

Water quality status of Manchanabele Reservoir: Bangalore West Region, Karnataka, India

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ABSTRACT:

The present study is an approach to assess the water quality status of Manchanabele reservoir located in Magadi mountain range of Bangalore district. The study was carried out for a period of one year (January 2014 to December 2014). Water flows from Magadi hills to Bangalore for about 51 Kms, regulates the water quality phenomena through exchange of water. This is the main source of water for drinking, domestic and irrigation purposes of Bangalore City and its suburbs. From the point view of monitoring water quality and to obtain update information on associated changes in the physico-chemical parameters in the habitat, analysis of the water was carried out. The aim of the present investigation is to discern the water chemistry of the reservoir for certain physico-chemical parameters such as water temperature, pH, Total dissolved solids, Electrical conductivity, Dissolved oxygen, Biological oxygen demand, Chemical oxygen demand, Chloride, Alkalinity and Hardness, that are considered to play a major role in the distribution, periodicity and abundance of aquatic fauna.

Keywords : Physico-chemical parameters, reservoir and Magadi mountain range.

Introduction:

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. It is a unique liquid which is regarded to be the most important substance for the sustenance of life for all the living organisms of the biosphere. From the biological stand point, water has many distinct properties that are critical for the proliferation of life that set it apart from other substances. Water resources in Bangalore are provided mainly by the river, lakes, ponds, Ground water, Rain water etc., The quality of water is

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. The rapid growth of industrialization, population explosion and illiteracy has generated irreversible change in such aquatic ecosystems. It is an established fact that water quality is closely linked to the surrounding environment and the prevalent land used. Therefore, the present work was undertaken to investigate about the physico-chemical parameters of water which determines the water quality status of Manchanabele reservoir of Bangalore, which can give an useful information of water quality to the users of the surrounding area.

In India many researchers have made noteworthy publications in relation to water chemistry, Gonjari et al., (2008) made hydrobiological studies on triputi reservoir near Satara, Maharashtra. Karne, A.V. and Kulkarni, P.D. (2009) made studies on physico-chemical characteristics of freshwater bodies in Khatav tahsil, Maharashtra. Agarwal, A.K. and Rajwar, G.S. (2010) made physico-chemical and microbiological study of Tehri dam reservoir.

Materials and Methods

Study area:

Manchanbele reservoir is located on the western side of the Bangalore at a distance of 51 kms. Geographically it is located at 12.97° N latitude and 77.23° E longitude with an elevation of 925 meters (3034 feet) from MSL. The reservoir has water spread area of 365 ha. Manchanbele has the highest ratio of catchment to reservoir area. The catchment of the reservoir is under forest cover. Manchanabele Reservoir is constructed across the river Arkavathy, a tributary to River Cauvery near Manchanabele village in Magadi Taluk of Bangalore Rural District. The Right and Left bank canals irrigate lands in Magadi and Ramanagaram Taluks. The water of this reservoir

is used for irrigating crop fields and for aquaculture. Owing to the large size, manchanbele Reservoir was divided into four stations for sampling purposes (S_1 - Inlet, S_2 - Left bank canal, S_3 - Right Bank canal and S_4 - Outlet). Figure: 1.A, B and C is the Map showing the location of Manchanabele reservoir, Satellite image of Manchanabele reservoir and View of Manchanabele reservoir respectively.

DAM: The length of composite Dam is 362.20 Mtr. and height is 28.74 Mtr. with a storage capacity of 34.58 M.Cum. Involving submersion to an extent of 365 Hectares of 4 villages.

CANALS: The canal length of Left and Right banks were 52 and 63 Kms. to irrigate 1767 and 2078 Hectares respectively. Since the inflow to the reservoir was not encouraging, it has been reduced the lengths of Right Bank Canal to 36 Kms and Left Bank Canal to 35 Kms.

