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Water Quality and Phytoplanktons of Bhogaon Reservoir in Parbhani District, Maharashtra, India

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A B S T R A C T

Present paper deals with the study of Physico-chemical parameters of Bhogaon reservoir in Parbhani district of Maharashtra. Seasonal variations in the physical and chemical parameters such as water temperature, pH, dissolved oxygen, total alkalinity, total hardness, chlorides, sulphates, total dissolved solids were investigated for a period of two years from 2014 to 2015. All parameters were within permissible limits. This represents that the reservoir is non-polluted and can be used for agriculture, fish culture and domestic use. The species of phytoplanktons investigated are chlorophyceae, Bacillariophyceae, Cynophyceae and euglenophyceae represented as true planktonic forms found in freshwater Bhogaon reservoir.

Introduction

Water is the life-blood of agriculture. India, being an agricultural country, has to depend much on irrigation and its development. Most of the works on irrigation are completed and some of the proposed projects are in the stage of completion. The importance of reservoirs is likely to increase over time as population, economic activity, and irrigation demands grow. In most regions, reservoirs are the single most important component of the regulated water supply system.

Phytoplanktons are vital component of aquatic life. They provide food for fishes and play a key role in maintaining proper equilibrium between biotic and abiotic components of the aquatic ecosystem. However the number of species of plankton determines the trophic level of the water body. Phytoplakton presence in the water body reflects the average ecological conditions and therefore, they may be used as indicator of water quality. Sharma and Sharma (1992) and Vijaykumar (1994) reported that the metabolic activities of the organisms depend on the physico-chemical factors of their aquatic environment and these factors in tern play an imperative role

in qualitative distribution of phytoplankton during different seasons.

Several researches are available on limnobiological aspects on Indian waters with reference to fish potential and planktonic growth viz. Joshi et al. (1981), Mishra (1991), Desai and Singh (2000), Sirsat et al (2004), Nafeesa Begum and Narayana (2006), Pawar et al (2006), Lakde et al (2010) and Kadam and Babar (2010).

The present investigation was undertaken to study the seasonal variation in water quality and phytoplankton population of the Bhogaon reservoir. The data on plankton in reservoir was collected seasonally for two years during pre-monsoon, monsoon and post-monsoon periods of 2014 and 2015.

Study Area

The study area Ambikapurwadi (Bhogaon) reservoir (Fig 1) is in Jintur Tahsil of Parbhani District, Maharashtra, India. Bhogaon reservoir, which is minor reservoir on the stream of Karpara river a tributary of Purna river. The reservoir is located in the latitude of $19^0$34′20" N, longitude of $76^0$45′30" E, included in the Survey of India toposheet no. 56 A/14 and covering reservoir area of 0.258 sq. km. The area belongs semiarid and subtropical climate with average annual rainfall of 909 mm. Except for monsoon period, the weather is generally dry. The monsoon rains are from SW monsoon winds and the rainy season starts from June and last till September and the post-monsoon or retreating monsoon season stretches from October to November. The winter season stretches from December to the end of February. The summer outset, in the area, from March and continues up to May. Average rainfall in the area is 811.10 mm. Most of the rain is received during the monsoon months from July - October.

Materials and Methods

The important physico-chemical parameters in assessing the quality of water from the reservoir water samples were collected from the reservoir for three seasons (i.e. pre-monsoon-April, monsoon-August and post-monsoon-November) during year 2014 and2015.

The samples for water analysis were collected in separate wide mouthed crew capped air tight and opaque polythene container. Each sample contains five litre of water and collected from fifteen cm below the surface. Separate samples were collected for estimation of dissolved oxygen and pH with necessary precautions. Remaining physico-chemical parameters were followed by standard methods of Trivedy and Goel (1986), Kodarkar (1992) and APHA (2006).

A simple type of planktonic net was used, large water was filtered through the sides and the planktons concentrated in a bottle connected at the lower end of the net. Phytoplankton kept in sedimentation columns after added 10 ml Lugol's iodine solution and the quantitative and qualitative analysis of phytoplankton was done by drop count method and calculated according to the formula of Welch (1952). Identifications were done by referring standard text by Phllipose (1967) and Adoni (1985).

Results and Discussion

The variations in the Physico-chemical parameters of Bhogaon reservoir water during the three seasonal periods of 2014 and 2015, and represented in the table 1 are described below:

Water Temperature

Water temperature is an important factor which influences the chemical, biochemical and biological characteristics of water body. Water temperature of Bhogaon reservoir ranged between 23.8 °C and 31.3 °C. The minimum water temperature was recorded in the winter season and maximum in the summer months. Similar results were reported by Jayabhaye et. al. (2008) and Kadam and Babar (2012).

pH

The pH of water ranged between 7.3 and 8.0. The minimum pH was recorded in the season of post-monsoon and it was highest in the season of pre-monsoon. Bade et.al. (2009), Jayabhaye et.al. (2008) and Kadam and Babar (2012) reported the similar observations.

