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Assessment Of Water Quality Of Himayath Sagar Lake, Hyderabad, Telangana State, India, Using Various Physico-Chemical Parameters.

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A B S T R A C T

Physico-chemical characteristic study has been carried out on Himayath Sagar Lake water of Hyderabad City, Telangana State in order to evaluate its suitability for drinking purpose. Lake water from 13 different locations were collected and analyzed for parameters like pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Total Alkalinity (TA), Total Hardness (TH), Calcium (Ca^{2+}), Magnesium (Mg^{2+}), Sulphate (SO_4^{2-}), Nitrate (NO_3^{2-}), Fluoride (F^-) and chloride (Cl^-) levels. The analytical results indicated that lake waters are slightly alkaline in nature and found that the physico-chemical parameters of lake waters are within the acceptable limits for drinking purposes (IS 10500: 2012) except TDS.

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Introduction:

Water is one of the most important components for human survival (Versari et al. 2002). The quality of water changes day by day and from source to source, which determines its use (Jadhav A.S., et al., 2013). Lakes are the planet's most important fresh water source and represent additional storage capacity of hydrologic systems. Lake is a watershed area in which its quality depends upon every component of that ecosystem (Indra 2006, Krishnan et al., 2007). Topography of the surrounding area, soil, geology and vegetation determines the kind of materials entering into lake which indicates the water quality (Dong et al., 2010). For evaluating suitability of lake water bodies for drinking purposes understanding its physico chemical characteristics is necessary.

In present study involves the analysis of water quality in terms of Physico-chemical Parameters of Himayath Sagar Lake of Hyderabad, Telangana State. The lake Himayath Sagar is located in Hyderabad, the capital of Telangana State in 17°18'28"N latitude and 78°20'47"E longitude. The storage capacity of the reservoir is about 3.0 TMC. Himayath Sagar Lake is the main drinking water source of Hyderabad City of Telangana State.

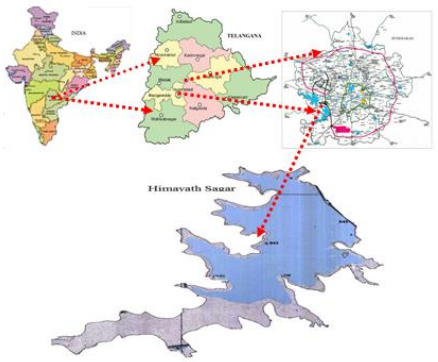

Fig.1: Location Map of the Study Area

Materials and Methods:

The water samples were collected from thirteen different sampling sites covering the entire lake during the post monsoon period (October 2014). Before water sampling polyethylene bottles cleansed and rinsed thoroughly with water samples to be analyzed. The physico-chemical parameters were analyzed as per the

standard procedures recommended by APHA, (American Public Health Association) 1998, and Central Pollution Control Board (CPCB), Guide manual: Water and Waste water analysis.

Table: 1. Various physico-chemical analysis data of Himayath Sagar Lake

S. No	pH	EC	TDS	TH	TA	NO_3^{2-}	SO_4^{2-}	Ca^{2+}	Mg^{2+}	Na^+	K^+	F^-	Cl^-
1	8.1	400	256	70	120	16	29	16	7	17	3	0.5	18
2	8.1	800	512	75	135	4	29	18	7	17	3	0.5	39
3	7.9	800	512	75	115	5	29	18	7	16	3	0.6	32
4	8.1	800	512	75	140	7	25	16	9	15	3	0.5	50
5	8.0	900	576	70	150	5	27	18	6	14	3	0.5	14
6	8.0	600	384	25	130	3	27	24	9	15	3	0.5	32
7	7.9	700	448	80	130	4	67	26	4	19	3	0.5	25
8	7.9	700	448	70	110	4	23	20	5	13	3	0.5	28
9	7.9	600	384	65	140	4	27	20	4	15	3	0.5	32
10	7.9	300	192	55	105	4	22	16	4	14	3	0.5	36
11	7.8	500	320	155	175	17	36	20	26	32	3	0.5	43
12	7.8	800	512	155	362	16	45	40	13	60	3	1.7	57
13	7.9	700	448	145	220	13	51	14	27	52	1	2.2	75

(Note: pH in pH units, EC in µS/cm, TDS, TH, TA, Na^+, K^+, Ca^{2+}, Mg^{2+}, NO_3^{2-}, SO_4^{2-}, F^-, Cl^- are in mg/lit**)**

Table: 2. Comparison of Physico-Chemical Analysis Data with IS 10500:2012

Water Parameters	Minimum	Maximum	Average	IS 10500 : 2012	% of samples exceeding acceptable limit
pH	7.8	8.1	7.9	6.5-8.5	0
EC	300	900	661.5	Not Mentioned	
TDS	192	576	423.4	500	38
TH	25	155	85.8	200	0
TA	105	362	156.4	200	15
Na^+	13	60	23	Not Mentioned	
K^+	1	3	3	Not Mentioned	
Ca^{2+}	14	40	21	75	0
Mg^{2+}	4	27	10	30	
NO_3^{2-}	3	17	8	45	0
SO_4^{2-}	22	67	34	200	0
F^-	0.5	2.2	0.7	1	15
Cl^-	14	75	37	250	0

Results and Discussion:

The results of a water quality assessment from Shah Hatim lake water are shown in Table. 1 and compared those values with IS 10500: 2012 guidelines for drinking water in Table.2.

pH:

In the study area pH of the water samples varies from 7.8-8.1 pH units with an average of 7.9 pH units. The acceptable limit of pH is 6.5-8.5 (IS 10500:2012 guidelines for drinking water). All samples are within the acceptable limit.

