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The study of some important parameters like Chlorine, Alkalinity, Hardness of lake water in Bangalore the capital city of Karnataka

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Abstract
Chloride in the form of chloride ion (Cl^-) is one of the major inorganic anions in water and waste water. The chloride concentration is higher in waste water than in raw water because sodium chloride (NaCI) is a common article of diet and passes unchanged through the digestive system. Alkalinity and hardness depends on the salts present in the water it determines the flora and fauna in the aquatic habitat. This paper details the Chlorine, Alkalinity, Hardness of lake water in Bangalore.

Keywords: chlorine, hardness, water, Karnataka and parameters

Introduction

Water is the most common yet the most precious resource on earth without which there would be no life on earth (Kumar and Ravindranath, 1998) [1]. It is an important factor which controls the limits of distribution of terrestrial animals (Allee *et al*., 1949) [2]. It is the most vital resource for the life molecule to survive. It possess a number of physical and chemical properties that help the molecule to act as best suited medium for the life activities. Most of the bio-chemical reactions that occur in the metabolism and growth of the living cells involves water, hence it has been referred to as a universal solvent. It has played a predominant role in governing the distribution of animals.

The quality of water bodies is influenced by physico-chemical environment. These factors determine the ecological conditions and also predict the nutrient status of the water. In India, water pollution is a major problem. Most of the water bodies around industrial and urban centers receive large amount of effluents either partially treated or untreated, thus affecting the quality of water. Most of the lentic water bodies are polluted due to urbanization, industrial growth and other man made problems.

Evaluation of effects due to water pollution involves physical, chemical and biological analysis. Physical and chemical parameters give information related to the time sampling, indicating levels and sources of various pollutants. The biotic and abiotic factors of aquatic ecosystem affect the life.

The chemical factors help in maintaining the salinity of water. The electrical conductance is mainly caused by the ions of calcium, magnesium, sodium, potassium, carbonate, sulphate, chlorides and heavy metals (Sudha Rani, 2004) [3].

The pH is a measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. The hydrogen ion concentration of the water is influenced by the biological activities, besides the addition of the chemical substances. The ions, besides maintaining the concentration of water, also acts as a buffer and thereby preserve the natural alkalinity.

So this research paper attempts to brief Chlorine, Alkalinity, Hardness of lake water in Bangalore the capital city of Karnataka

Study Area

Bangalore City in Karnataka State of India lies between 12°44' and 13°14'N latitude and 77°25' to 77°47'E longitude and at a mean altitude of 921m above mean sea level (MSL).

The climate of the district enjoys an agreeable temperature range from the highest mean maximum of 33°C in April to lowest of 14°C in January. It has two rainy seasons from June to September and October to November coming one after the other but with opposite wind regime, corresponding to south-west and north-east monsoons. The mean monthly relative humidity is lowest in the month of March (44%) and high during the month of June to October, being between 80 to 85% on an average. The mean annual rainfall is 859.6 mm and the mean number of rainy days is about 57. Bangalore receives 54% of the total rainfall in the Southwest monsoon period with a rainfall of 496 mm and 34 rainy days, whereas the Northeast monsoon contributes a mean rainfall of 241 mm and mean rainy days being 14 (Kamath, 1990) [4].

Material and Methods

Chloride

Chloride in the form of chloride ion (Cl~) is one of the major inorganic anions in water and waste water. The chloride concentration is higher in waste water than in raw water because sodium chloride (NaCI) is a common article of diet and passes unchanged through the digestive system. Chloride was estimated by Argentometric method (APHA, 2000).

50 ml or an aliquot volume and diluted to about 50 ml with distilled water. If the samples are highly coloured, it was removed with charcoal.

Samples were titrated directly in the pH range 7.0 to 10.0. pH of the sample was adjusted between 7 and 10 with Calcium Carbonate (CaCOa) powder when the sample is acidic. 3 to 5 drops of Potassium Chromate (K2CrO4) was added as

indicator. Titrated with standard Silver Nitrate (AgNO3) titrant to brick red end point.

Alkalinity

Alkalinity of water is its acid-neutralizing capacity. It is the sum of the entire titratable alkaline groups. Alkalinity is significant in many cases and treatments of natural and waste waters. Alkalinity of water is primarily a function of carbonate, bicarbonate and hydroxide content. It is taken as an indication of the concentration of these constituents. Alkalinity was measured by titrimetric method (APHA, 2000). Hydroxyl ions present in a sample as a result of dissociation or hydrolysis of solute, react with addition of standard acid. Alkalinity thus depends on end point pH used.

To 50 ml sample or an aliquot volume and diluted to 50 ml with distilled water was directly titrated with 0.02N H_2SO_4 using methyl orange as indicator.

