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RESEARCH ARTICLE

IONIC COMPOSITION OF IBRAHIMPATNAM LAKE, R.R.DISTRICT, TELANGANA, INDIA

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ABSTRACT

Ibrahimpatnam Lake which is a fresh water Lake , was taken up for ecological investigation over a span of one year April 2014 – March 2015. According to the Hydrogen ion composition , the waters of, Ibrahimpatnam Lake were alkaline with a p^H of 7.5 .The cations CO_3^{--} were 27.8 mg/l HCO_3^- were 219.4 mg/l and Cl^- were 230.28 mg/l . The anion p^H and the cation Cl^- were within the permissible limits given by BIS(1983), WHO(1984) & ICMR(1975). Based on the Relative Proportion of anions, $HCO_3^{--}$was dominant during the summer while it was Cl^- dominated during the Rainy & Winter seasons in this Lake. The anion Cl^- in Ibrahimpatnam Lake was 30 times more than fresh water give by Bowen 1966 and 14 times more than Swedish Hardwaters given by Rodhe 1949.

INTRODUCTION

The planet earth is a suitable habitat for organic life because of the unique element water. Development of human society and the very existence of life on the planet earth depend on the availability of water. Water is not only the most common substance on earth; it is also one of the most unique. It is called the "Mirror of Life". Water has been vital to the development and survival of civilization. Civilizations arose in the Indus Valley of India and Pakistan; and the Huang He Valley of China. All these civilization crumbled when water supplies failed or were poorly managed. Zafar 1964, Rao 1971, and Cynthia 1980 were the pioneers who worked on the ionic composition of South India lakes specially Telangana region. Later on Johnson 2004, Johnson 2012 and Kumar *at el*., 2015 worked on the ionic composition of lakes.The ions presents in fresh water lakes play a key role because the algae and other aquatic organisms take them as nutrients for their and development. The anion p^H and the cations CO_3^{--}, HCO_3^- & Cl^- are discussed.

MATERIALS AND METHODS

Water samples were collected from the Lake Ibrahimpatnam for period of one year i.e. April 2014 to March 2015, at monthly intervals at Site- 1 and Site- 2. Site-1 is located towards the Bund and Site-2 towards Residental Colonies. The specific procedures selected for analysis are given below:

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Carbonates and Bicarbonates

Wilcox and Hatcher (1950), Take 50 ml of sample in a conical flask and add 0.5ml drops of phenapthaline indicator , pink colour appears if carbonates are present . Titrate with 0.05N H_2SO_4 pink colour disappears. To this solution add 0.2 ml of Methyl Orange indicator it turns light yellow. Titrate with 0.05N H_2SO_4 until yellow changes to orange.

Chlorides

Wilcox & Hatcher (1950), Take 50 ml of sample in a china dish and add 2ml of K_2CrO_2 solution. Titrate the contents against 0.02N $AgNO_3$ until a persistent reddish brown precipitate appears.

Calculations:

Carbonates =B.R X 2 X 30.005
Bicarbonates= B.R x 61.015
Chlorides = B. R x 35.457/mg/l sample

RESULTS AND DISCUSSION

p^H

The p^H of solution is the negative logarithm of the hydrogen ion activity; is approximately equal to the concentration of hydrogen ion. The p^H of an aqueous system is a measure of the acid base equilibrium achieved by various dissolved compounds & in most natural waters is contributed by carbondioxide, bicarbonates, carbonate equilibrium. p^H is main factor which shows acidic and alkaline nature of water.

Table 1. p^H , CO_3^{--}, HCO_3^- and Cl^- in Ibrahimpatnam Lake – Site-1 & Site-2

Parameter	2014 Apl	2014 May	2014 June	2014 July	2014 Aug	2014 Sep	2014 Oct	2014 Nov	2014 Dec	2015 Jan	2015 Feb	2015 Mar	Avg	Total (avg)
pH*														
Site1	8.3	8.4	6.9	7.1	6.7	7.0	7.9	8.0	7.7	7.7	7.33	7.4	7.5	7.5
Site2	8.3	8.31	7.0	7.1	6.8	7.1	7.8	8.1	7.6	7.7	7.3	7.4	7.5	
CO_3 mg/l														
Site1	21.1	22.0	29.1	29.1	30.1	25.1	22.0	24.0	25.0	22.0	22.0	20.1	30.2	27.25
Site2	20.0	22.0	28.1	28.0	32.0	32.0	23.1	21.0	22.0	21.1	21.2	22.0	24.3	
HCO_3 mg/l														
Site1	160.0	296.86	256.07	172.76	168.70	335.0	190.13	200.68	213.14	220.03	222.53	240.0	223.0	237.4
Site-2	162.0	296.86	250.07	172.90	297.6	160.8	180.13	200.68	200.12	220.03	220.53	220.5	216.9	
Cl^- Mg/l														
Site1	221.0	260.5	219.61	216.41	225.38	230.1	210.56	250.44	247.24	260.28	220.52	260.6	231.0	251.5
Site-2	219.0	219.52	218.61	221.41	222.38	222.4	223.51	230.11	232.12	240.36	250.47	255.2	229.4	

