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PHYSICO-CHEMICAL STATUS OF ASOLAMENDHA RESERVOIR DISTRICT - CHANDRAPUR (MAHARASHTRA)

Rajendra V. Tijare and A. J. Shastrakar

Abstract

Asolamendha reservoir is situated at coordinates 20°15'16"N, 79°49'18"E near Pathari village in Chandrapur district. This perennial lake constructed on the Pathri river and water of the lake used for the agriculture and fishery purposes. Due to anthropogenic activities and due to the carelessness this water body is under problematic condition for the fish culture and agriculture. Physicochemical study was carried out from June 2010 to May 2012 during different seasons. Total 14 physicochemical parameters analyzed for the judgment of water quality of lake.

Keywords :*Physicochemical, status, Asolamendha*

Short Profile

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INTRODUCTION:

In aquatic ecosystem physico-chemical environment exert profound influence on its biotic compo nents, it controls biodiversity, biomass and spatial distribu-tion of biotic comm-unities in time and space. The physical and chemical parameters exert their influence both, individually and collectively and their interaction creates a biotic environment, which ultimately conditions the origin, development and finally succession of the biotic commu-nities.

The Asoamendha reservoir, located near Pathari, Sindewahi taluka of Chandrapur district of Maharashtra (India). It is historical lake situated 1 km away from Pathari village and near about 60 km away from Chandrapur city. The reservoir is situated at coordinates 20°15'16"N, 79°49'18"E near Pathari village in Chandrapur district. Its construction work have been started from 1902-03 and completed on 1917-18. It is huge lake sprayed over about 93724 hect, and having water storage capacity 67.017 million cubic meters. The length of the main canal is 27.12 miles and the length of distributor or minor canal is 139.14 miles. About 18794303 sq.m space is under the water surface and depth of reservoir is 208.33 m is noted as per the information collected by the irrigation depart-ment. Temperature of Asolamendha region is minimum upto the 19.2 ^{0}C and maximum up to 37.4 0C, it is quite nice for the diversity present at that region.

This reservoir is surrounded by the forest and average rainfall in the catchment area of Asolmendha reservoir is 1146 mm. In the rabbi season most of the former take yield of rice and other crop except wheat. This is a perennial reservoir constructed on the Pathri river and water of the lake used for the agriculture and fishery purposes. The sub-basin of this lake is Pranhita and basin is Godavari river. There are near about 50,859 hector land is getting benefits from this lake for the agriculture purpose throughout the year. Some talukas are

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benefited from this lake such as 3959 ha. area of Mul, 500 ha. area of Pombhurna, and 5460 ha. area of Saoli tahsils . Number of villages which are getting the benefits from this reservoir is 63 and all are depends upon water of this reservoir. But due to some man-made activities or due to the carelessness this water body is under problematic condition for the fish culture and agriculture. Due to huge lake area and beneficial characteristics it is important to investigate physicochemical characteristic of this reservoir, so that this lake is taken for investigation.

Material and method:

The study was carried out from June 2010 to May 2012 during three different seasons. The seasons defined as monsoon (June to September) and winter (October to January) and summer (February to May). Sampling sites were chosen from the lake keeping in view the accessible area of the lake. Sampling sites were selected at 3 different corners of the lake and samples were collected under the permission of forest department. Monthly samples were collected from three sites in the morning hours from June 2010 to May 2012. in five litre plastic cans. Sample for dissolved oxygen determination was collected in 300 ml capacity BOD bottle from just below the surface slowly to avoid any air bubble entering into the bottle and fixed by Winkler A and Winkler B solution at the site. The parameters like temperature, pH conductivity and transparency were analyzed with the help of thermometer and water analysis kit developed by EIPRODUCTS, (MODEL -161 – E). Measurement of transparency was done by Secchi disc. For the analysis of chemical parameters the samples were transported to the laboratory. Physico-chemical parameters were analysed with the help of the procedures given by APHA (1998), Khanna and Bhutiani (2004), Bhalerao (1998) and Kodarkar (1992).

Result & Discussion:

Temperature: Ambient temperature ranged from 27.60 ^{0}C to 44.30 ^{0}C. Minimum temperature was recorded in month of January and maximum temperature was recorded in the month of May in 2011 - 12. Maximum temperature is found in the summer season due to the high solar radiation and clear atmosphere, while minimum in winter season might be due to decrease solar radiation, cloudy days and short day and thereafter steadily increased till month of May (Lohar and Patel; 1998, Siddamallayya and Pratima; 2008).

Water temperature plays an important role in water body. It influences the physiology of the organism. The water temperature was in the range of 23.15 ^{0}C to 34.60 ^{0}C. The maximum temperature recorded during the month of May and minimum during December (Sahani and Yadav; 2012). Minimum temperature recorded in the winter season while maximum temperature was found in summer season. Many workers observed similar trends while working on different water bodies (Khan et al.; 2012, Dwivedi and Pandey 2002, Pawar et al., 2009).

pH: pH values was ranges from 7.1 to 8.12 during the investigation period and indicates alkaline nature of the water (Kulkarni and Zade; 2012). pH high in monsoon season, indicating its dependence on photosynthetic activity. The maximum pH recorded in monsoon while minimum pH was recorded in the winter season (Goel et al., 1985, Meshram et. al.; 2012).