Hardness

Hardness is defined as the sum of calcium and magnesium concentrations, both expressed as calcium carbonate in milligrams per liter. When hardness numerically is greater than the sum of carbonate and bicarbonate alkalinity, that amount of hardness equivalent to the total alkalinity is called "Carbonate hardness" and the amount of hardness in excess of this is called "Non-carbonate hardness". Total hardness was estimated by Ethylenediaminetetra acetic acid (EDTA) Titrimetric method (APHA, 2000).

EDTA and its sodium salts form a chelated soluble complex when added to a solution of certain metal cations. If small amount of a dye such as Eriochrome Black-T is added to a solution containing calcium and magnesium, the solution becomes wine red.

If EDTA added as a titrant after calcium and magnesium ions have been complexed, the solution turns wine red to blue. Magnesium ion must be present to yield a satisfactory end point.

To 50ml or an aliquot volume and diluted to about 50ml with distilled water, 2 ml of ammonium buffer solution was added and then titrated against standard EDTA (0.02 N) solution using Erichrome Black-T' as indicator. The end point of the titration is pink to blue

Results and Discussion

Chloride

Table 1: Variations in Chlorides at the studied lakes

Month & Year	LAKES					
	HEBBAL		MUNINAGARA		YELAHANKA	
	Station		Station		Station	
	'A'	'B'	'A'	'B'	'A'	'B'
Nov 03	210	135	15	12	425	320
Dec 03	192	136	18	13	430	326
Jan 04	215	140	18	15	445	330
Feb 04	225	142	22	18	450	332
Mar 04	230	148	28	22	464	335
Apr 04	228	156	35	28	480	338
May 04	236	162	48	32	480	340
Jun 04	234	160	52	38	480	339
Jul 04	214	140	48	31	466	328
Aug 04	180	125	32	18	410	280
Sep 04	91	75	26	14	342	195
Oct 04	95	80	26	15	345	194
Year Average	195.8±26.056	133.4±27.029	30.5± 12.3	21.3±8.4	434.7± 46.3	304.6± 51.6
Nov 04	160	85	10	07	375	270
Dec 04	142	88	13	08	380	275
Jan 05	165	90	13	10	395	280
Feb 05	175	92	17	13	400	282
Mar 05	180	98	23	17	414	285
Apr 05	178	106	30	23	430	288
May 05	186	112	43	27	430	290
Jun 05	184	110	47	27	430	289
Jul 05	164	90	43	26	416	288
Aug 05	130	75	27	13	360	230
Sep 05	41	25	21	09	292	145
Oct 05	45	30	21	10	295	144
Year Average	145.8+ 48.68	83.41±27.02	25.6+ 12.3	15.8± 7.5	376.4± 54.6	255.5± 52.0

The mean total chloride present in the samples collected at station 'A' amounted to 195.8 mg/l while it was 133.4 mg/l at station 'B' near Hebbal lake from Nov 03 to Oct 04. The chloride content differed considerably during the subsequent year of investigation and amounted to 145.8 mg/l at station 'A' and 83.4 mg/l at station 'B' during Nov 04 to Oct 05 near Hebbal lake.

The mean total chloride content was 30.5 mg/l at station 'A'

and 21.3 mg/l at station 'B' from Nov 03 to Oct 04 and 25.6 mg/l at station 'A' and 15.8 mg/l at station 'B' from Nov 04 to Oct 05 in the samples collected near Muninagara lake.
However, the mean total chloride content was higher and was 434.7 mg/l at station 'A' and 304.6 mg/l at station 'B' from Nov 03 to Oct 04 and 376.4 mg/l at station 'A' and 255.5 mg/l at station 'B' from Nov 04 to Oct 05 in the samples collected near Yelahanka lake.

