

*Cationic Contamination in Lake's Water Situated West Zone, Ahmedabad, Gujarat, India*

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Abstract

Ahmedabad is unique in the whole of India in matter of environmental neatness and flourishing conditions and it is superior to other cities in the excellence of its monuments. Ahmedabad Urban Development Authority (AUDA) proposes to undertake work for revival, development of catchments areas and beatification of few lakes under the present project .of these Ramol, Vastral, Singarva and Nikol lake's waters were analysed for cationic contaminations. The results values of the metals estimated through 4 lakes during monthly Analysis of the January-2010 to December -2010. Their ranges of concentration were comparing to permissible limit of BIS. Calcium content of water samples from all localities were within the permissible limit of BIS except locality no.2 November-2010. Magnesium content of water samples from all localities were within the permissible limit of BIS except locality no.3 in March-2010. Sulphate contents of water samples from locality no.2 December-2009. Ammonia Content of water samples from locality no.4 July-2010, Phosphate content of water samples from all localities were within the permissible limit of BIS except locality no.1 and 2 in April-2010. The results suggested that water was suitable for drinking purpose. Nitrite content of water samples from all localities were within the permissible limit of BIS except locality no, 1 in November-2010. The results suggested that water was suitable for drinking purpose.

**Key Words:** Cation, Calcium, magnesium, Sulphate, Ammonia, Phosphate, Nitrite, lake.

### **Introduction:**

Limnology is a discipline that concerns the study of inland waters (both saline and Fresh) specifically lakes, ponds and river (both natural and man made) including their biological, physical, chemical and hydrological aspects. The term 'limnology' stem from Greek 'limne (lake)' and 'logos'(study)'. In ecology the environment of a lake is referred to as *lacustrine*. The lakes are quiet large bodies of fresh water usually deep enough that their beds lie much beyond the photosynthetic zone (Agrawal, 1999) fluctuations in the lake level are because of climate conditions and human requirements of water. The rate of water replacement of a lake also depends upon the season. A lake may be occasionally created by digging a basin that intercepts the water table. Such a lake is in a sense nothing but a wide shallow well. Most man made lakes are created by damming a stream at a strategic point, so that the the water backed up the dam can be contained in a natural valley or basin. Many lakes are artificial and constructed for hydro-electric power supply, recreational purposes, industrial, agricultural use and domestic water supply. Ahmedabad is unique in the whole of India in matter of environmental neatness and flourishing conditions and it is superior to other cities in the excellence of its monuments. Ahmedabad Urban development Authority (AUDA) carried out a survey of 645 lakes and identified 22 lakes which have been severely degraded. AUDA proposes to undertake works for revival, development of catchments area and beautification of lakes under the present project. Of these, 4 lakes were studied which are located at Ramol ,Vastral , Singarva and Nikol villages , Ramol lake is located at near vatva back side Ramol village , Ahmedabad . Its total storage capacity is 77.0 Carore liters. Lake Desilting area is 6535 m<sup>3</sup> and peripheral development Works including landscaping; Vastral Lake is located at Vastral Village its total storage capacity is 77.0 Carore liters. Lake Desilting Area is 5400 m<sup>3</sup> and peripheral development works including landscaping: recreation facilities are such as Amphi theatre, children park and Boating facilities and percolation wells to recharge ground water table. Singarva Lake is located at Kathwada Village one of side GIDC Area And Atached to National Highway no.8 Ghodhra and Kapadvanj road Singarva village a Ahmedabad. Its total storage capacity is 13.6 Carore liters. Lake Desilting area is 5675m<sup>3</sup> and peripheral development work including landscaping: recreation facilities are such as Amphi theatre, children park And Boating Facilities and percolation wells to recharge ground water Table; Nikol Lake is located at Nikol village. Its total storage capacity is 10.5 Carore liters. Lake Desilting area is 2498 m<sup>3</sup> and peripheral development Works including landscaping ; AUDA has commenced work on this lake also through own resources.

### **Methodology:**

Water samples were collected from four lakes (Ramol, Vastral, Singarva, Nikol). Samples were collected in these month January-2010 to December -2010. following cations were analysed using standard methods given by APHA , 1998 Ca<sup>++</sup> and Mg<sup>++</sup> were determined By complexometric titration methods:SO<sub>4</sub><sup>2-</sup>, NH<sub>3</sub> N, PO<sub>4</sub> P and NO<sub>2</sub> N was determind by spectrophotometric method: Distilled water was used as control for comparison and their results were compared with the desirable limit and permissible limit of WHO, 1992: BIS, 1991 and ICMR,1975.

