

STATUS OF DISSOLVED OXYGEN IN THREE LAKES OF NAGPUR CITY

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Abstract: A lake is a large body of water, lakes the vigorous water filled in land and aquatic system performed variety of functions provide a potable water, irrigation and water for industrial uses sink for water disposal fisheries and recreation, resources etc. Are subject to contamination due to various natural and anthropogenic disturbances and all the turbulences in their water quality can assessed by calculating dissolved oxygen to judge the purpose for current water can be safely used. Naik, Futala and Sakkardara lakes was carried out by assessing water with the help of 7 parameters to calculate the quality and status of each lake. Four parameters i.e. DO, BOD, Hardness and Chloride and Turbidity were found beyond the permissible limit when compared with standards given by WHO, BIS. Results revealed that water quality of two lakes I e Naik Lake and Sakkardara is presently in extremely poor condition. Now a day many human activities creates the pollution in and around the water body due to which natural status of this lake may come in the danger zone of water pollution. In this connection the study were carried out in which water samples from different locations of three lakes were collected and analyzed for their physico-chemical characteristics to report the status of water quality of three lakes and monitoring by assessing Dissolved Oxygen level.

Key words: Physico-chemical, Turbidity, Water body, Pollution, Dissolved oxygen.

1. INTRODUCTION

Water quality in an aquatic ecosystem is determined by many factors and parameters. Water quality assessment was developed to give an indication of how suitable the water is for human consumption and other purposes. Assessment is also required for sustainable management of water resources. The objective behind the study was to develop an overall status of the lakes. Analysis is the prime consideration to assess the water quality for its best utilization like drinking, domestic, irrigation, fisheries, agriculture water conservation, management and industrial purpose.

Lake studies are being polluted, degraded and destroyed due to faculty planning; town planning is the major causes for deterioration of lakes. City lakes are also deteriorated due to Indian festival by adding garnet, idol immersion, silt, increasing building construction and clay.

The purpose of analysis is to know the exact composition of elements and Dissolved Oxygen at particular point of time of sample collection.

Natural lakes and rivers generally cannot have too much oxygen. On the other hand, if oxygen level were too low in the water then it is affect on quality of water and ecosystem. Each type of living creatures in water require different amount of oxygen.

2. METHODS AND MATERIALS

Samples were collected from three different lakes of Nagpur city. They are Naik Lake, Futala Lake and Sakkardara Lake. Samples were analyzed by adopting APHA Method (2005) and NEERI manual. In the present study sampling was done during morning and collected samples bring in laboratory for further analysis. Dissolved Oxygen is fixed at sampling site and analyzed in laboratory. Then collected samples were analyzed for a number of physico-chemical parameters pH, Turbidity, DO, BOD, Alkalinity, Hardness and Chloride.

table No. 1: Showing physico-chemical parameters of Naik lake

Sr. No.	Month	pH	Turbidity NTU	DO (mg/lit)	BOD (mg/lit)	Alkalinity (mg/lit)	Hardness (mg/lit)	Chloride (mg/lit)
1.	January	6.7	18	4.0	30	780	704	421.8
2.	February	6.4	18	4.5	34	800	600	305
3.	March	6.5	18	4.8	38	815	584	297.9
4.	April	6.6	18	3.9	40	780	710	400
5.	May	6.7	17	3.7	40	810	608	308
6.	June	6.5	18	3.8	41	815	585	300
7.	July	6.7	20	4.1	30	760	700	400
8.	August	6.6	20	4.5	29	800	600	305
9.	September	6.7	20	4.8	29	810	580	298
10.	October	6.8	18	4.9	29	770	600	290
11.	November	6.8	18	4.9	29.2	780	600	395
12.	December	6.8	18	4.9	29.3	810	600	395

table No. 2: Showing physico-chemical parameters of Sakkardara lake

Sr. No.	Month	pH	Turbidity NTU	DO (mg/lit)	BOD (mg/lit)	Alkalinity (mg/lit)	Hardness (mg/lit)	Chloride (mg/lit)
1.	January	7.9	20	5.4	28	725	712	216
2.	February	6.8	19	5.3	28	755	680	237
3.	March	7.1	19	5.3	28	765	592	117
4.	April	7.7	20	5.0	26	726	590	216
5.	May	7.8	18	4.9	22	725	598	216
6.	June	7.6	18	4.9	22	724	600	220
7.	July	7.8	18	4.9	22	720	670	222
8.	August	7.8	18	4.8	23	720	677	223
9.	September	7.9	20	4.8	23	720	690	224
10.	October	7.9	20	5.4	26	720	695	220
11.	November	7.9	20	5.4	26	720	694	216
12.	December	7.9	20	5.8	26	720	692	218