Dissolved Oxygen

It is an important factor in water as it controls many metabolic processes of aquatic organisms. The dissolved oxygen almost all plants and animals need for respiration. The values of dissolved oxygen ranged from 4.3 mg/lit to 5.2 mg/lit. The minimum dissolved oxygen was recorded in the month of May (summer) and maximum in the month of August (monsoon).

Turbidity

The turbidity in reservoir is mainly due to silty floods or incoming of silt with water from catchment area in the upper reaches. The diminution of the solar ray penetration during monsoon, causes lowering of pH and DO give a positive co-relation whereas chloride and sulphate show converse correlation with respect to turbidity. The seasonal variation has been observed in the present study and it ranged from 37 to 55 NTU. Higher turbidity affects the life indirectly by cutting the light to be utilized by the plant for photosynthesis there by declining the rate of primary production and hence reduces the phytoplanktonic growth. The high level of turbidity may curtail the phytoplankton inhabitants. WHO (2006) recommended 5 NTU and Indian standard up to 10 units turbidity permissible for drinking water (BIS 2012). Devi (1997) also reported the maximum total dissolved solids during monsoon in Shathamraj and Ibrahimbagh reservoir of Hyderabad. Same findings were recorded by Sakhare (2007) and Tripathi and Pandey (1990).

Total alkalinity

Alkalinity is the measure of the capacity of water that neutralizes the acids. In present study the total alkalinity ranged between 33.5 mg/lit and 37.9 mg/lit. Total alkalinity found minimum in monsoon and maximum in summer during the study. Similar observations were also made by Bade et.al. (2009) and Kadam and Babar (2012).

Total hardness

The values of hardness ranged between 105 mg/L to 121 mg/L. The maximum value (121 mg/lit) was recorded in the post-monsoon period and minimum value (105 mg/lit) in the pre-monsoon period. The increased hardness is found during winter and spring while relative poor hardness during summer (Kadam and Babar 2012). However, presence of bicarbonates of Ca^{++} and Mg^{++} appears to result temporary hardness, while permanent hardness is caused due to sulphate and chloride. Increased hardness in winter is also a consequence of poor dilution of water due to low precipitation (Kadam and Babar 2012).

Total dissolved solids

Total dissolved solids means the amount of particles that are dissolved in water. The total dissolved solid varies from 263.2 mg/lit to 284.5 mg/lit. Seasonal variations revealed that total dissolved solids values were maximum during summer and minimum during winter. TDS in water originate from natural sources, sewage, urban and agricultural runoff and industrial wastewater. Desirable limit of TDS is 500 mg/l and maximum permissible limit is 1400 mg/l as per (BIS 2012), if TDS is greater than 2100 mg/l it is not suitable for any purpose (i.e. domestic or irrigation). Total dissolved solid values for Manair reservoir of Karimnagar district ranged from 261.25 to 269.05 mg/l in different seasons (Thirupthaiah et al 2012). They interpreted that TDS analysis has great repercussions in the control of biological and physical waste water treatment processes.

Chloride

The Chloride concentration is present in all potable waters and usually present in sewage as a metallic salt. Its concentration in fresh water is quite low and generally less than that of sulphate and bicarbonates. The seasonal variation in chloride values was high in summer and low in monsoon (Kadam and Babar 2012). Larsan (1982) linked this factor to bed rock geology and elevation of stream. Mishra and Yadav (1978) found the rise of chloride due to increased summer temperature and evapo-transpiration. In the present investigation the range of chloride in reservoir obtained is 13.2 to 16.7 mg/lit.

Sulphates

In present study, the sulphate values ranged between 14.5 mg/lit to 20.4 mg/lit. The minimum sulphate values are recorded during rainy season and maximum in winter. The investigation of sulphate was maximum during winter and minimum in rainy season as observed by Goel et al (1985) on the sulphate values recorded in Radhanagari and Satara reservoir i.e. 33.3 gm/lit and 43.7 mg/lit. The range of sulphate obtained was from 7.0 to 9.0 mg/lit in Danapadi canal of Kayamkulum lake by Jain and Seethapathi (1996). Kadam and Babar (2012) investigated the range of Sulphate from 11 to 26 mg/lit at three different stations of Masooli reservoir during 2008 and 2009.