### **Result and Discussion:**

Major Cationic concentration (Ca<sup>++</sup>, Mg<sup>++</sup>, SO<sub>4</sub><sup>2-</sup>, NH<sub>3</sub> N, PO<sub>4</sub> P , NO<sub>2</sub> N) are naturally variable from season to other in water according to changes in Environment

Conditions similar study was Latif , A.F.A and A.A Elewa *et al.*,(1998) as well as increases in the decay organic matter. Sabre, S.Z and A.M Abdel-Satar *et al.* (2001) which cause the release of cations to overlying water. Also ,the adsorption of cation on the surface of fine suspended particles plays an in\mportant role on the distribution of cation in the aquatic Environment; Badr,M.H., A.A Elewa, M.B.Shehata, L.F.Mohamed and G.Abdelaziz *et al.*(2006)the study included measuring the concentrations of calcium, magnesium, Ammonia, sulphate, phosphate and nitrogen in surface and bottom water layers in different seasons with emphasis on the effect of flood water on the distribution of major cations in fresh water ; Elewa ,A.A., *et al.* (1980).

**Calcium** content of water samples from all localities were within the permissible limit of BIS Except locality No. 1,2,3,4 in January-2010 to December -2010. The highest concentration of calcium in water was record at locality no.2 in November-2010 (150mg/l). The lowest concentration of calcium in water was recorded at locality no.3 July -2010(30 mg/l), (Table -1).

**Magnesium** content of water samples from all localities were within the permissible limit of BIS except locality no1, 2, 3, 4 in January-2010 to December-2010. The highest concentration of magnesium in water was recorded at locality no.3 in March-2010(180 mg/l). The lowest concentration in water was recorded at locality no.4. November-2010 (30 mg/l) of Table -2 .similar studies was conducted by Agarkar (1998) and Kapaly *et al.* (1998) in Maharastra.

**Sulphate (SO<sub>4</sub><sup>2-</sup>)** Content of water samples from all localities were within the permissible limit of BIS except locality no.1, 2, 3,4 in January-2010 to Decmber-2010. The highest concentration of Sulphate in water was recorded at locality no.2 December-2010 (6.2 mg/l) of 2009. The lowest concentration in water was recorded at locality no.2 March-2010 (0.001 mg/l) of 2010 (Table-3).

**Ammonia(NH<sub>3</sub>-N)** Content of water samples from all localities were within the permissible limit of BIS except locality no.1, 2, 3, 4 in January-2010 to December-2010. The highest concentration of Ammonia in water was recorded at locality no.4 July -2010 (14.25 mg/l) of 2009. The lowest concentration in water was recorded at locality no.1 and 4 February -2009 (0.01 mg/l) of 2009 The January -2010 To December-2010, Shown in Table-4 clearly depicts that Ammonia Decreased .The progressive increase in water quality to Ammonia could be due to Heavy Growth of Aquatic weeds which efficiently utilize the Ammonia in the lake (Kaloo *et al.*, 1995).

**Phosphate (PO<sub>4</sub>-P)** Content of water samples from all localities were within the permissible limit of BIS except locality no.1, 2, 3, 4 in January-2010 to December-2010. The highest concentration of Phosphate in water was recorded at locality no.1 And 2 April-2010 (4.0 mg/l) of 2010. The lowest concentration in water was recorded at locality no.3 November -2010 (0.11 mg/l), (Table-5).

**Nitrite (NO<sub>2</sub>-N)** Content of water samples from all localities were within the permissible limit of BIS except locality no.1, 2, 3 ,4 in January-2010 to December-2010. The highest concentration of Nitrate in water was recorded at locality no.1 November-2010 (77.11 mg/l) of 2009. The lowest concentration in water was recorded at locality no.2 November -2010 (0.58 mg/l) of 2010 (Table-6)

Nitrite is more toxic and nitrogen indicates the recent pollution from lake water. Maximum permissible limit of WHO for both is 1.0 mg/l (Anon., 1984). The nitrite nitrogen was also observed within the permissible limits of WHO (Table-6).

