The water quality assessment of Amgaon Lake in Gadchiroli district, Maharashtra state (India)

SB Rewatkar

Principal, Mohasinbhai Zaweri College, Desaiganj (Wadsa) Dist. Gadchiroli, Maharashtra, India

Abstract

In order to understand the water quality of Amgaon Lake, Physico-chemical parameters are studied and analysed for the period of one year (October 2015 to September 2016). Various physico-chemical parameters, like temperature, pH, electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), chemical oxygen demand (COD), total alkalinity (TA), total hardness (TH), chloride (Cl^-), nitrate (NO_3^-), sulphate (SO_4^{--}) and phosphate (PO_4^{3-}) are determined. The results are compared with standards prescribed by WHO. The results revealed that there is significant seasonal variation in some physico-chemical parameters but most of the parameters are in normal range and indicate that the lake water is suitable for domestic, irrigation and pisciculture purposes.

Keywords: *Physico-chemical parameters, Amgaon Lake, water quality, monthly variations.*

1. Introduction

Water is one of the most important compound to the ecosystem. "No life without water" is a common saying depending upon the fact that water is the one of the naturally occurring essential requirement of all life supporting activities [1]. Since, it is a dynamic system, containing living as well as nonliving organic, inorganic, soluble as well as insoluble substances. So its quality is likely to change day to day and from source to source. Water is the most important in shaping the land and regulating the climate. It is one of the most important compound that profoundly influence life. The quality of water usually described according to its physical, chemical and biological characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic biota.

Factors that are directly or indirectly polluting the lake ecosystems includes population growth, unplanned growth of city area, urbanization, agricultural land expansion and lack of awareness among the local residents. All such activities and pollution causing factors are decreasing the utility of water day by day (Tank and Chippa) [2],

The present investigation involves the water quality assessment of Amgaon Lake of Desaiganj Taluka in Gadchiroli District of Maharashtra. Now a day's lake water is polluted due to domestic waste and agricultural discharges. Physico-chemical parameters of Amgaon lake water are studied and analyzed for the period of one year.

2. Material and Method

The surface water samples from Amgaon Lake are collected on first week of every month during 9.30 am to 11.30 am. Samples are collected from four different sites of lake in plastic cans of two litres capacity. The temperature, pH, conductivity and dissolved solids of the water samples are determined on the spot using a thermometer, pH meter, conductometer and TDS meter. The physico-chemical analysis of lake water samples are carried out according to standard methods. [3]. the results were compared with standards prescribed by WHO [4, 5, 6, 7].

3. Results and Discussion

The monthly variation in physico-chemical parameters of the Amgaon Lake have been given in the Table 1.

Table 1: Physicochemical parameters analysis of surface water Amgaon Lake (October 2015 to September 2016)
(Following values are the average of four site readings)

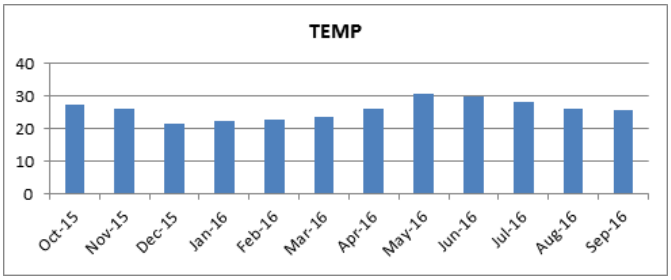
Parameters	Temp ^0C	pH	EC mS	TDS	TA mg/l	TH mg/l	D.O. mg/l	COD mg/l	Cl^- mg/l	NO_3^- mg/l	SO_4^{--} mg/l
Oct 2015	27.5	8.41	682	398.4	256.9	110.3	3.5	09.2	83.9	2.8	25.5
Nov 2015	26.2	7.62	701	442.2	264.8	129.2	4.2	10.5	81.2	3.5	30.3
Dec 2015	21.4	8.49	781	488.3	276.5	157.3	5.8	06.6	75.6	4.2	20.2
Jan 2016	22.2	7.93	624	530.1	223.4	102.4	3.7	11.8	88.3	4.8	28.4
Feb 2016	22.6	7.62	591	620.2	204.6	122.2	4.9	11.4	116.4	6.3	52.1
Mar 2016	23.4	7.81	649	565.6	306.2	150.5	3.1	12.0	110.2	8.2	78.6
April 2016	26.1	8.15	784	392.2	328.6	175.6	3.9	11.5	124.5	10.2	90.5
May 2016	30.5	8.92	865	740.4	358.9	225.0	5.2	07.2	160.0	11.5	87.2
Jun 2016	29.9	8.63	893	767.5	205.1	183.1	5.3	10.3	115.3	12.9	92.1