Table.1 Seasonal Variation in physic-chemical parameters of Bhogaon reservoir water

Parameter	2014			2015		
	Pre-monsoon	Monsoon	Post-monsoon	Pre-monsoon	Monsoon	Post-monsoon
Water temperatures ^{0}C	31.2	27.7	24.3	30.1	26.8	23.8
pH	7.9	7.6	7.3	8.0	7.7	7.5
Dissolved Oxygen (mg/lit)	5.2	4.7	4.3	5.1	4.8	4.5
Turbidity (NTU)	37	52	42	40	55	45
Total Alkalinity (mg/lit)	37.9	34.3	35.2	36.0	33.5	34.9
Total Hardness (mg/lit)	105	113	121	109	112	120
Total Dissolved Solids (mg/lit)	277. 0	284.5	269.2	270.4	276.2	263.2
Chloride (mg/lit)	16.7	16.3	16.0	13.2	13.7	13.4
Sulphate (mg/lit)	17. 0	14.5	20.4	18.4	16.2	19.2

Table.2 Phytoplankton algal count per litre in Bhogaon Reservoir during 2014-2015.

Name of Phytoplankton	2014			2015		
	Pre-monsoon	Monsoon	Post-monsoon	Pre-monsoon	Monsoon	Post-monsoon
Chlorophycae	560	482	610	512	468	565
Bacillariophycae	845	785	925	804	770	875
Cynophycae	513	475	582	489	456	501
Euglenophycae	356	342	378	326	312	345

