Seasonal Water Quality Analysis of Katraj Lake, Pune

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Abstract- Katraj Lake is one of the prime lake of Pune Maharashtra, which has a historical significance, is situated in south Pune covering about 82 hectares. In 1749 the water supply system which was commissioned from "AmbilOdha" that flow down to Katraj-Dive ghat. The system consists of an intricate system of two lakes, 600 m away from each other. In 19th century the katraj lake water used to supply water through a underground canal to the heart of the city. Several fountains, tanks, baths and wells constructed to supply water from the Katraj Lake to the local residents. In 1879, the Pune Municipality took over the city's water supply system and from then began a gradual decline in the use of the katraj lake water.

As recently in 20th century, the surface water quality of the Katraj Lake is severely degraded due to the pollution from surrounding areas directly entering the waters. The quality of lake water is studied and compared with desired limits by some analytical procedure in Pre monsoon and post-monsoon.

Index Terms: Degradation, Katraj Lake, Pre monsoon, Post monsoon, Physico-Chemical parameters

1. INTRODUCTION

Water is one of the most important natural resource available to mankind. Knowing the importance of water for sustenance of life, the need for conservation of water bodies especially the fresh water bodies is being realized everywhere in the world. Global fresh water covers about 75% of the globe, but most of the water is saline. Less than 5% of water is fresh and much of this water is in the ice caps, glaciers and groundwater. Most of the remainder is in lakes, streams and soil moisture.

Basically the quality of water is described according to its physical, chemical and biological parameter. The biological study of water is helpful in problems like pollution control and renovation of dams or lakes, fish and aquatic life. The physico chemical methods are used to detect the effects of pollution on the water quality. Changes in the water quality are reflected in the biotic community structure. Water pollution occurs when water body is adversely affected due to the addition of undesirable materials to the water. When it is fit for its intended use, water is considered polluted. Lakes serve as an important life support system by helping in recharging of aquifers and regulating hydrological regimes. Restoration and recharge of water tables is possible due to the lakes, so the lakes play important role in our life. The lakes also act as natural traps for sediments and nutrients thereby helps to regulate water quality and sedimentation of the river system from the catchment area. The main causes for the water pollution of lake are due to pollution

entering from fixed point sources and pollutants entering fromnon point sources. Presently study deals with a katraj lake which is situates in Pune in western Maharashtra. The lake does not seem to have received care and attention during last few years as a result, the lake as well as its catchment is facing serious threats from encroachment and pollution. In this connection Pune Municipal Corporation should undertake the lake improvement project which includes de-siltation, beautification and removing of aquatic weeds and its disposal with the help of government and NGOs. In the present study water quality analysis was done for pre monsoon, post monsoon and monsoon season for the lake. The water quality analysis for pre monsoon and post monsoon season are done.

2. METHODOLOGY

2.1 Collection of sample

A sample taken meets the requirements of sampling program and handled it in such a way that it does not deteriorate or become contaminated before it reaches the laboratory. The water samples are stored in polythene container or bottles. Before filling, the sample bottle was rinsed out two to three times with the sample being collected. The details of collection vary so much with local conditions that no specific recommendations would be universally applicable.

2.2Manual sampling:

Manual sampling involves no equipment but may be unduly costly and time consuming for routine or large scale sampling programs. The care was taken so that no air bubbles were trapped in the cans at the time of sampling.

Here 'manual sampling' is used for assessment of lake water quality. The sampling was done at five points of lake from points S1 to S5 in premonsoon (May-13) and post-monsoon(Oct.-13)

2.3 Quantity and Parameters

Collection of 4 to 5 Liters of samples for most physical and chemical analysis was taken. For certain

2.4 Sampling stations:-

Sampling stations were selected as shown in Map of Katraj lake above; 1-Near peacock point, 2-MTDC point, 3- Bear point, 4- Gava point, 5-Elephant point.

Temperature of lake water found in the range 24 to 26° C of all sampling points S1-S5. It is also observed from the present study that, the colour of the lake water is also Greenish because of Weeds and green algal growth population. Odour is agreeable in Pre monsoon but some foul odour in Post monsoon at all points.

determinations, larger sample may be necessary. Here the same sample is not used for chemical, bacteriological and microscopic examinations because methods for collecting and handling are different.

The analysis of the following Physicochemical parameters was carried out using standard methods: pH, Turbidity (NTU), Electrical Conductivity (EC- µs/cm), Total Dissolved Solids(mg/l), Total Hardness(mg/l), Alkalinity(mg/l), Nitrate(mg/l), Chloride(mg/l), Fluoride(mg/l), Iron(mg/l) Dissolved Oxygen(mg/l), Biological Oxygen Demand(mg/l) and Chemical Oxygen Demand (COD-mg/l).The temperature, colour and odour are also recorded on the spot. The results were compared with the desirable limit.