Conductivity: It provides an indication of ionic concentration of most dissolved inorganic substances in water and hence contribute to conductance. Minimum conductivity 0.198 umohs reported during month of February and maximum i.e 0.415 during monsoon season in month of August (Unni et al.; 1998). The seasonal variation in the conductivity may be due to the increase in concentration of salt due to discharge of domestic influents and organic matter from the nearby residential area into the

lake. Minimum value of conductivity in the winter season might be due to the utilization of minerals by phytoplankton, macrophytes and much dilution of pond water.

Transparency: Minimum transparency was recorded during monsoon in month of August i.e. 25.5 NTU and maximum transparency was recorded during in December (69.5 NTU) which also supported by Shashikant and Raina (1990), Kaushik and Saxena (1999) and Kadam et al., (2007). Pawar and Pulle (2005) also recorded same finding of transparency from the different water bodies from the Maharashtra, as per present finding. Minimum value of transparency in monsoon might be due to influx of rain water from catchment area, cloudiness, less penetration of light and high turbidity due to suspended inert particulate matter. The water transparency values were maximum in the season of summer and minimum in the monsoon season.

Total alkalinity: Total alkalinity was ranged from 159.00 mg/ ltr to 365.00 mg/ ltr. The maximum alkalinity was noted down during the month of June and minimum during March (Khan et al.; 2012). Maximum value of the total alkalinity found in the June while minimum in March in 2011 - 12. Fluctuation in the total alkalinity could be correlated with increase and decreases oscillation of the photosynthetic activities in different season. Maximum value of alkalinity might be due to surface runoff from the catchment area and minimum value may be due to high photosynthetic rate (Hujare 2008).

Total hardness: Total hardness ranged between 86.00 mg/ ltr to 156.00 mg/ ltr. The minimum value of total hardness was recorded in month of January 2010-11 and maximum in the month of June 2011-12. It is also important components for the exoskeleton and endoskeleton of the Arthropods and shell in Mollusca (Piska 2000). Maximum values of total hardness of water may be due to leaching of rocks in catchment area. These are the main source of calcium and magnesium in natural water. The higher values of total hardness of water may be due to deposition of calcium and magnesium salt (Bagade and Verma; 1985).

Calcium and Magnesium Hardness: Calcium hardness was ranged between 49.00 mg / ltr to 98.00 mg / lt. Maximum value recorded during month of June 2011-12 and minimum during the month of February 2010-11. Magnesium hardness ranged between 27.00 mg / lt to 58.00 mg/ lt. The maximum value was found during month of June 2011-12 while minimum during the month of January 2010-11. Calcium hardness as well as magnesium hardness both values are maximum in monsoon season and minimum in winter season.

Total solids: The total solid ranges between 445.0 to 985.0 mg/lit. Minimum total solids were recorded in month of February and maximum value of total solids was recorded in month of September (Salve and Hiware; 2006). Maximum value total solid may be due to high turbidity, leaching of rocks, and surface flow (Kalbandhe et al.; 2012).

Total dissolved solids: The total dissolved solids were ranged from 245.00 mg / lt to 6645.00 mg/lt. The maximum range of the TDS recorded in October 2010-11 and minimum range of the TDS recorded in February 2011-12. In the present investigation maximum TDS found in monsoon season and minimum in summer season.

Dissolved Oxygen: DO is the important physicochemical parameter which affects on the distribution of aquatic organism. Dissolved oxygen range recorded between 4.0 mg / ltr to 10.23 mg / ltr. Maximum value of dissolved oxygen recorded in the month of January and minimum range recorded in the month June.

Dissolved oxygen in maximum range recorded in winter 2011-12 and minimum in monsoon in the month of June.

Free carbon dioxide: The value of free CO2 ranged between 2.02 mg/ltr to 4.65 mg/ltr. The maximum range of free CO2 was recorded in the month of August and minimum range of free CO2 was recorded in the month of December (Patil and Tijare; 2001). High values of CO2 recorded during summer season may be high rate of biological oxidation of organic matter due to high temperature and respiratory activity of biota. However low value free CO2 during winter may be due to maximum utilization of CO2 by more algal bloom in winter, decrease water temperature and low diffusion from air (Vyas 1968). The annual peak in the month of March is attributed to increased decomposition of dead organic matter with the rise in temperature.

Sulphate: Suphate was recorded in the range of 9.3 mg/ lt to 20.32 mg/ltr. Maximum value of sulphate was recorded in September and minimum value of sulphate was recorded in April. The maximum value of sulphate was found in monsoon due to surface runoff and sewage influx in the water.