Figure.1 Location map of the Bhogaon Reservoir

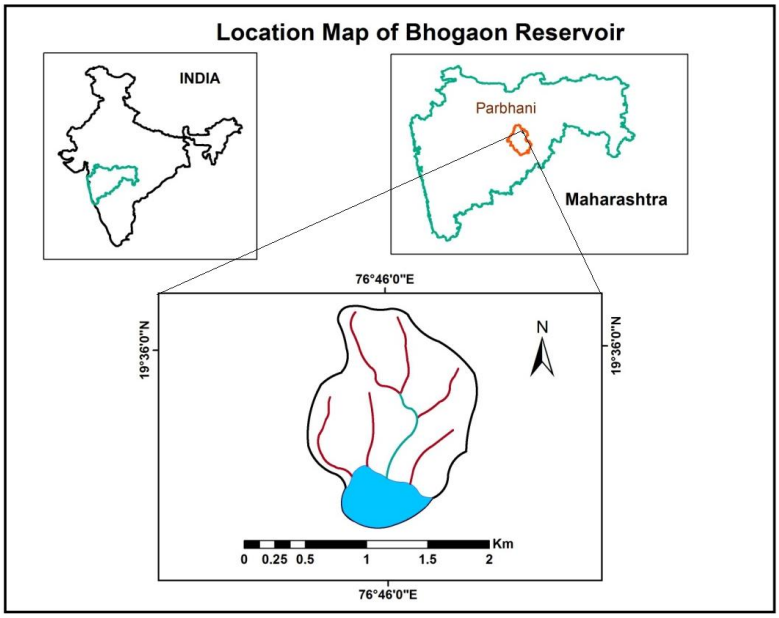


Figure.2 Seasonal variation in Phytoplankton algal count per ml in 2014

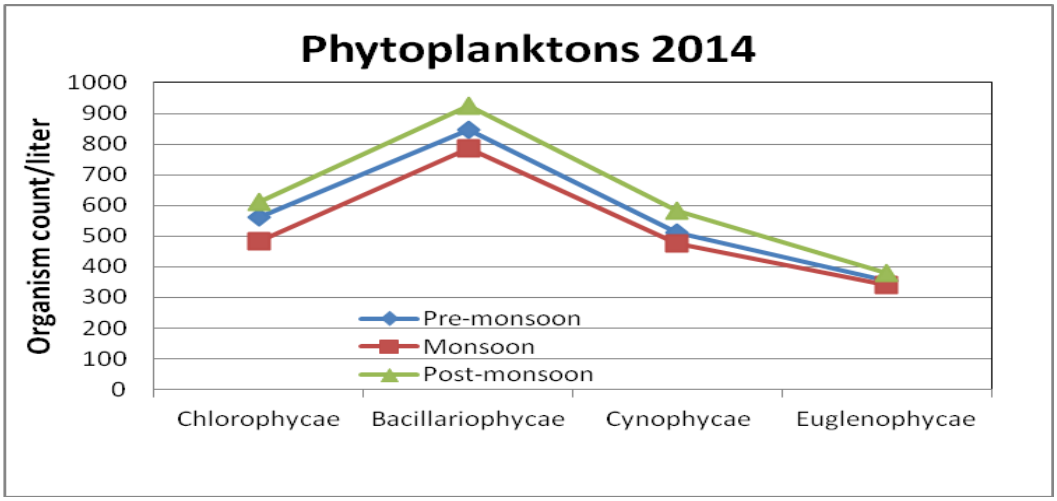
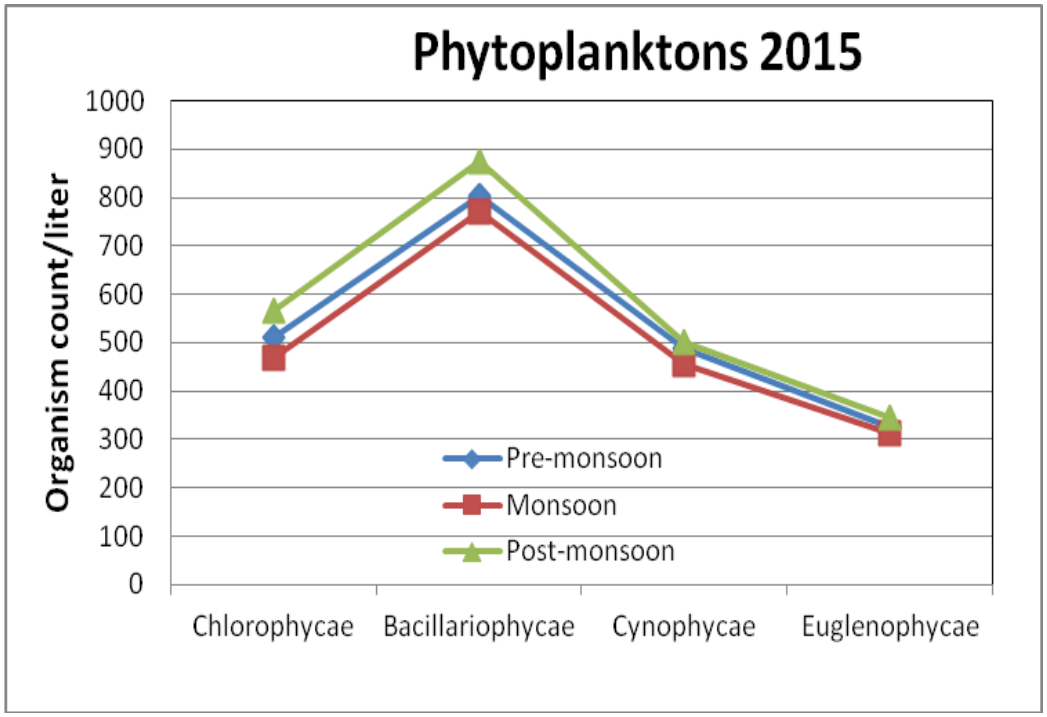


Figure.3 Seasonal variation in Phytoplankton algal count per ml in 2015



The species investigated are chlorophyceae, Bacillariophyceae, Cynophyceae and euglenophyceae represented as true planktonic forms whereas the diatoms exhibited a mixed population consisting mostly the benthic species that are detached from substratum. The blue green algae also show a similar picture like diatoms.

The seasonal variation and planktonic algal counts are given in Table 2 and seasonal variation in algal organism count per litre in 2014 and 2015 are illustrated in Fig.2 and Fig. 3 respectively.

Conclusion

Physico-chemical parameters and phytoplanktons of Bhogaon reservoir in Parbhani district of Maharashtra were analysed by taking certain important parameters of water quality such as water temperature, pH, dissolved oxygen, total alkalinity, total hardness, total dissolved solids, chlorides, sulphates, etc. for three seasons (i.e. pre-monsoon, monsoon and post-monsoon) during 2014 and 2015. In present investigation it was found that all water quality parameters were within permissible limits given by WHO and BIS. This symbolizes that the reservoir is free from pollution and can be used for agriculture, fish culture and domestic uses.

References

Adoni, A.D. (1985). Work book on limnology. Indian MAB committee, Department of Environment, govt. of India, Pratibha Publishers, Sagar, pp. 216.

APHA (2006). Standard methods for the examination of water and wastewater, 21st Edn. APHA, AWWA,WPCF, Washington, DC, USA.

Bade B B, Kulkarni D A and Kumbhar A C. (2009). Studies on physico-chemical parameters in Sai Reservoir, Latur Dist, Maharashtra.Vol.II(7): 31-34.

BIS (2012). Indian Standard Drinking water Specification. Bureau of Indian Standards IS 10500-2012 (Second revision).