Fig. 1 Map of katraj lake

Sr no	Para- meter	Near peacock point S1		MTDC point S2		Bear point S3		Gava point S4		Elephant point S5		Desirable limit BIS 10500
		Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
1	pН	8.0	8.96	8.02	8.95	7.87	8.7	7.73	7.65	7.4	9.06	6.5-8.5
2	TDS	430	346	420	364	430	357	510	519	353	420	500
3	Turbidity	68.1	108	434	470	15.99	21.8	16.74	9.32	105	437	5
4	EC	333	535	573	561	412	547	444	644	695	543	250-750 Good
5	Alkalinity	80.54	292.4	96.5	288.1	80.3	270.9	109.2	326.8	102.9	305.3	200
6	Hardness	350	250	325	310	330	350	360	380	340	200	300
7	Chlorides	20.6	51.98	17.63	45.5	1.0	47.98	1.1	48.3	0.7	59.98	250
8	Flourides	Nil	Nil	0.764	0.7640	0.271	0.271	0.67	0.67	0.56	0.56	1.0
9	Nitrate	5.26	0.071	6.84	0.656	4.17	0.545	4.82	0.545	4.57	1.65	45
10	Iron	0.013	0.104	0.013	0.408	0.052	0.635	0.156	0.434	0.023	0.15	0.3
11	COD	150	144	153	241.58	75	148	169	84	50	73.92	Not mentioned
12	BOD	44	40	48	46	98	98.5	106	116.9	120	86.4	Not mentioned
13	DO	7.9	7.2	8.7	8.6	3	3.2	1.3	1.3	1.5	3.5	Not mentioned

 TABLE I: Observations For Pre mansoon and Post Monsoon

 (All the analytical results are in mg/litre except pH, turbidity, conductivity.)

3. RESULT AND DISCUSSION

pH range of 6.5 to 8.5 is normally accepted as suggested by BIS. In this study pH values were found in the range of 7.4 to 9.06 in the water samples. At all the locations of sampling points are within the desirable limit in pre monsoon.

High TDS levels generally indicate hard water, which can cause scale build up in pipes, valves and filters. In the present study the value of TDS found in the range 346 to 519 mg/l. At point S4 TDS is above the desirable limit but within the permissible limit as per BIS standard.

Turbidity is a measurement of the cloudiness of water. In the present study the turbidity found in the range between 9.32 to 470 NTU. At all the locations exceeds the permissible limit, above 5 NTU consumer acceptance decreases. Electrical Conductivity(EC) - Higher the concentration of salts in water, a higher will be the EC.As per BIS, the good quality of irrigation water ranges 250-750 μ mhos/cm, so that here the lake water can be used for irrigation purpose and not for drinking purpose. In this study the value of EC found in the range 333 to 695µs/cm.

Alkalinity found in the range of 80.3 to 326.8 mg/l. The Alkalinity exceeds the desirable limit at all points after monsoon, can cause taste become unpleasant.

The total hardness found is out of the range of BIS standard at near about all stations. The values of hardness are found to be200 to 380 mg/l. only hardness at points S1 & S2 in post monsoon are within the desirable limit.

Chloride found in the range of BIS. The values are from 17.63 to 59.98mg/l.

Fluoride found in the range of 0.0172 to 0.7640 mg/l. High fluoride may cause fluorosis.

Nitrate concentration depends on the activity of nitrifying bacteria which in turn get influenced by presence of dissolved oxygen. In the present study the values of nitrate ranged from 0.071 to 6.84 mg/l, which is below desirable range of BIS.

Iron found in the range of BIS. The values are very less, from 0.013 to 0.635 mg/l.

Chemical oxygen demand (COD) value found in the range of 73.92 mg/l to 241.58 mg/l. COD test which measure the oxygen required for the oxidation of all the substance present in water, included those are not biologically decomposable. COD is a reliable parameter for judging the extent of pollution in water. The COD of water increases with increasing concentration of organic matter.

Biochemical oxygen demand (BOD) found in the range of 40 mg/l to 120 mg/l, is the measurement of the amount of biologically oxidisable organic matter present in the waste. The BOD values obtained in the





present study are exceeds the ICMR standards 5.0 mg/l, leads to decreases the level of dissolved oxygen.

Dissolved oxygen found in the range of 1.3 to 8.7 mg/l.This can be attributed to addition of effluents containing oxidisable organic matter and consequent biodegradation and decay of vegetation at higher temperature leading to consumption of oxygen from water. Concentration below 5 mg/l may adversely affect the functioning and survival of biological communities and below 2 mg/l may lead to fish mortality.

GRAPHS:

Here only those graphs of parameters shown which are not within the range of BIS 10500

Pre Monsoon:-Graphs : pH, Turbidity, Alkalinity, Hardness











Post Monsoon: Graphs: pH, Turbidity, Alkalinity, Hardness

Graph 7: Alkalinity

4. CONCLUSION

It is concluded from the present study that the pH values exceeds the desirable range in post monsoon as per BIS, means it make water alkaline. The turbidity highly exceeds the desirableas well as permissible limit as recommended by BIS because of various inlets to katraj lake from surroundings.Alkalinity at all points are within the desirable limit before monsoon but exceeded after monsoon. Total hardness is above desirable limit in pre monsoon at all points but it reduces at all points in post monsoon. It is within range at S1 & S5 in post monsoon. Total dissolved solids (TDS) found above are within the desirable limit but at point S4 slightly above the limits as per BIS. Dissolved oxygen found very less as recommended by ICMR standards and the values of Biochemical oxygen demand (BOD) are found higher, in lake water samples. As DO decreases BOD







increases.COD values are within the limits as per BIS 2490. All other parameters tested are within the desirable limits of BIS. All locations need proper treatment for lake water to use the water effectively without any pollution inserted from outsource. If some precautions will be taken then theKatraj lake water can be used for domestic, irrigation purpose as well as for aquatic life.

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