Phosphate: Phosphate recorded in the range of 0.213 mg / ltr to 0.878 mg / lt. Maximum value of the phosphate recorded in the month of September and minimum value of phosphate recorded in the month of February. Maximum value of the phosphate recorded in the monsoon season and minimum value of phosphate recorded in the summer season followed by the winter (Patil et al., 2011). The high values of phosphate in monsoon are mainly due to rain, surface water runoff, agriculture run off; cloths washing activity could have also contributed to the inorganic phosphate content, and minimum value may be due to abundance of phytoplankton population (Arvindkumar; 1996).

Nitrates: Nitrate recorded in the range of 0.309 mg/ltr to 1.023 mg/ltr .Maximum value of the nitrate recorded in the month of September and minimum value of nitrate recorded in the month of February. Maximum value of the nitrate recorded in the monsoon season and minimum value of nitrate recorded in the onset of summer season, supported by Swaranlatha and Narsingrao (1998). Maximum value of nitrate was might be due to heavy run-off of the oranic matter from the catchment area. Human and animals waste detergent is good source of nitrates

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Table 1 : Monthly variations of physico-chemical parameters of water in Asolamendha lake during 2010-11

S. N.	Parameters	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Ambi. Temprature	42.3	40.1	38.12	36.14	35.9	34.5	29.6	28.3	31.5	41.2	42.6	44.2
2	Water Temprature	32.2	31.25	29.6	28.4	27.9	27.2	25.1	23.5	25.05	29.3	31.9	34.15
3	pH	8.05	8.1	8.12	7.9	7.5	7.42	7.32	7.1	7.32	7.54	7.6	8.1
4	Conductivity	0.365	0.41	0.415	0.356	0.298	0.235	0.243	0.21	0.198	0.245	0.265	0.36
5	Transparency	32	30.5	28.6	29.5	39.5	45.5	52.5	62	63.5	59	52	49.5
6	Total Alkalinity	201	270	319	340	309	285	260	215	199	210	320	325
7	Total Hardness	130	142	135	120	112	106	96	86	89	99	113	125
8	Ca - Hardness	86	97	85	89	79	65	61	59	49	59	68	86
9	Mg - Hardness	44	45	50	31	33	41	35	27	40	40	45	39
10	Total Solids	516	780	890	985	910	754	610	590	530	610	645	710
11	T.D.S.	455	560	610	625	645	565	510	490	410	560	585	615
12	D.O.	4	4.1	5.2	5.7	6.2	7.12	8.13	8.5	7.3	5.2	4.21	4.1
13	Free CO2	3.1	3.1	3.4	4.3	3.5	2.1	2.02	2.19	4.11	4.08	4.3	4.2
14	Sulphate	10.2	12.3	14.5	14.6	12.2	12	11.5	11.1	9.6	9.56	9.3	11.3
15	Phosphate	0.63	0.73	0.78	0.59	0.513	0.462	0.432	0.356	0.312	0.302	0.41	0.53
16	Nitrate	0.56	0.79	0.989	1.023	0.983	0.652	0.561	0.456	0.356	0.389	0.456	0.548

Table 2 : Monthly variations of physico-chemical parameters of water in Asolamendha lake during 2011-12

S.N.	Parameters	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
1	Ambi. Temprature	43.2	40.12	38.6	37.85	36.12	33.88	29.52	27.6	31.52	41.2	42.61	44.3
2	Water Temprature	32.12	29.56	29.45	28.12	27.65	26.31	23.15	23.56	26.42	29.65	32.5	33.98
3	pH	7.68	7.98	8.06	8.01	7.12	7.45	7.65	7.56	7.32	7.12	7.68	7.96
4	Conductivity	0.342	0.365	0.312	0.297	0.256	0.215	0.198	0.156	0.286	0.249	0.265	0.389
5	Transparency	27.5	26	25.5	35.5	45.5	61	69.5	71	64.5	53.5	51.5	41
6	Total Alkalinity	365	312	298	254	201	186	176	173	165	159	213	341
7	Total Hardness	156	133	112	105	99	94	89	87	101	123	145	149
8	Ca - Hardness	98	85	67	63	59	64	61	60	69	87	89	98
9	Mg - Hardness	58	48	45	42	40	30	28	27	32	36	56	51
10	Total Solids	641	698	745	856	764	642	608	587	445	573	599	612
11	T.D.S.	397	423	532	512	465	364	312	289	245	289	302	385
12	D.O.	5.6	6.12	6.8	6.9	7.12	7.32	9.65	10.23	9.65	8.64	7.64	6.1
13	Free CO_2	3.12	3.25	4.65	4.32	3.56	4.32	3.12	3.02	2.65	2.45	3.12	3.96
14	Sulphate	12.3	15.62	18.52	20.32	16.52	17.65	15.61	14.3	12.23	13.54	14.32	14.97
15	Phosphate	0.658	0.678	0.789	0.878	0.654	0.546	0.463	0.356	0.213	0.245	0.365	0.598
16	Nitrate	0.789	0.898	0.978	0.879	0.765	0.654	0.523	0.532	0.309	0.359	0.469	0.661

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