Electrical Conductivity (EC):

EC is the measure of the ability of an aqueous solution to convey an electric current. The conductivity measurement provides an indication of ionic concentration. In the study area EC of the water samples ranges from 300-900 µS/cm with an average of 661.5 µS/cm.

Total Dissolved Solids (TDS):

In natural water, dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, phosphates, nitrates, calcium, magnesium, sodium, potassium, iron and manganese etc (Esmaeili H R., and Johal M S., 2005). In the study area TDS of the water samples ranges from 192-576 mg/litre with an average of 423.4 mg/lit. The acceptable limit of TDS is 500 mg/lit (IS 10500:2012). Five samples (38%) are exceeding the acceptable limit.

Total Hardness:

Total Hardness includes sulphates, chlorides of calcium and magnesium. In most natural waters the predominant ions are those of bicarbonates associated mainly with calcium, to a lesser degree with Magnesium, and still less with sodium and potassium (Rafiullah M., et al., 2012). In the study area total hardness of the water samples ranges from 25-155 mg/lit with an average of 85.8 mg/lit. The acceptable limit of TH is 200 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Total Alkalinity:

In the study area total alkalinity of the water samples ranges from 105-362 mg/lit with an average of 156.4 mg/lit. The acceptable limit of TDS is 200 mg/lit (IS 10500:2012 guidelines for drinking water). The acceptable limit of TA is 200 mg/lit (IS 10500:2012). Two samples (15%) exceeding the acceptable limit.

Sodium (Na^+):

In the study area Sodium concentration of the water samples ranges from 13-60 mg/lit with an average of 23 mg/lit.

Potassium (K^+):

In the study area Potassium concentration of the water samples ranges from 1.0-3.0 mg/lit with an average of 3.0 mg/lit.

Calcium (Ca^{2+}):

Calcium is found abundantly in all natural water. In the study area calcium concentration of the water samples ranges from 14-40 mg/lit with an average of 21 mg/lit. The acceptable limit of Ca^{2+} is 75 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Magnesium (Mg^{2+}):

Magnesium is often associated with calcium in all kinds of waters, but its concentration remains generally lower than the calcium (Venkatasubramani., and Meenambal., 2007). In the study area magnesium concentration of the water samples ranges from 4.0-27 mg/lit with an average of 10 mg/lit. The acceptable limit of Mg^{2+} is 30 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Nitrate (NO_3^{2-}):

In the study area Nitrate concentrations ranges from 3-17 mg/lit with an average of 8.0 mg/lit. The acceptable limit of NO_3^{2-} is 45 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Sulphates (SO_4^{2-}):

In the study area concentration of sulphates in the water samples ranges from 22-67 mg/lit with an average of 34 mg/lit. The acceptable limit of SO_4^{2-} is 200 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Fluorides (F^-):

Fluorosis is a disease caused by excessive fluoride concentration in drinking water. In the study area fluoride concentration in the water samples ranges from 0.5-2.2 mg/lit with an average of 0.7 mg/lit. The acceptable limit of F^- is 1.0 mg/lit (IS 10500:2012). Two samples (15%) exceeding the acceptable limit.

Chlorides (Cl^-):

The salts of sodium, potassium and calcium contribute chlorides in water. In the study area chloride concentration in the water samples ranges from 14-75 mg/lit with an average of 37 mg/lit. The acceptable limit of Cl^- is 250 mg/lit (IS 10500:2012). All samples are within the acceptable limit.

Conclusion:

Water quality of Himayath Sagar Lake by using Physico-Chemical parameters from thirteen sampling locations revealed that the waters suitable for drinking. Waters slightly alkaline which may be due to the algal activity. TDS are high in the lake waters but less than 50% samples exceeded the acceptable limit of IS 10500:2012. TA and F^- 15% of the samples exceeded the acceptable limit. Remaining parameters like TH, Ca^{2+}, Mg^{2+}, NO_3^{2-} and Cl^- are within the acceptable limits. But slight high pH, TDS levels indicating that lake may face pollution problem in near future. So it is therefore recommended that the authorities should continuously monitor for Physico-Chemical analysis for seasonal variations and prevent point and non point source pollution around the lake and control weeds within the lake. Finally, it is recommended that a policy has to be developed for water allocation linking ecological, hydrological and socio-economic aspects of life, with the involvement of all of the stake holders.

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