**Table -1**

Analysis of Ca<sup>++</sup> (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

No	Locality name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
01	Ramol	100	100	90	100	50	60	50	80	70	110	110	110
02	Vastral	120	80	60	50	40	50	40	80	100	110	150	120
03	Singarva	60	50	40	40	60	40	30	60	60	100	90	60
04	Nikol	80	60	60	50	80	70	40	90	80	70	100	100

**Table -2**

Analysis of Mg<sup>++</sup> (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

No	Localit y name	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Jul	Au g	Se p	Oc t	No v	De c
01	Ramol	110	150	160	160	160	160	160	120	160	130	150	130
02	Vastral	60	130	170	160	110	60	120	70	120	120	100	130
03	Singarva	90	110	180	170	100	110	120	60	90	100	110	90
04	Nikol	70	100	90	50	90	80	80	110	80	80	30	110

**Table -3**

Analysis of SO<sub>4</sub><sup>2-</sup> (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

No	Localit y name	Ja n	Fe b	Mar	Ap r	Ma y	Ju n	Jul	Au g	Se p	Oc t	No v	De c
01	Ramol	0	0	0	1.0	2.0	3.5	3.8	5.2	2.2	2.1	2.1	5.4
02	Vastral	0	0	0.00	2.0	0.9	2.1	4.8	6.1	4.5	4.0	5.1	6.2
03	Singarva	0	0	1.0	2.0	0.7	2.1	5.1	4.1	1.3	1.5	1.7	5.7
04	Nikol	0	0	0	1.0	0.5	1.2	3.3	5.1	2.5	2.1	3.5	6.1

**Table -4**

Analysis of NH<sub>3</sub> N (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

N o	Localit y name	Ja n	Fe b	Ma r	Ap r	May	Ju n	Jul	Au g	Se p	Oc t	No v	De c
01	Ramol	0	0.0 1	0	0	1.3	0.2 4	3.51	0.1 4	1.2	1.0	0.1 1	3.7
02	Vastral	0	3.0	0	0	2.22	0.2 3	1.41	0	0.5	1.1	1.2 2	0.9
03	Singar va	0	0.1	0	0.0 5	3.44	0.9 8	1.23	0.1 1	1.4	1.2	0.9 1	0.9
04	Nikol	0	0.0 1	0	0.0 3	11.2 1	7.2	14.2 5	0.3 2	4.9	4.1 2	2.3 1	3.7

**Table -5**

Analysis of PO<sub>4</sub> <sup>-</sup>P (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

N o	Localit y name	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Ju l	Au g	Se p	Oct	No v	De c
01	Ramol	0	0	0	4.0	2.1	2.5 5	3. 8	2.5	1.6	2.1	3.5 1	3.2
02	Vastral	0	0	0	4.0	1.7	1.8 2	2. 8	1.6	0.4	1.1	1.4 2	2.7
03	Singarv a	0	0	0	2.0	1.0	0.5	1. 7	1.1	1.2	0.8 8	0.1 1	0.6
04	Nikol	0	0	0	3.0	1.2	1.7 5	2. 3	3.6	0.8	0.5 5	0.3 2	0.4

**Table -6**

Analysis of NO<sub>2</sub> <sup>-</sup> (mg/l) in water of various lakes during the year 2010 for comparative study of pollution.

N o	Localit y name	Ja n	Fe b	Ma r	Ap r	Ma y	Ju n	Jul	Au g	Se p	Oct	Nov	De c
01	Ramol	0	0	0	0	0	0	1.2 2	0	8.5	25.2 2	77.1 1	1.4
02	Vastral	0	0	0	0	0	0	1.1	0	5.3	2.22	0.58	1.6
03	Singar va	0	0	0	0	0	0	1.5 5	0	1.5	0.91	0.8	1.1
04	Nikol	0	0	0	0	0	0	1.1 1	0	3.3	1.9	0.9	2.5

### Summary and Conclusion:

Ahmedabad city is situated on the river bank of Sabarmati at Gujarat. The Water samples were collected from Different lakes. The Cationic Contamination like Calcium, Magnesium, Ammonia, Sulphate, Phosphate and Nitrite were studied comparatively during January-2010 to December-2010. The results suggested that water was not suitable for Drinking Purpose.

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