Sampling Procedure:

Water samples were collected monthly from the sampling sites at a maximum depth of 10cm from the surface. Collection of water samples was done during morning hours during 10.30 am to 12.30 pm. The samples were collected with necessary precautions in plastic bottles and the samples for the estimation of Biological oxygen demand were collected in BOD bottles. Parameters were analysed in the laboratory using analytical techniques. Four sampling stations designated as S_1 , S_2 , S_3 and S_4 were established in the reservoir covering its whole area for the collection of water samples.

Analytical techniques:

Analytical techniques as described in APHA *et al.* (2005) and Trivedy & Goel (1986) were used for the physico-chemical analysis. The physico-chemical parameters viz., water temperature were determined by mercury filled centigrade thermometer, pH by digital pH meter, Electrical conductivity by conductivity meter, Physico-chemical parameters like water temperature, pH,

dissolved oxygen, were determined at the sampling sites immediately after the collection of water samples while rest of the parameters were analyzed in the laboratory within a period of six hours after the collection of water samples.

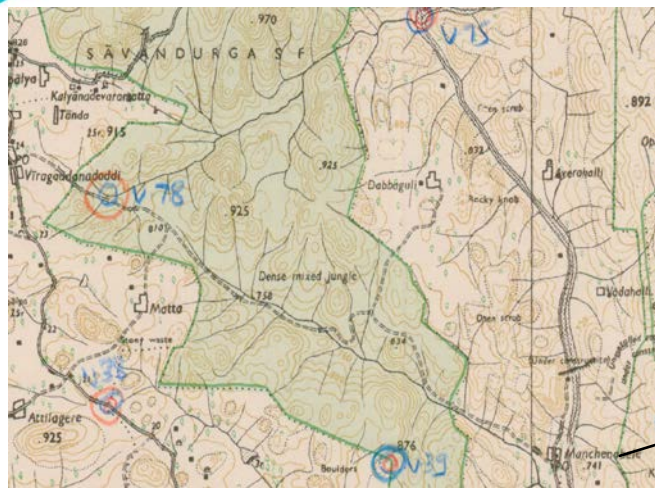
Results and Discussion:

The average values of four stations were taken to represent seasonal variation of physico-chemical characteristics of Manchanabele reservoir during January 2014 to December 2014 are given in Table 1. Water temperature was recorded between 29.5⁰C to 32.1⁰C with an average value of 30.7±0.75⁰C. The temperature is one of the important factors in aquatic environment since it regulates physicochemical as well as biological activities (Kumar et al., 1996). The rise in temperature can be resulted in high rate of evaporation, may cause decline in water level during summer months. The pH of water was slightly alkaline maximum pH was recorded in premonsoon season (8.1) and minimum in the monsoon month (7.2) with an average value of 7.56±0.27. It is evident from the data that the pH declines during the rainy season and increases during summer. pH status in the aquatic environment on important chemical parameters which predicts about the suitability for the fish culture. The alkaline pH is suitable for fish culture (Jhingran, 1982). In present study Total dissolved solid were fluctuating between 200 to 500 mg/L with an average value of 400±100 m/L which was minimum in postmonsoon and maximum in premonsoon and monsoon season. High values of total dissolved solids during rainy seasons may be attributed to the runoff and catchments watershed and also due to leaching of substances from rocks in surrounding area. Almost same observations were obtained from Minor reservoir (Rajashekhar et al. 2007), Mansagar lake of Jaipur (Singh et al. 2010) and three dams in Nanded (Pawar & Kanvate 2010) and the Electrical conductivity values ranged from 312.5 to 781.25 µmhos/cm with an average value of 625±156.25 which was minimum in postmonsoon

