



Original Research Article

Physico-chemical study of the freshwater pond Osargaon- Ghonsari in Kankavli taluka of District Sindhudurg, Maharashtra, India

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Nature has gifted life with most precious commodity, which is water. Life is sustained by water. In a present study, an attempt was made to analyze various physico-chemical parameters of the freshwater pond Osargaon-Ghonsari located in Kankavli taluka in Sindhudurg district of Maharashtra state. The study was conducted for two years from March 2012 to February 2014. Water samples from the Osargaon-Ghonsari pond were collected monthly and analyzed for different parameters like colour, temperature, light penetration, turbidity, pH, total alkalinity, total hardness, chlorides, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, nitrites, nitrates, phosphates, sulphates. The results revealed that all the parameters were within the desirable limits of Indian standard specifications for drinking water.

Introduction

Ponds are the small aquatic ecosystems and are generally located near human civilization. Due to this reason these ponds are mostly influenced by the human activities which in turn pollute them. Most of the time all domestic wastes, agricultural runoffs, sewage is drained into these ponds which elevates the concentration of phosphates, nitrates, etc. causing pollution. Hence physico-chemical characteristics of this pond were studied during year 2012-2014 with respect to pollution. The freshwater pond Osargaon-Ghonsari is located in Kankavli taluka (16° 28' 55" N 73° 68' 44" E) in district Sindhudurg of state Maharashtra, India.

The total area of this taluka is 8.46 Sq. Km. The population according to 2011 was 16,398. It is an important town due to its central location in the Sindhudurg district. Kankavli is located in South- West Maharashtra. It has an elevation of 42m. it is situated on the banks of two rivers Gad river and Janavli river. Climate in Kankavli is a blend of coastal and inland climate of Maharashtra. The temperature has a relatively narrow range between 20°C to 40°C. The weather is humid, maximum temperature rarely exceeds 40°C. The taluka receives rainfall from June to September due to its proximity to the Western Ghats and Arabian Sea.

Materials and Methods

Water samples for the estimation of physico-chemical parameters were collected monthly from the study region for a period of two years from March 2012 to February 2014. One liter acid leached polythene cans were used for water sampling. Sample collection was done during morning hours between 7.00am to 10.00 am and brought to laboratory for further analysis. Parameters like colour, temperature, light penetration, pH, were estimated on the spot while samples for dissolved oxygen (DO) and biochemical oxygen demand (BOD) estimation were collected in BOD bottles and DO was fixed on spot and other parameters were analyzed in the laboratory as per standard methods prescribed by Trivedy and Goel (1986), APHA (1992), Kodarkar *et al* (1998).



Figure.1 Osargaon-Ghonsari Pond in Kankavli Taluka

Result and Discussion

The results of the study conducted during March 2012 – February 2014 at Osargaon – Ghonsari Pond are presented in table 1, 2, 3, 4 respectively. The results revealed that all the parameters analyzed were within the desirable limits of Indian standard specifications for drinking water, (IS:10500). Only pH was recorded higher than the desirable limit.

Colour: The colour observed during the study was dark green from February to May, while for rest of the months it was light green. Different matter present or dissolved in water imparts colour to natural water. Colour may result due to different metallic ions, planktons or any suspended matter.

Temperature: The temperature recorded during year 2012-2013 ranged in between 25°C - 34°C and during year 2013-2014 was between 25°C - 33°C. In both the years the maximum temperature was recorded in month on May while minimum temperature was recorded December. Temperature is one of the important parameter which regulates the overall environment of the aquatic ecosystem. Similar temperature fluctuations were also observed by Koshy and Nayar (1999) in river Pamba, Sawane *et al* (2007) in river Irai.

Light Penetration: Light penetration values ranged in between 217.02cm to 286.50cm in year 2012 – 2013, while 217.02cm to 288.5cm in year 2013 -2014. Light penetration values were recorded higher during month of October, which may be due to low depth of water at collection site. Adebisi (1981) has reported minimum light penetration in month of October while highest in month February of Ogun river.