table No. 3: Showing physico-chemical parameters of Futala lake

Sr. No.	Month	pH	Turbidity NTU	DO (mg/lit)	BOD (mg/lit)	Alkalinity (mg/lit)	Hardness (mg/lit)	Chloride (mg/lit)
1.	January	7.9	12.0	5.8	23	655	784	127
2.	February	7.8	12.2	5.9	22	638	780	125
3.	March	7.7	12.5	5.7	23	642	777	125.6
4.	April	7.7	12.10	6.5	24	650	779	127.6
5.	May	7.2	11.00	4.3	18	638	720	120.2
6.	June	7.3	11.0	4.3	17	640	719	120.8
7.	July	7.3	10.0	4.2	19	644	721	120.9
8.	August	7.2	9.0	4.3	18	642	728	120.7
9.	September	7.9	9.0	5.3	20	639	738	129
10.	October	8.0	10.0	5.6	21	635	738	128
11.	November	8.1	9.05	5.5	23	636	740	129
12.	December	8.0	10.05	5.5	23	633	742	129

table No. 4: Standard of values of physic-chemical parameters of drinking Water (WHO).

Sr No.	Parameters	WHO standards Value
1.	pH	6.5-8.5
2.	Turbidity (NTU)	10
3.	Dissolved Oxygen (DO) (mg/lit)	4-6
4.	Biological Oxygen Demand (BOD)(mg/lit)	1.85(BIS) and 6 WHO
5.	Total Alkalinity (mg/lit)	20-200
6.	Total Hardness (mg/lit)	300
7.	Chloride (mg/lit)	250

STUDY AREAS:

Futala Lake: Futala Lake is taken in Nagpur in Indian state of Maharashtra. This lake is spread over 60 acres. Build by the Bhosla King of Nagpur, the lake is known for its coloured fountains. In the evening the sites are illuminated with halogen light and in western area in Nagpur city and on average, 1,000 visitors visit the lake daily. In the absences of maintenance, the use of this pre-historic lake was use to cattle washing only. It was therefore decided in 2003 to beautify this lake from NIT funds with equal aid from the stage government. Now its quality again deteriorated due to slum area besides lake and restaurant.

Naik Lake: The Present investigation is based on filed study of Naik lake situated in dense populated area of Nagpur city. The study area is located at latitude 21 09'N and longitude 79 20'E in Nagpur city. The additional sewage from the adjacent localities is directly dumped in Lake Basin and increasing organic content. Now lake called as dead lake because not used for any purpose. The dead lakes of the city have now become garbage dumping ground, Naik lake in central Nagpur is latest example.

Sakkardara Lake: The Sakkardara lake was developed during the Bhosla empire. Once upon time this lake was tourist destination now has just become dumping ground of all type of waste and idol immersion spot. The NMC should take responsibility and clean the lake and regain its lost beauty both the adjoining Bollywood Centre Point Hotel and NMC garden will look even beautiful. Sakkardara Lake which was built in the 18th century during the Bhosle regime in Eastern Nagpur is about 5kms from zero miles in south-east direction of Nagpur near Ayodhyanagar area.

Water samples were collected and analysed from three selected lakes adopting standard methodology (Jackson, 1973; Trivedi & Goel, 1984; APHA, 2005 & Mukherji & Nandi, 2004).

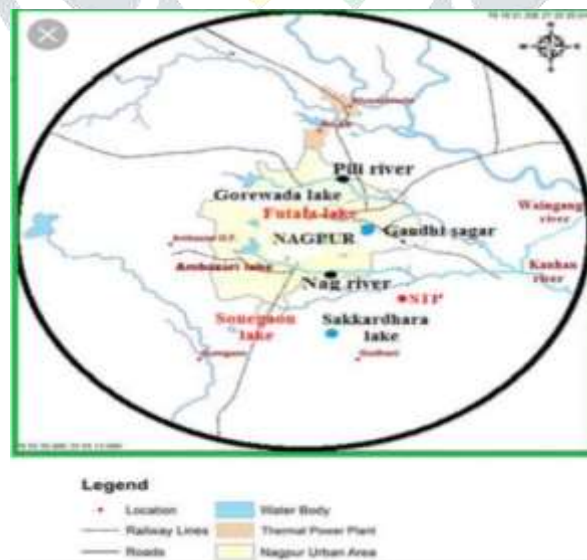


fig1. Study areas

3. RESULTS AND DISCUSSION

The monthly variations of seven physico-chemical parameters of lake water over a period of one year are given in table 1, 2 &3 and fig. 1

pH: pH values In the present investigation were lowest in winter season in all the three sampling sites, higher values were recorded in summer season. Ph remains almost high or alkaline in nature as reported by (Dutta and Sarangi, 1980, Choudhury *et al.*, 1984, Paul & Nandi, 2003 & Bandhopadhyay & Burman, 2006).