Desai V.R. and R.K. Singh (2000). Impact of monsoon inflow on oxycline recorded in Rihand reservoir. J. Environ. Biol. 21 (2), 149-152.

Devi, Sarla B. (1997). Present status, potentialities, management and economics of fisheries of two minor reservoirs of Hyderabad. Ph.D. thesis, Osmania University, Hyderabad.

Goel, P.K., R.K. Trivedy and S.V. Bhave (1985). Studies on the limnology of a few freshwater bodies in Southwestern Maharashtra. Indian J. Environmental Protection, Vol. 5 No. 1.

Jain C.K. and P.V. Seethapathi (1996). Limnological studies of Kayamukulam lake. IJEP 16 (8) : 561-568.

Jayabhaye U. M, B S Salve and M S Pentewar. (2008). Some Physico-chemical aspects of Kayadhu river, District Hingoli, Maharashtra. J. Aqua. Biol. 23(1):64-68.

Joshi, A., A.P. Sharma and M.C. Pant (1981). Limnological studies in a subtropical system (Lake Sattal, India), Acta Hydrochim et. hydrobiol, 9 (4), 407-425.

Kadam S.U. and Md. Babar (2010). Hydrochemistry and Phytoplankton Biodiversity of Masooli Reservoir, Parbhani District Maharashtra, India. Nanobiotechnica Universale Vol. 1 (1), pp. 17-28.

Kadam S.U. and Md. Babar (2012). A Monograph on "Biodiversity of Reservoirs: In Humid Tropics' Authored by Kadam S.U. and Md. Babar, published by Lambert Academic Publication, Germany.

Kodarkar M S. 1992. Methodology for water analysis- physicochemical, biological and microbiological. Indian Association of Aquatic Biologists Hyderabad, Pub. 2: pp. 50.

Lakde, H.M., Dhawle S.D. and Lohare. S.D. (2010). The Study On Phytoplankton Of Kundrala Dam, Taluka Mukhed, Disrtrict Nanded (Ms) India. Shodh, Samiksha aur Mulyankan (International Research Journal), Vol. II, Issue-11-12, pp. 80-81.

Larsan E.H. (1982). Chloride current rectification in toad skin epithelium. In Zadunaisky JA (ed). Chloride transport in Biological membrane. Academic press New York, pp. 333-364.

Mishra P.C. (1991). Environmental status of Hirakud reservoir system. J. Ecotoxicol. Environ. Monit 1 (1) 23-30.

Mishra G.P. and Yadav A.K. (1978). A comparative study physico-chemical characteristic of river and river water in central India. Hydrobiol. 59 : 275-278.

Nafessa Begum and J. Narayana (2006). Phytoplankton diversity of four lentic water bodies in and around Davangarere city, Karnataka. *J. Aqua. Biol*. 21 (2): 13-18.

Pawar, S. K., J. S. Pulle and K. M. Shendge (2006). The study on Phytoplankton of Pethwadaj dam, Taluka Kandhar, District Nanded, Maharashtra, J. Aqua. BioI. 21(1):1-6.

Philipose, M.T. (1967). Freshwater plankton of Inland fisheries. Proc. Symp. Algal. ICAR New Delhi, 272-291.

Sakhare, V.B.(2007). "Reservoir Fisheries And Limnology", Narendra Publ.Delhi.

Sharma K.C. and Renu Sharma (1992). Algal diversity in the littoral zone of a polluted shallow lake at Ajmer, Rajasthan. International journal of Ecology and Environmental Sciences 18 : 139-146.

Sirsat, D. B., Ambore N. E. and Pulle J. S. (2004). Study of Phytoplankton of fresh water pond at Dharmapuri in Beed district, Maharashtra, J. Aqua. BioI. 19(2):7-10.

Thirupathaiah M., Ch.Samatha, Chintha Sammaiah (2012). Analysis of water quality using physico-chemical parameters in lower manair reservoir of Karimnagar district, Andhra Pradesh. International Journal of Environmental Sciences Volume 3, No 1, pp. 172-180.

Tripathy, A.K.and Pandey,S.N.(1990). Water pollution. Ashish publishing house, New Delhi.

Trivedy, R.K. and P.K. Goel (1986). chemical and biological methods for water pollution studies. Environmental Publication, Karad.

Vijay Kumar K. (1994). Seasonal variations in the primary productivity of a tropical pond. J. Ecobiol 6(3) 207-211.

Welch, P.S. (1952). Limnological methods, McGraw Hill Book Company.

WHO- World Health Organization, (2006), Guideline for Drinking Water Quality. World Health Organization, Geneva.

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