Turbidity: In the present study, the turbidity values ranged from 0.2 NTU to 0.5 NTU in 2012 -2013, while in year 2013 –

2014 it ranged in between 0.2 NTU to 0.7 NTU. Higher values were recorded in summer and rainy season. Generally the turbidity in water is due to suspended matter or microscopic organisms making such water unfit for consumption or for other domestic purposes. The turbidity values observed during the present study were well within the permissible limits.

pH: The pH values recorded ranged in between 7.3 to 9.2 in year 2012 – 2013, while 7.1 to 9.2 in year 2013 – 2014 indicating alkaline nature of waterbody. Higher pH was recorded in summer season. Saxena and Chauhan (1993) also reported higher pH values in summer at Yamuna river in Agra.

Total Alkalinity: Total alkalinity values fluctuated from 24mg/L to 36mg/L in year 2012 – 2013, while 22mg/L to 36mg/L in year 2013 – 2014 showing maximum values in rainy season. Similar observations were done by Sahni *et al* (2011) at Mansagar Lake, Jaipur. However, higher alkalinity values were recorded by Kunungo and Naik (1987) at Raipur in summer season. Khatavkar and Trivedy (1993) stated pollution in water may cause increase in level of total alkalinity.

Total Hardness: Total hardness ranged from 15mg/L to 37 mg/L in year 2012 – 2013, while 17mg/L to 37mg/L in year 2013 – 2014. Higher values were recorded in rainy season, especially in month of August. Similar observations were recorded by Mishra and Tripathi (2001) in Ganga river. Mohanta and Patra (2000) recorded maximum values in summer and minimum values were recorded rainy season at Keonjhar Garh, Orissa. However, Koshy and Nayar (2000) reported higher values in post monsoon and pre monsoon period at Pamba river.

Chlorides: The values of chlorides reported during the study for two years did not show much fluctuation. In year 2012 – 2013 the values ranged in between 35.62mg/L to 39.94mg/L, while 37.67mg/L to 39.98mg/L in year 2013 – 2014. Higher chloride values are the indicator of pollution due to organic waste was stated by Moundiotiya *et al* (2004). In present study chlorides did not exceed the permissible limit indicating waterbody was unpolluted by organic waste

Dissolved Oxygen: The values of dissolved oxygen reported during the studies for two years ranged in between 6mg/L to 8.24mg/L. The higher values of dissolved oxygen were reported in month of December while minimum values in month of July.

Arvindkumar and Singh (2002) also reported higher values of dissolved oxygen in winter at Mayurakshi river. Similar results were also reported by Biswas *et al* (2011) at Budha reservoir in Raipur. Higher dissolved oxygen values in winter season may be due to higher solubility of oxygen in water due to decrease in temperature. Chourasia and Adoni (1985) and Sukumaran and Das (2002) stated that the lower catabolic activity of the aquatic organisms probably accelerated the dissolved oxygen in the water. All aquatic aerobic organisms require oxygen for metabolism and it is obtained from dissolved oxygen.

Biochemical Oxygen Demand: The total amount of oxygen used by microbes to breakdown the organic material in an aquatic ecosystem is called biochemical oxygen demand. The biochemical oxygen demand values showed a very little fluctuation throughout the year. The values ranged from 2.41mg/L to 2.86mg/L during both the study years.