Turbidity: Turbidity was more in winter season than remaining season. Required turbidity in drinking water is 10 NTU but in this lakes water was contaminated with suspended, dissolved solids, silt clay and other substances in the water (Garg, 2003; Gupta & Shukla, 2004). The study had revealed highest record of turbidity in the month of October. This may be due to loose soil present in deep earth crust (Mishra & Patel, 2001)

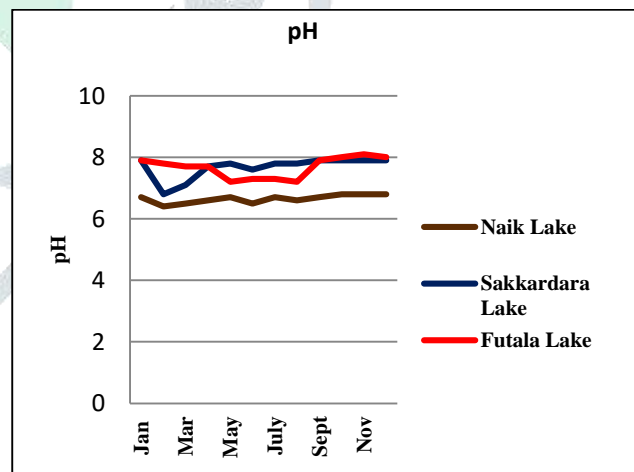
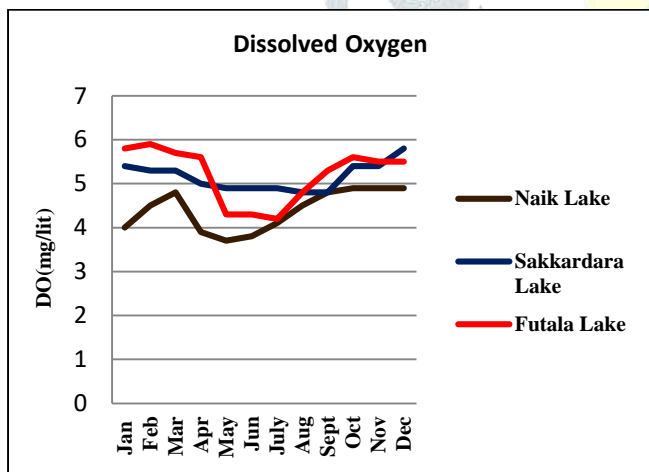
Dissolved Oxygen (DO): Dissolved oxygen is the essential parameter of water, Without dissolved oxygen water is not elixir. It is required for all creatures. The dissolved oxygen values varied according to the rate of respiration and decomposition of organic materials in the water. Pollution process tends to deplete the dissolved oxygen in the water (Mason, 1989). The colder the water, the more oxygen it can hold because gases like oxygen are more easily dissolved in cold water. The dissolved oxygen concentration was maximum in summer season in all three lakes and minimum in winter season (Saksena *et al.*, 2006). The lowest dissolved oxygen level was recorded in Naik lake as compared with other two lakes, it shows poor water quality.

Bio-chemical Oxygen Demand (BOD): Highest value of BOD was observed in winter season and lowest was in summer season. When the BOD exceeds the available DO Is depleted. In the present study the BOD Values was very high due to direct discharge of domestic waste water and other pollutants.

Alkalinity: In three lakes the total alkalinity content was highest in summer season. The lowest value was observed in winter season. The higher alkalinity in the lakes might be due to the anthropogenic activities and organic waste matters (Robert, 1977; Das & Sinha, 1994 & Paul & Nandi, 2003).

Hardness: Maximum hardness was recorded in summer season and minimum in winter season. According to Saksena *et al.*, 2006 hardness depends upon the soil characteristics of the lake and the present findings of three lakes contaminated with organic matters.

Chlorides: the high levels of chloride influences physiological and reproductive biology of aquatic organisms (Kinne, 1971). The values surpassed the acceptable limits of potable water quality (ISI, 1991). The amount of chloride varied from lake to lakes these results are in agreement with (Goel *et al.*, 1990).