July 2016	28.0	7.93	981	770.8	125.3	99.5	4.9	11.2	150.2	13.7	98.0
Aug 2016	26.2	8.24	924	685.7	106.4	105.6	4.3	08.3	125.7	5.8	64.6
Sep 2016	25.8	7.52	705	667.9	175.2	94.3	3.9	11.5	108.5	4.4	48.5
Min.	21.4	7.52	591	392.2	106.4	94.3	3.1	06.6	75.6	2.8	20.2
Max.	30.5	8.92	981	770.8	358.9	225.0	5.8	12.0	160.0	13.7	98.0
WHO.	-	6.5-8.5	1000	1000	500	500	7.5	--	250	50	250

(All parameters are in mg/l except pH and EC. EC is in micro-Siemens,)

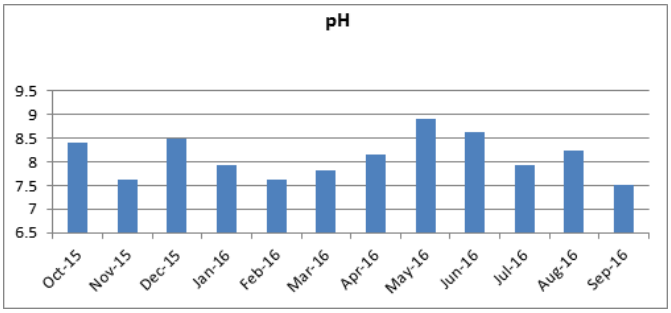
3.1 Temperature

The atmospheric temperature is recorded between 21.4 ºC to 30.5 ºC. The temperature is one of the important factors in aquatic environment since it regulates physicochemical as well as biological activities [8]. Temperature below 14°C and above 39.5°C is harmful for fish. Hence it can be concluded that the water temperature of Amgaon Tank is suitable for fish production [9].



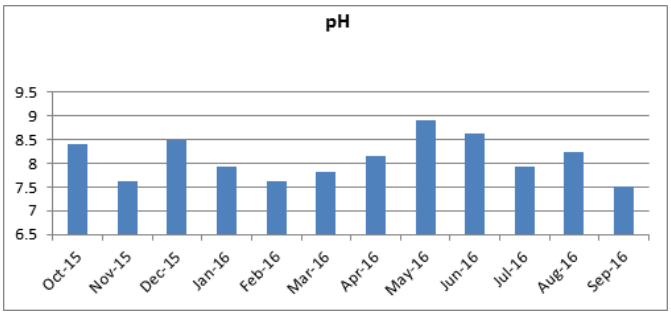
3.2 pH

The pH of Amgaon lake water is slightly alkaline as the values are being greater than 7.0. Minimum pH is recorded in September (7.52) and maximum in the month of May (8.92). Similar result are reported by Manjare *et al* in Tamdalge Tank. [10]



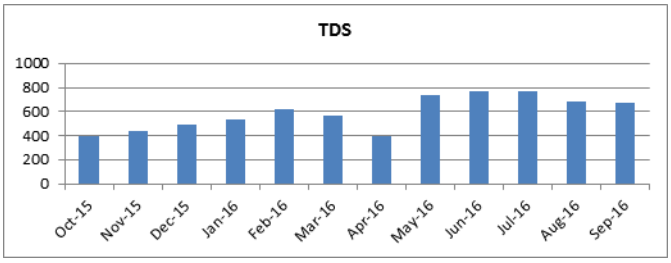
3.3 Electrical Conductivity (EC)

Electrical conductivity (EC) is the measure of water capacity to convey electric current it signifies the amount of total dissolved salts. [11] In present study conductivity values range from 591 to 981 micro-Siemens. The minimum value is recorded in February and the maximum in July.