Table 2. Seasonal variation of p^H,CO_3^{--}, HCO_3^- and Cl^- Ibrahimpatnam LakeSite-1 and Site-2

S.No	parameter		Summer	Rainy	Winter
1	pH *	Site1	7.85	6.92	7.82
		Site2	7.82	7.00	7.8
2	Carbonates	Site1	21.31	28.36	22.78
	mg/l	Site2	21.32	30.04	21.82
3	Bicarbonates	Site1	300.99	220.75	231
	mg/l	Site2	305.0	174.4	215.0
4	Chlorides	Site1	242.5	222.5	239.5
	mg/l	Site2	236	220.9	226.0

Table 3. Relative Proportion of Ions in Ibrahimpatnam Lake

Season	Ibrahimpatnam Lake	Relative Propotion
Summer	Site-1	HCO_3^->Cl^->CO_3^{--}
	Site-2	HCO_3^->Cl^->CO_3^{--}
Rainy	Site-1	Cl^->HCO_3^->CO_3^{--}
	Site-2	Cl^->HCO_3^->CO_3^{--}
Winter	Site-1	Cl^->HCO_3^->CO_3^{--}
	Site-2	Cl^->CO_3^->HCO_3^-

Table 4. Standards According to BIS (1983), WHO (1984) and ICMR (1975)

	BIS 1983	WHO 1984	ICMR 1975	Fresh Waters Bowen 1966	Swedish Hard waters Rodhe 1949	Ibrahimpatnam lake
P^{H*}	6.5-8.5	6.5-8.5	6.5-9.2	-	-	7.5
CO_3^{--}mg/l	-	-	-	55.0	103.2	27.3
HCO_3^- mg/l	-	-	-	-	-	219.4
Cl^- mg/l	250	250	1000	7.8	16.6	230.28

It also depends upon carbonates bicarbonates present in water. p^H ranged from 6.7 to 8.4 and averaged to 7.5 at Site- 1. At Site 2 it ranged from 6.8 to 8.31 and averaged to 7.5 as shown in Table 1. In summer season highest concentration of 7.85 and 7.82 was seen at Site- 1 & Site- 2 of the lake (Table-2). According to BIS (1983), WHO (1984), & ICMR (1975) at both the sites was within the permissble limit (Table - 4).

CO_3^{--}

Variation of p^H is due to the presence or absence of free CO_2 and carbonates. The direct relationship with p^H & CO_3^{--} and inverse relation of free CO_2 is well know. Carbonates ranged from 20.0 -30.11 mg/l , and averaged to 30.24 mg/l . At Site-2 carbonates ranged from 20.01 -32.03 mg/l and averaged to 24.3 mg/l (Table-1). The seasonal variations of carbonates is shown in Table 2 at Site 1 & Site- 2. At Site- 1& Site- 2 high concentration of 30.1 mg/l and 32.0 mg/l was observed respectively. This may be due to the inflow of rain water into the lake from the surrounding residential colonies.

HCO_3^-

Bicarbonates ranged from 160.01 – 335.01 mg/l and averaged to 223.0 mg/l at Site-1. At Site-2 they ranged from 160.80-296.86 mg/l and averaged to 216.9 mg/l. In summer season highest concentration of 300.99 mg/l and 305.0 mg/l was seen at Site- 1 and Site -2 respectively.

Cl^-

The chloride ion one of the major inorganic anions in water and waste water responsible for the production of salty taste. Chlorides in nature are in the form of salts of Calcium, Potassium and Sodium. The presence of chloride in natural waters can be due to dissolution of salt deposits, discharges of effluents from chemical industries. Oil, sewage discharges, irrigations, drainage etc. Chloride fluctuated from 210.56 – 260.61 mg/l and averaged to 231.0 mg/l at Site- 1.At Site-2 it varied 218.61 to 255.29 mg/l and averaged to 229.4 mg/l. The

seasonal variation of Cl^- is shown in Table 2. High value of chlorides were seen in summer season i.e. 242.5 mg/l and 236.0 mg/l at Site-1 & Site-2 respectively. Excessive summer evaporation lead to accumulation of Cl^-. Similar observation was seen by Johnson 2004.According to Livingstone 1963 the average concentration of Cl^- in natural fresh water was 8.3 mg/l, but here in Ibrahimpatnam Lake it was 230.35 mg/l. Which was 28 times more than the normal fresh water given by Bowen 1966 and 14 times more than Swedish Hardwaters, Rodhe, 1949. The high concentration of Cl^- may be due to pollution of animal origin. Ranga Reddy district lies in the semi arid region and the rate of evaporation was more than rain fall. Perhaps this may be the other reason for the increase of Cl^-.

Conclusion

The p^H of Ibrahimpatnam Lake was within permissible limit given by BIS (1983), WHO (1984), & ICMR (1975). The anion chloride was 30 times more than fresh water given by Bowen 1966 and 14 times more than Swedish Hardwaters given Rodhe 1949. The Lake water can be used for domestic purposes like bathing, washing clothes ,& utensils; irrigation purpose & recreation-boating, swimming etc .

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