Alkalinity

Table 2: Variations in Alkalinity at the studied lakes

MONTH & YEAR	LAKES					
	HEBBAL		MUNINAGARA		YELAHANKA	
	Station		Station		Station	
	'A'[1]	'B'	'A'	"B"	'A'	'B'
Nov 03	195	125	55	50	402	325
Dec 03	201	130	65	52	410	326
Jan 04	208	135	61	52	412	326
Feb 04	210	148	63	54	420	326
Mar 04	215	155	64	54	422	330
Apr 04	219	160	68	55	421	335
May 04	225	168	68	59	425	335
Jun 04	220	168	69	61	425	334
Jul 04	190	138	62	55	413	322
Aug 04	175	130	56	48	392	295
Sep 04	95	82	44	40	322	200
Oct 04	98	85	44	40	325	202
Year Average	187.5+ 42.9	135.3+ 27.1	59.9+ 8.2	51.6+ 6.2	399.0+ 35.1	304.6+ 47.4
Nov 04	145	75	35	30	352	275
Dec 04	151	80	45	32	360	276
Jan 05	158	85	41	32	362	276
Feb 05	160	98	43	34	370	276
Mar 05	165	105	44	34	372	280
Apr 05	169	110	30	23	371	285
May 05	175	118	48	39	375	285
Jun 05	170	118	49	41	375	284
Jul 05	140	88	42	35	363	272
Aug 05	125	80	36	28	342	245
Sep 05	45	32	24	20	272	150
Oct 05	48	35	24	20	275	152
Year Average	137.5+ 42.9	85.3+ 27.1	39.9+ 8.3	31.6+ 6.2	349.0+ 35.1	254.6+ 47.4

The mean total alkalinity was 187.5 mg/l at station 'A' and 135.3 mg/l at station 'B' from Nov 03 to Oct 04 and 137.5 mg/l at station 'A' and 85.3 mg/l at station 'B' from Nov 04 to Oct 05 in the samples collected near Hebbal lake.
The mean total alkalinity was 59.9 mg/l at station 'A' and 51.6 mg/l at station 'B' from Nov 03 to Oct 04 and 39.9 mg/l at station 'A' and 31.6 mg/l at station 'B' in the samples collected near Muninagara lake.
The mean total alkalinity was as high as 399.0 mg/l at station 'A' and 304.6 mg/l at station 'B' from Nov 03 to Oct 04 and 349.0 mg/l at station 'A' and 254.6 mg/l at station 'B' from Nov 04 to Oct 05 in the samples collected near Yelahanka lake.

Hardness

Table 3: Variations in Hardness at the studied lakes

Month & Year	LAKES					
	HEBBAL		MUNINAGARA		YELAHANKA	
	Station		Station		Station	
	'A'	'B'	'A'	'B'	'A'	'B'
Nov 03	260	190	62	50	575	410
Dec 03	279	208	65	52	580	415
Jan 04	286	215	66	55	582	416
Feb 04	302	230	68	58	585	420
Mar 04	315	250	70	63	595	425
Apr 04	335	280	82	70	610	424
May 04	352	295	84	72	650	442

Jun 04	350	294	86	73	648	448
Jul 04	302	250	76	65	615	422
Aug 04	264	210	51	42	540	382
Sep 04	202	148	47	38	380	220
Oct 04	208	152	49	42	395	222
Year Average	287+ 0.430	226+ 47.4	67.1 + 12.8	56.6+ 11.7	562.9+ 87.1	387+ 25.9
Nov04	220	150	42	30	535	370
Dec 04	239	168	45	32	540	375
Jan 05	246	175	46	35	542	376
Feb 05	262	190	48	38	545	380
Mar 05	275	210	50	43	555	385
Apr 05	295	240	62	50	570	384
May 05	312	255	64	52	610	402
Jun 05	310	254	66	53	608	408
Jul 05	262	210	56	45	575	382
Aug 05	224	170	31	18	500	342
Sep 05	162	108	27	18	340	180
Oct 05	168	112	29	22	355	182
Year Average	247.9+ 470	186.8+ 43.3	47.4+ 127	36.6+ 11.6	522.9+ 11.6	347.1 + 75.9

The mean hardness was 287.0 mg/l at station 'A' and 226.0 mg/L at station 'B' from Nov 03 to Oct 04 near Hebbal lake. Similar results were found during the successful next year of study where the mean hardness was 247.9 mg/l at station 'A' and 186.8 mg/l at station 'B' (Fig. 20) in the samples collected near Hebbal lake from Nov 04 to Oct 05.

The mean hardness was lower of 67.1 mg/l at station 'A' and 56.6 mg/l at station 'B' from Nov 03 to Oct 04 in the samples collected near Muninagara lake. Similarly, the hardness was lower of 47.4 mg/l at station 'A' and 36.6 mg/l at station 'B' from Nov 04 to Oct 05 in the samples analysed.

The mean hardness was the highest of 522.9 mg/l at station 'A' and 347.1 mg/l at station 'B' during Nov 04 to Oct 05 in the samples collected from Yelahanka lake. Similarly, the hardness was 562.9 mg/l at station 'A' and 387 mg/l at station 'B' from Nov 03 to Oct 04 in the samples collected from Yelahanka lake.

All the chemical parameters play a significant role on flora and fauna and help to study the complex food chains and food web in the eco system. There was significant change in chlorine in the water habitat which resulted in diverse flora and fauna study in relation with different habitat at different geographical area is necessary to place in record a detail hypothesis on flora and fauna.

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