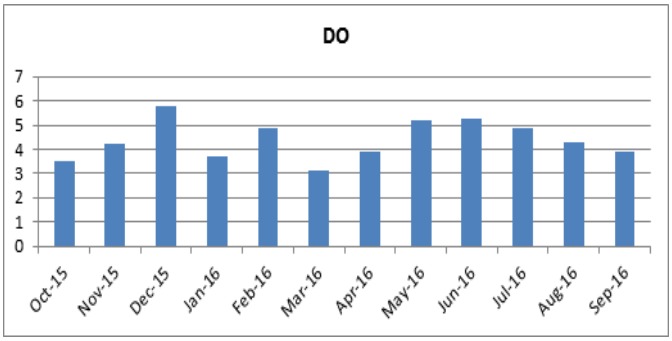
3.4 Total Dissolved Solids (TDS)

Total dissolved solids (TDS) indicates the general nature of water quality or salinity. In present investigation the total solids in the lake water fluctuated in the range of 392.2 to 770.8 mg/l. the minimum value is recorded in April (summer) and the maximum in July (monsoon). Basavaraka Simpi *et al* also recorded maximum value in monsoon due to heavy rainfall and minimum in summer in Hosahalli tank. [12]



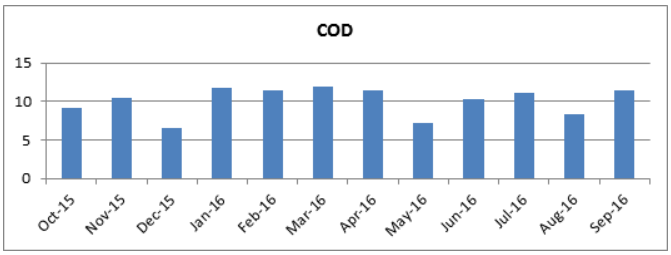
3.5 Dissolve Oxygen (DO)

In present investigation the dissolved oxygen concentration ranged from 3.1 to 5.8 mg/lit. Dissolved oxygen is minimum in March and maximum in December. Earlier workers also observed similar trend of dissolved oxygen in fresh water lakes [13]. Dissolve oxygen (DO) is one of the most important parameter in water quality assessment and reflects the physical & biological processes prevailing in the water.



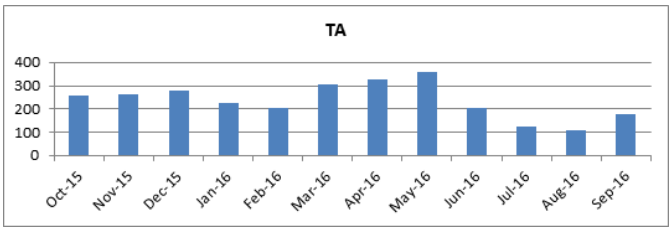
3.6 Chemical Oxygen Demand (COD)

Chemical oxygen demand (COD) is a measure of the oxidation of reduce chemicals in water. It is commonly used to indirectly measure the amount of organic compound in water. [14]. In present study, COD values varies from 06.6 to 12.0 mg/l. The minimum value was recorded in May and the maximum in October.



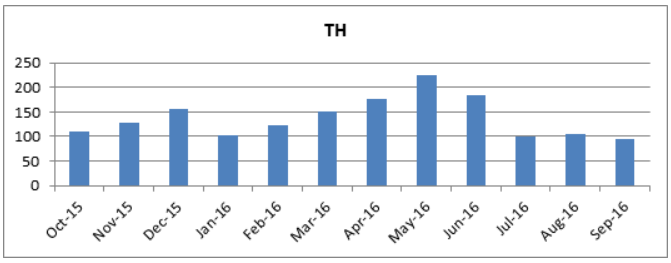
3.7 Total Alkalinity (TA)

Total alkalinity of the lake is varies from 106.4 to 358.9 mg/lit. The minimum value was recorded in august and the maximum in May (summer). Das and Chand also recorded low alkalinity during monsoon, which might be due to dilution effect of rainfall [15].