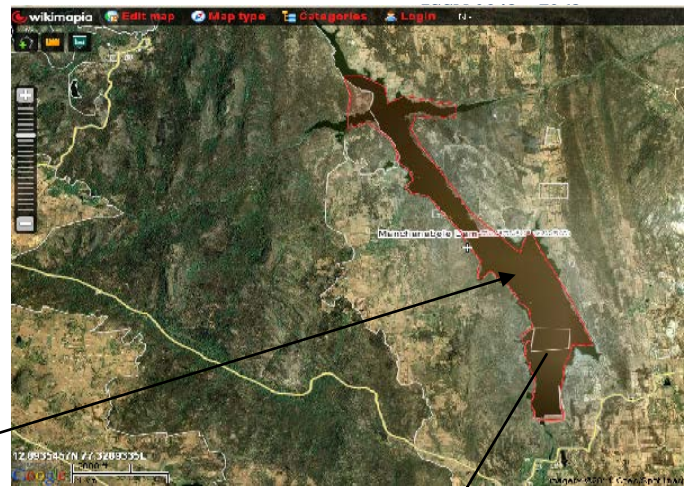
and maximum in premonsoon. The dissolved oxygen concentration ranged from 5.7 to 9.1 mg/L with an average value of 7.53 ± 0.99 . Dissolved oxygen was minimum in monsoon and maximum in premonsoon. Dissolved oxygen is a very important parameter for the survival of fishes and other aquatic organisms. The Biological oxygen demand concentration ranged from 5.51 to 6.2 mg/L with an average value of 5.87 ± 0.19 and it was minimum in monsoon and maximum in premonsoon. BOD as an important parameter in aquatic ecosystem to establish the status of pollution. The Chemical oxygen demand concentration ranged 14.5 to 20.6 mg/L with an average value of 18.1 ± 1.84 it was minimum in monsoon and maximum in premonsoon. The Chloride concentration ranged from 27.0 mg/L in monsoon to 52.6 mg/L in premonsoon with an average value of 39.53 ± 7.39 Chlorides play an important role in water quality determination. High chloride content in this reservoir were observed during summer months which was due increased temperature and consequent evaporation of water from the water body especially in summer. Similar observations have also been made by Lendhe & Yeragi (2004) and Babar & Raje (2009). The Alkalinity concentration ranged from 53.0 mg/L in monsoon to 63.0 mg/L in premonsoon with an average value of 59.33 ± 3.17 . Das and Chand (2003) recorded low alkalinity, which might be due to diuition effect of rainfall. Katariya et al., (1996) have measured maximum value of alkalinity due to confluence of industrial and domestic waste. The results obtained in the present study are in well agreement with the findings of above authors. The Hardness concentration ranged from 174.0 mg/L in monsoon to 192.0 mg/L in premonsoon with an average value of 182.66 ± 5.20 . The total hardness is the total soluble magnesium and calcium salts present in the water expressed as its CaCO_3 equivalent.

Table 1. Showing seasonal variation of physico-chemical parameters of Manchanabele reservoir during January 2014 to December 2014.

Parameters	Premonsoon	Monsoon	Postmonsoon	Mean \pm SE
Water Temperature ($^{\circ}$ C)	32.1	30.5	29.5	30.7 \pm 0.75
pH	8.1	7.2	7.4	7.56 \pm 0.27
Total Dissolved Solids (mg/L)	500	500	200	400 \pm 100
Electrical Conductivity (μ mhos/cm)	781.25	781.25	312.5	625 \pm 156.25
Dissolved Oxygen (mg/L)	9.1	5.7	7.8	7.53 \pm 0.99
Biological Oxygen Demand (mg/L)	6.2	5.51	5.9	5.87 \pm 0.19
Chemical Oxygen Demand (mg/L)	20.6	14.5	19.2	18.1 \pm 1.84
Chloride (mg/L)	52.6	27.0	39.0	39.53 \pm 7.39
Alkalinity (mg/L)	63.0	53.0	62.0	59.33 \pm 3.17
Hardness (mg/L)	192.0	174.0	182.0	182.66 \pm 5.20



(A)



(B)



(C)

Figure: 1.A. Map showing the location of Manchanabele reservoir. B. Satellite image of Manchanabele reservoir. C. View of Manchanabele reservoir.

Conclusion:

The life in the aquatic ecosystem is directly or indirectly depend on the water quality. The alteration of the physico-chemical parameters affect the biota on its number and biodiversity. From the above investigation it is understood that the estimated water quality parameters are within the permissible limits of WHO standards of water quality and finally concluding that more basic information and data on fresh water aquatic habitat are required to be generated in order to evolve effective and appropriate strategies for management of our natural and man made water resources.

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