Table.1 Physical parameters of Osargaon- Ghonsari Pond, Kankavli taluka, Sindhudurg District during March 2012- February 2014

Month	Colour		Temperature (°C)		Light Penetration (cm)		Turbidity (NTU)	
	2012- 2013	2013- 2014	2012- 2013	2013- 2014	2012- 2013	2013- 2014	2012- 2013	2013- 2014
March	Dark Green	Dark Green	28	29	217.02	217.02	0.5	0.7
April	Dark Green	Dark Green	31	31	219.97	221.97	0.4	0.6
May	Dark Green	Dark Green	34	33	223.98	223.13	0.5	0.5
June	Light Green	Light Green	32	33	225.78	233.78	0.4	0.5
July	Light Green	Light Green	31	31	233.22	243.22	0.4	0.3
August	Light Green	Light Green	30	31	237.01	241.01	0.4	0.3
September	Light Green	Light Green	30	30	234.98	231.98	0.3	0.5
October	Light Green	Light Green	31	31	286.5	288.5	0.2	0.2
November	Light Green	Light Green	28	27	246.04	253.04	0.3	0.3
December	Light Green	Light Green	25	25	261.89	267.89	0.3	0.2
January	Light Green	Light Green	26	25	225.67	225.67	0.5	0.6
February	Dark Green	Dark Green	27	27	223.7	227.7	0.4	0.4

Table.2 Chemical parameters of Osargaon- Ghonsari Pond, Kankavli taluka, Sindhudurg District during March 2012- February 2014

Month	pH		Total Alkalinity (mg/l)		Total Hardness (mg/l)		Chlorides (mg/l)	
	2012-2013	2013-2014	2012-2013	2013-2014	2012-2013	2013-2014	2012-2013	2013-2014
March	8.6	8.7	26	26	22	22	39.90	39.91
April	8.0	8.1	27	31	24	22	37.93	37.98
May	7.8	7.8	31	31	31	31	37.62	37.67
June	7.8	7.7	31	31	33	35	39.74	39.79
July	7.5	7.5	35	33	35	33	38.93	39.93
August	7.3	7.1	35	35	37	37	38.34	38.37
September	7.3	7.3	36	36	35	35	35.62	38.63
October	7.4	7.4	36	33	26	28	37.94	39.98
November	7.6	7.1	32	32	25	25	38.31	38.34
December	7.8	7.5	26	29	21	21	38.19	38.19
January	8.4	8.2	29	22	15	17	38.17	38.17
February	9.2	9.2	24	24	22	22	39.98	39.98

Table.3 Chemical parameters of Osargaon- Ghonsari Pond, Kankavli taluka, Sindhudurg District during March 2012- February 2014

Month	Dissolved Oxygen (mg/l)		Biochemical Oxygen Demand (mg/l)		Chemical Oxygen Demand (mg/l)	
	2012-2013	2013-2014	2012-2013	2013-2014	2012-2013	2013-2014
March	7.12	7.12	2.83	2.86	90	93
April	7.12	7.12	2.84	2.81	91	91
May	6.84	6.82	2.82	2.82	94	94
June	6.45	6.45	2.81	2.81	102	106
July	6.03	6.01	2.75	2.75	103	103
August	6.12	6.12	2.56	2.56	101	103
September	6.46	6.44	2.41	2.41	102	102
October	6.84	6.84	2.83	2.83	100	103
November	7.83	7.85	2.82	2.82	101	101
December	8.24	8.24	2.83	2.83	92	93
January	7.83	7.83	2.76	2.81	91	91
February	7.65	7.65	2.84	2.84	93	93

Table.4 Chemical parameters of Osargaon- Ghonsari Pond, Kankavli taluka, Sindhudurg District during March 2012- February 2014

Month	Nitrates (µgatoms/l)		Nitrites (µgatoms/l)		Phosphates (µgatoms/l)		Sulphates (mg/l)	
	2012-2013	2013-2014	2012-2013	2013-2014	2012-2013	2013-2014	2012-2013	2013-2014
March	10.21	10.17	182.45	184.41	191	190	0.12	0.12
April	9.62	9.67	183.40	184.40	167	167	0.16	0.18
May	9.61	9.61	181.23	181.23	165	167	0.23	0.23
June	9.11	9.11	181.01	181.01	156	153	0.32	0.31
July	8.73	8.76	173.89	176.83	143	143	0.31	0.31
August	7.01	7.01	176.34	176.34	139	133	0.31	0.33
September	6.52	6.52	173.88	173.83	132	135	0.30	0.30
October	4.16	4.13	202.08	202.08	300	305	0.44	0.42
November	4.93	4.93	201.45	201.45	270	272	0.42	0.45
December	5.34	5.34	201.03	201.03	252	252	0.36	0.33
January	7.96	7.96	200.88	200.88	212	217	0.23	0.23
February	10.8	10.8	182.6	182.6	210	210	0.12	0.12

