Research Article

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Effect of pollution on the quality of water in three freshwater lakes of Nirmal town, Adilabad Dist. (A.P.)

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Abstract

The Present Study deals with the effect of pollutions on the quality of water in three freshwater lakes of Nirmal Town, Adilabad Dist. The investigation was done from January 2010 to December 2010. All the three lakes suffer from encroachments. Dumping and burning of wastes, and unchecked inflow of domestic and industrial effluents. The parameters studies were: colour, odour, temperature, pH, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, chemical oxygen demand, alkalinity, total hardness, total solids, total dissolved solids, total suspended solids, sulphate and chloride.

Key-Words: Darmasagar Lake, Water pollution, Adilabad

Introduction

These three lakes of Adilabad Dist is the important tourist places with buetiful temples built by mighty NimmaNaidu kings during the period of 8th Century. Rapid development, increase in population of the metro cities and urbanization of their suburbs have resulted in the manifold increase in environmental pollution. The most affected are the water bodies which become highly polluted by addition of foreign materials such as plant and animal matter, and domestic sewage and industrial effluents. Dumping of solid wastes and indiscriminate encroachments also add to the chaos. The diminishing quality of water seriously delimits its use for human consumption and for aquatic life. Therefore, the continuous and periodical monitoring of water quality is necessary so that appropriate preventive and remedial measures can be undertaken. The present study was done to evaluate various physic-chemical parameters of the three important freshwater lakes. These water bodies recharge the groundwater and also harbor numerous aquatic lives. The physic-chemical characteristics of an aquatic body not only reflect the type and diversity of aquatic biota but also the water quality and pollution (Mir et al. 2004).

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Material and Methods

Three freshwater bodies viz., Darmasagar lake, Khajan lake and Natrajmill lake were selected for the study. These lakes are strategically located in the rapidly expanding southern region of Nirmal Town and catering to a large population. The water bodies were labeled Site 1, Site 2 and Site 3 respectively.The water samples were collected for a period of 12 months, starting from Janury 2010 to December 2010. 125 ml glass bottles were used to collect and fix samples for estimation of dissolved oxygen (DO) content. Samples were collected in triplicate from each site during the four quarters of the year using PET bottles as per standard procedures.

Results and Conclusion

Based on the cyclic phenomenon of the climate, four seasons are recognized at Nirmal Town even though it falls in the tropical zone. The seasons are post-monsoon (January-March), summer (April-June), premonsoon (July-September)and monsoon (October-December). The data presented here are discussed on the basis of these seasons. The results of physic-chemical analysis of three freshwater bodies for different seasons are given in Tables 1,2 and 3.

The temperature of water varied between 24.3° C and 33.5° C at Site 1, between 23°C and 35° C at Site 2, and 23.9° C and 37.2° C at Site III. In all the three sites a high temperature was recorded during summer and lower temperature during post-monsoon, which is a normal feature of water bodies in this region. The

average pH values were 7.7.7.68 and87.3 at Sites 1,2 and 3. The lowest pH values were recorded during monsoon and postmonsoon seasons, which indicates the influence of run-off water entering into the water bodies. The pH was slightly alkaline during summer and premonsoon which may be due to dumping of wastes, garbage and sewage water. The desirable limit of pH recommended by BIS(1992) is 6.5-8.5.The dissolved oxygen (DO) values at Site 1 ranged from 4.6 to 8.6 mg/L, and the values at Site 2 from 5.8 to 8.7 mg/L. At Site 3 DO from 5.3 to 7.7 mg/L. Dissolved oxygen is an important factor, which influences the health of an aquatic ecosystem. Higher values of DO were recorded during postmonsoon period at all the sites. The BOD values at Site 1 ranged from 45 to 94.9 mg/L, and at Site 2 from 52 to 76 mg/L. At Site 3 BOD ranged from 51.5 to 97.3 mg/L. BOD is the measure of quantity of oxygen required by bacteria and other microorganisms under aerobic condition in order to biochemically degrade and transform organic matter present in the water bodies. The highest BOD value was recorded during premonsoon season in all the three freshwater bodies. The COD at Site 1 varied between 46 and 63 mg/L. The values at Site 2 ranged between 38.9 and 79 mg/L, while at Site 3 between 36.8 and 61.5 mg/L. The high COD value indicates a heavy load of organic and inorganic pollution that require more oxygen to oxidize under increased thermal conditions (Koushik & Saksena 1999).The total alkalinity values at Site 1 ranged between 97.5 and 146.3 mg/L. The values at Site 2 ranged between 107.5 and 144 mg/L, while the values at Site 3 between 86.9 and 120 mg/L. Excess alkalinity gives a bitter taste to water. Maximum alkalinity values were registered during summer at Site 1 and Site 3, where as at Site 2, it was during premonsoon. The higher alkalinity in itself is not harmful to human beings, but still it delimits the water for domestic uses.

The total hardness (TH) values at site I ranged from 169 to 284 mg/. At Site 2 it ranged between 143 and 243 mg/, while at Site 3 it was between 163 and 209 mg/L. In general, Total hardness of water is due to the concentration of salts, especially of divalent metallic ions of calcium and magnesium. The desirable may be the cause of high TH at Site 1.The total solids (TS) at Site I ranged between 557 and 782 mg/L, and the values at Site 2 from 540 to 670 mg/L. At Site 3 TS ranged from 609 to 663 mg/L . Maximum value of TS was recorded during postmonsoon at samplimg Site 1 and Site 3, whereas at Site 2 maximum value was noted during monsoon season.