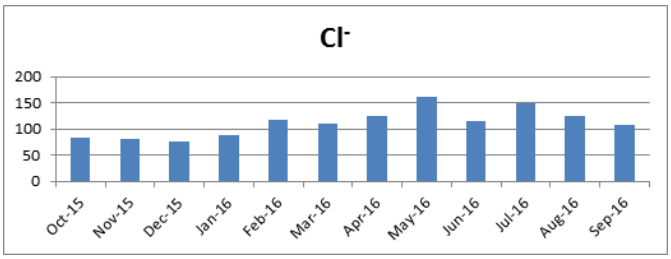
3.8 Total Hardness (TH)

Total hardness in water is the sum of concentration of alkaline earth metal cations such as Ca^{++}, Mg^{++}. The total hardness is the total soluble magnesium and calcium salts present in the water expressed as its $CaCO_3$ equivalent. The total hardness of Amgaon Lake found the range from 94.3 to 225.0 mg/lit. The minimum value is recorded in September (monsoon) and the maximum in may (summer). Hujare also reported total hardness high during summer than monsoon and winter. [16]



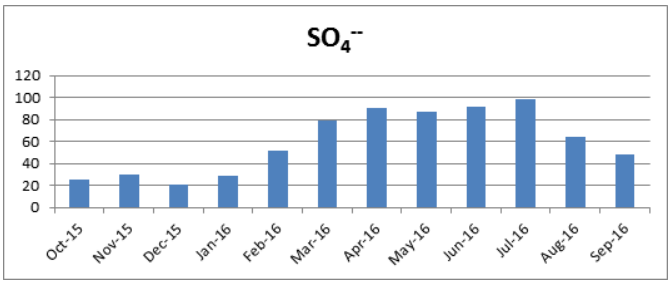
3.9 Chloride (Cl^-)

In present study, the chloride value varies from 75.6 to 160.0 mg/l. The minimum value is recorded in December (winter) and the maximum in the month of May (summer). Similar maximum value in summer are reported by Swarnalatha *et al* [17] High chloride ion concentration indicates organic pollution in water.



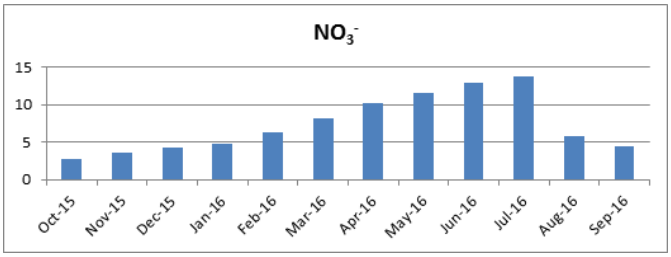
3.10 Sulphate (SO_4^{--})

Sulphate value fluctuates from 20.2 mg/l to 98.0 mg/l. The minimum value is recorded in December (winter) and the maximum in July (monsoon)



3.11 Nitrate (NO_3^-)

Nitrate value ranges from 2.8 mg/l to 13.7 mg/l the minimum value is recorded in October (winter) and the maximum in July (monsoon). Lake water can be contaminated by sewage and other wastage rich in nitrates. The main source of nitrate is the run off and decomposition of organic matter. The higher inflow of water and consequent land drainage cause high value of nitrate. (Thilange *et al*) [18]



4. Conclusion

The result revealed that there is significant seasonal variation in some physico-chemical parameters and most of the parameters are in the normal range and indicates better quality of lake water. The result indicate that the lake is not polluted and can be used for domestic, irrigation and pisciculture. The physico-chemical features of Amgaon lake water are influenced due to the discharge of domestic waste and agricultural discharges and washerman activity.

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