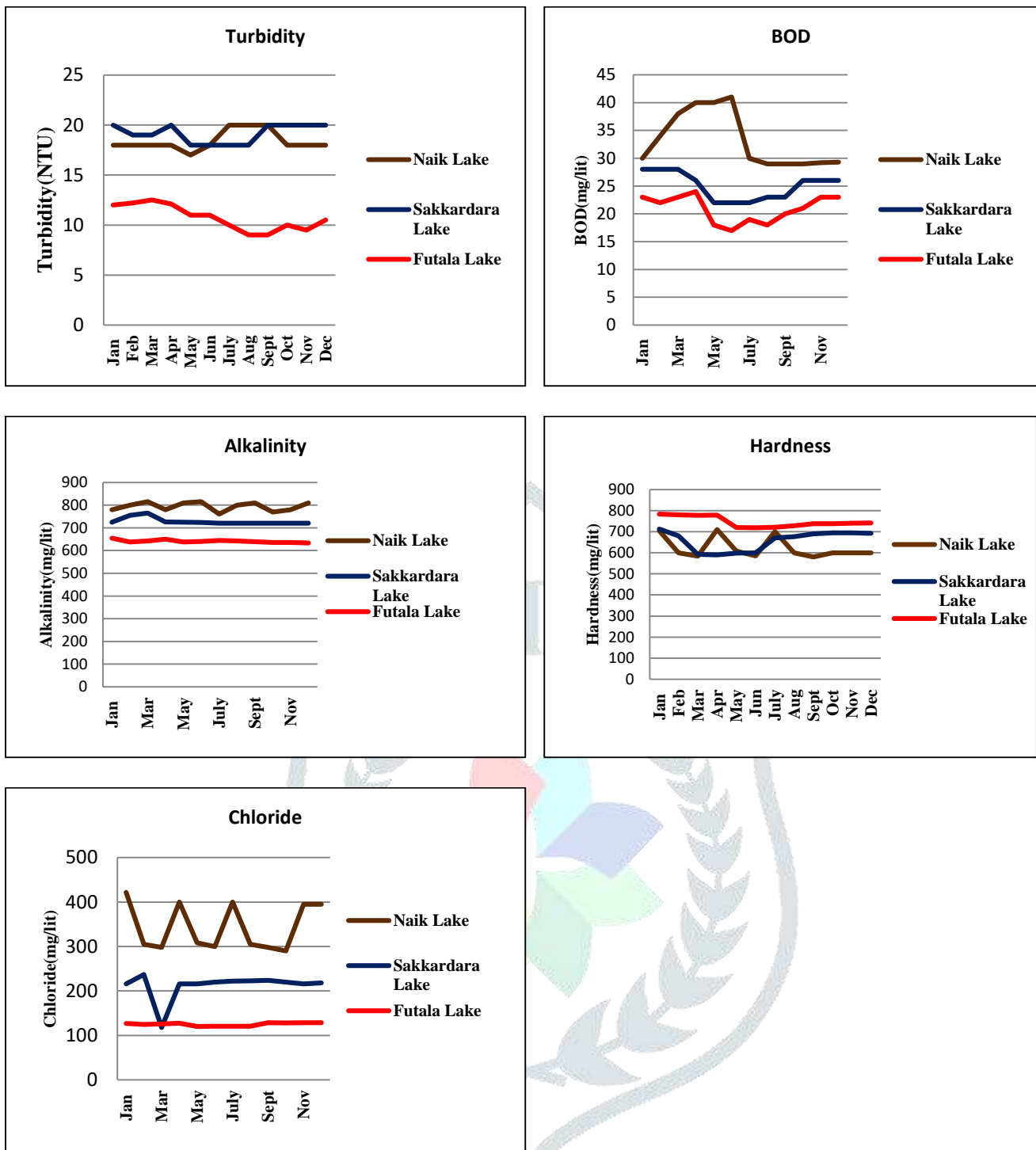


fig. 2 Seasonal variations in water parameters of three lakes of Nagpur city

All observations compared with WHO standards table No. 1-4. and graphically the study revealed there is gradual variation in dissolved oxygen in three lakes i.e. in Naik lake, Sakkardara and Futala lake.

4. CONCLUSIONS

A relatively higher concentration of chloride, BOD and hardness also indicate the unsuitability of water for domestic use and other purposes. Hence application of water quality technique for the overall assessment of the water body could be a useful tool. To summarize the baseline results of present investigation indicate that Naik lake water quality was poor. The observation shows the status of Futala lake was good as compared to Sakkardara and Naik lake. But all lakes need proper care, preliminary treatments and regular monitoring will be increased city beautification. Water crises will be fulfill by lakes restoration, storing fresh water and maintain ecosystem.

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