indicator of organic surface water pollution useful. COD value at tank-1 ranges from 3 to 194, tank-2 ranges from 3 to 842.(Table n.o-1,2)

5.Dissolved oxygen (DO): Dissolved oxygen is a major contributor to the health of the stream. Due to bioaccumulation and biomagnification, this failure affects the river ecosystem directly.The oxygen content of water samples depends on various processes of physics, chemistry, biology and microbiology. The lateral, spatial and seasonal changes in DO values are also shown in accordance with industrial, human and thermal activity.DO value at tank-1 ranges from 3.1 to 11.1, tank-2 ranges from 1.2 to 9.4(Table n.o-1,2,)

6.TOTAL DISSOLVED SOLIDS (TDS): The concentration of dissolved oxygen in water indicates the presence of physical and biological processes, and it is an important factor in determining whether aerobic or anaerobic organisms are responsible for biological changes (Gangwar RK). Photosynthetic organisms (Kumar A and Bahadur Y) can produce water oxygen by dissolving oxygen from the air. The natural water consists primarily of carbonate, bicarbonate, chloride, sulphate, phosphate, nitrate, Ca, Mg, Na, K, Fe, Mn, etc., total dissolved solid (TDS) (Esmaeili and Johal,2005). Samples of lake water with high total dissolved solids showed a higher ionic concentration, which is less potable and can cause adverse physical chemical effects in the consumer.Samples of tank water with high total dissolved solids showed a higher ionic concentration, which is less potable and can cause adverse physical chemical effects in the consumer. TDS value at tank-1 ranges from 434 to 3966, tank-2 ranges from 2672 to 6622. (Table n.o-1,2)

7. Total hardness: The total hardness in tank-1 ranged between 222 to 1019 mg/L and in tank-2 ranged between 862 to 1702 mg/L(Table No. 1,2). The total hardness showed maximum values during winter season and minimum value during rainy season. The values of total hardness were moderate during summer months.

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8. Chloride: Chloride exists in all natural waters,in fresh waters the sources include soil and rock formations, sea spray and waste discharges. Sewage contains large amounts of chloride, as do some industrial effluents. During the period of investigation chlorides in the tank-1 was ranged between 113 to 1887 mg/L. In tank-2 it was ranged between 163 to 2911 mg/L (Table No. 1,2). During rainy season higher values were recorded where as in winter and summer season less chloride content weredetected.

9. Nitrate Relatively little of the nitrate found in natural waters is of mineral origin, most coming from organic and inorganic sources. The observed level of Nitrate in the study area in tank-1 ranged from 3 to 12 mg/lit and in tank-2 the values ranged between 7 to 45 mg/lit.

10. Phosphate Phosphorus occurs widely in nature in plants, in micro-organisms, in animal wastes and so on. It is widely used as an agricultural fertiliser and as a major constituent of detergents, particularly those for domestic use. Run-off and sewage discharges are thus important contributors of phosphorus to surface waters. The observed level of Phosphate in study area in tank-1 ranged from 0.11 mg/lit to 9.2 mg/lit and in water tank-2 was ranged between 0.2 to 9 mg/L (Table No. 1,2)

11. Total Alkalinity (TA) Total alkalinity is the total concentration of the bases in water expressed as part per million (ppm) or milligrams per liter (mg/lit) of calcium carbonate (CaCO3). Total alkalinity of tank-1 water ranged from 96 mg/lit to 474 mg/lit,Whereasin the tank-2 total alkalinity was found in the range of 152 mg/lit to 1451mg/lit.

CONCLUSION:

In the current study, the physico and chemical properties of the Gandigudem and Kistareddypet from the sampling sites selected were analyzed. The following parameters have been determined by the samples Water Temperature,pH, BOD, COD, DO, TDS,total hardness,chlorides,nitrate,phosphate and total alkalinity. Temperature values between 20°C and 38°C, pH 7.0 to 8.5, BOD values 1.2 to215,COD values 3 to 842, DO values 1.2 to 11.1, TDS 434 to 6622 mg/l,Total hardness 222 to 1702 mg/L, chlorides 113 to 2911 mg/L,nitrate 3 to 45 mg/L,Phosphate 0.11 to 9.2 mg/L and Total alkalinity 96 to 1451 mg/L. The same samples of alkalinity, total dissolve solid and total hardness were found above the allowable WHO limit (1984). The temperature, pH of all samples hasbeen identified below WHO's allowable limit. The conclusion is that the water of the two lakes are polluted.

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