The Total suspended solids (TSS) at Site 1 ranged from 93.9 to 110 mg/L, at Site 2 from 96 to 135 mg/L, and at Site 3 from 105 to 136 mg/L. Higher values of TSS were recorded during monsoon season at Site 1 and Site 2, and during summer at Site 3. Increased concentration of TSS would reduce light penetration into the water and affect the planktor. and fish by decreasing dissolved oxygen in water.Sulphate ranged between 245 and 317 mg/L, 261 and 321 mg/L, and 245 to 333 mg/L at Sites 1,2 and 3 respectively. Sulphate can taint the taste of water and may create a laxative effect. Higher concentration of sulphate was observed during summer at Site 1 and 2 and during premonsoon at Site 3. Chloride values at Site 1 varied from 141 to 264 mg/L, at Site 2 from 139 to 273 mg/L, and at Site 3 from 132 to 180 mg/L. Chloride concentration was higher during postmonsoon.

Periodic determination of physic-chemical parameters of important water bodies is essential for assessing the suitability of water for human and animal use as well as for aquatic biota. Discharge of domestic, municipal and industrial effluents combined with dumping of solid wastes affects the water quality severely. It causes a verity of health problems to humans as well as to other organisms dependent either directly or indirectly on these ecosystems. The present study, therefore, urges the need for the restoration of these degrading freshwater bodies in Nirmal Town to ensure sustainability of a healthy ecosystem.

Acknowledgements

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Table 1: Physico-chemical characteristics of Darmasagar Lake (Site 1) from January to December 2010

S.No	Parameter	J an-Mar '10	Apr-Jun'10	J ul-Sep'10	Oct-Dec '10	Range
1.	Colour (visual)	Unclear	Unclear	Unclear	Unclear	-
2.	Odour (sensory)	Agreeable	Agreeable	Agreeable	Agreeable	-
3.	Temperature (°C)	24.3	33.5	31.6	27.5	24.3-33.5
4.	pH	7.1	7.7	6.9	6.3	6.3-7.7
5.	DO (mg/L)	8.6	6.9	4.6	7.8	4.6-8.6
6.	BOD (mg/L)	68	85.3	94.9	45	45-94.9
7.	COD (mg/L)	49.3	54.5	46	63	46-63
8.	Alkalinity (mg/L)	97.9	146.3	128	121	97.5-146.3
9.	Total Hardness (mg/L)	284	162	192	198	169-284
10.	TS (mg/L)	782	560	691.1	557	557-782
11.	TDS (mg/L)	656	468	549	441	441-656
12.	TSS (mg/L)	101	98	93.9	110	93.9-110
13.	Sulphate (mg/L)	296	317	305	245	245-317
14.	Chloride (mg/L)	264	193	141	149	141-264

Table 2: Physico-Chemical parameters of Khajan lake (Site 2) from January to December 2010

S.No	Parameter	Jan-Mar 10	Apr-Jun 10	Jul-Sep 10	Oct-Dec '10	Range
1.	Colour (visual)	Unclear	Unclear	Unclear	Unclear	-
2.	Odour (sensory)	Agreeable	Agreeable	Agreeable	Agreeable	-
3.	Temperature (°C)	23	29.4	35	33.5	23-35
4.	pH	6.7	7.3	7.6	6.9	6.7-7.6
5.	DO (mg/L)	8.7	7.3	5.8	6.5	5.9-8.7
6.	BOD (mg/L)	5.6	69	76	52	52-76
7.	COD (mg/L)	38.9	45.9	52	79	38.9-79
8.	Alkalinity (mg/L)	107.5	138	144	127	107.5-144
9.	Total Hardness (mg/L)	243	173	154	143	143-243
10.	TS (mg/L)	640	598.4	540	670	540-670
11.	TDS (mg/L)	541	509	633	538	509-633
12.	TSS (mg/L)	96	88.9	113	135	96-135
13.	Sulphate (mg/L)	314	323	287	259	259-323
14.	Chloride (mg/L)	273	225	164	139	139-273

Table 3: Physico-Chemical parameters of Natrajmill lake (Site 3) from January to December 2010

S.No	Parameter	J an-Mar '10	Apr-Jun'10	J ul-Sep'10	Oct-Dec '10	Range
1.	Colour (visual)	Unclear	Unclear	Unclear	Unclear	-
2.	Odour (sensory)	Agreeable	Agreeable	Agreeable	Agreeable	-
3.	Temperature (°C)	23.9	37.2	3.0	29.8	23.9-37.2
4.	PH	6.6	7.6	8.3	7.2	6.6-8.3
5.	DO (mg/L)	7.7	6.4	5.3	6.8	5.3-7.7
6.	BOD (mg/L)	57	78.9	97.3	51.5	51.5-97.3
7.	COD (mg/L)	36.2	47.2	54.2	61.5	36.8-61.5
8.	Alkalinity (mg/L)	86.9	120	118	92.9	86.9-120
9.	Total Hardness (mg/L)	209	180	163	177	16-209

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10	TS (mg/L)	663	619	609	614	609-663
11.	TDS (mg/L)	543	481	497	510	481-543
12.	TSS (mg/L)	120	136	110	105	105-136
13.	Sulphate (mg/L)	245	315	333	281	245-333
14.	Chloride (mg/L)	180	160	132	171	132-180

TDS) at Site 1 varied between 441 to 656 mg/L, at Site 2 between 509 and 633 mg/L and at Site 3 between 481 and 543 mg/L. Maximum value of TDS were registred during postmonsoon season at Site 1 and Site 3, whereas at Site 2, it was noted during premonsoon season.The permissible level of TDS is 500 mg/L in drinking. Presence of excess TDS may cause gastro-intestinal irritation.