Comparatively higher BOD values were obtained in summer while minimum values in rainy season. These results are similar to the results of Biswas *et al* (2011) at Budha reservoir in Raipur. Kanungo and Naik (1987) in their study of nineteen ponds of Raipur found BOD values ranging from 31.2 to 67.6mg/L. Higher values of upto 380mg/L and 460mg/L were also reported by Rao *et al* (1978) at Ujjain and Chattopadhyay *et al* (1984) at Ganga river in Kanpur region respectively. These higher values of BOD are may be due to heavy civilization and increased inflow of organic matter as well as domestic sewage in the waterbody.

Chemical Oxygen Demand: In the present study, the chemical oxygen demand values ranged in between 90mg/L to 103mg/L in year 2012- 2013 while in year 2013-2014 values were in between 91mg/L to 106mg/L. the higher values were recorded during monsoon and post monsoon period during both the year. Dakshini and Soni (1979) stated that domestic sewage and industrial

waste are main factors responsible for increase in COD values which they studied in Yamuna river. According to Biswas *et al* (2011) higher BOD values reflect the organic and inorganic pollution of waterbody. BOD values upto 830mg/L were reported by Govindan and Sundaresan (1979) at Adyar river.

Nitrates: The values of nitrates in present study fluctuated from 4.16 µgatoms/L to 10.8µgatoms/L during both the years of study. The highest values of nitrates were recorded in month of February while lowest values were recorded in month of October. However, Arvindkumar and Singh (2002), Badge and Verma (1985) recorded highest values of nitrates in rainy season at Mayurakshi river in Santhal Pargana, Jharkhand and J.N.U. lake New Delhi respectively.

Nitrites: Lokare and Rathinraj (1997) started nitrite as an intermediate product, when a bacterium oxidizes ammonia to nitrate. Nitrate values ranged in between 173.89µgatoms/L to 202.08µgatoms/L in

year 2012-2013 while in year 2013-2014 the values were within the range of 173.83 µgatoms/L to 202.08µgatoms/L. Higher values were reported in October.

Phosphates:In the present study the values of phosphates ranged in between 132 µgatoms/L to 300 µgatoms/L in year 2012-2013 while in year 2013-2014 the values were in between 133 µgatoms/L to 305 µgatoms/L. Higher values were recorded in post monsoon season during both the years of the study. This may be due to agricultural runoff during rainy season to the waterbody. Inflow of fertilizers and detergents into waterbody are responsible for high concentration of the phosphates, is stated by Tuzen *et al* (2002). Imevbore (1978) said that phosphate content in lotic waters change slightly from time to time while in lentic waters is more or less constant.

Sulphates:In present study the values of sulphate recorded were in range from 0.12mg/L to 0.44mg/L during year 2012-2013 while during 2013-2014 it ranged in between 0.12mg/L to 0.45mg/L. Higher values were recorded in winter as compared to rainy season and minimum values in summer season. Kulshresta *et al* (1992) and Singh and Singh (1990) recorded maximum sulphate values in monsoon season at Manas Sarovar reservoir, Bhopal and Subernarekha river at Ranchi, Bihar respectively.

In present study all the parameters except pH were within permissible limits of IS standards. The water of the Osargaon-Ghonsari pond is pollution free and good for human consumption and other domestic utility. The present study will also help in providing base line data for the conservation and monitoring of the pond.

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