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Study of Physico-Chemical Parameter of Dewale Lake in Panvel, Dist –Raigad (Maharashtra)

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Abstract: ***Present investigation is carried out to study the Physico-chemical parameters liketemperature, pH, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, chloride, alkalinity, hardness, conductivity, salinity, turbidity and CO_2. Water samples were collected and evaluated from February 2009 to January 2010. Variation in the values of the parameters was observed according to seasons.***

Keywords: Dewale Lake, Physico-chemical parameter, seasonal variation.

1. Introduction

Dewale Lake is situated in Panvel. The geographical location of Panvel is 18.58^0N latitude and 73.12^0E longitude with an area of 12.17 sq. km. Lake is littered by leaves of plant and domestic waste from surrounding adds to the organic content, thereby polluting the lake. Polluting the lake reduces water quality and hence the water is not suitable for domestic purposes as well as aquaculture. Thus, timely monitoring of the lake is necessary to access the Physico-chemical parameters of the lake in order to know the quality of water. Thus, present investigation will help us to understand the biotic and abiotic factors influencing the water body.

2. Material and Method

Sampling was done from four different site of the lake in the morning at 8.00 am to 10 am during the period of one year from Feb 2009 - Jan 2010. Water samples were collected in one litre bottle and brought to laboratory for analysis. Location of lake and sampling stations are shown in (Fig 1 and 2A & 2B).

Parameters such as temperature, electrical conductivity and pH value were measured directly in the field. Temperature in water was measured by thermometer and pH by pen pH meter while electrical conductivity by electrical conductivity meter, other parameters such as BOD, COD, DO,CO_2,chlorides were analyzed as described in APHA(2005), Trivedy and Geol (1986) and Kodarkar(2006).

Figure 1: Location of Dewale Lake in Panvel.

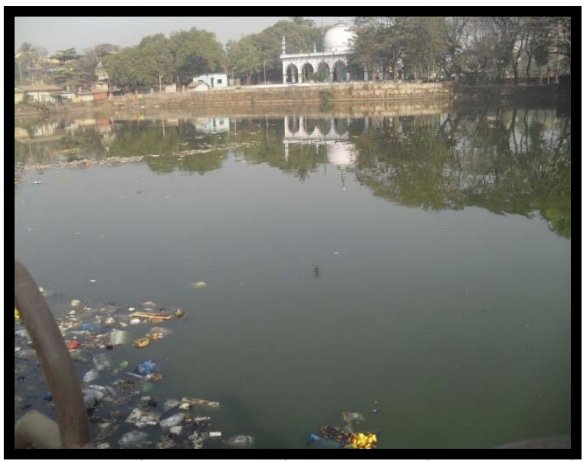

Figure 2: (A) Photograph showing Dewale Lake

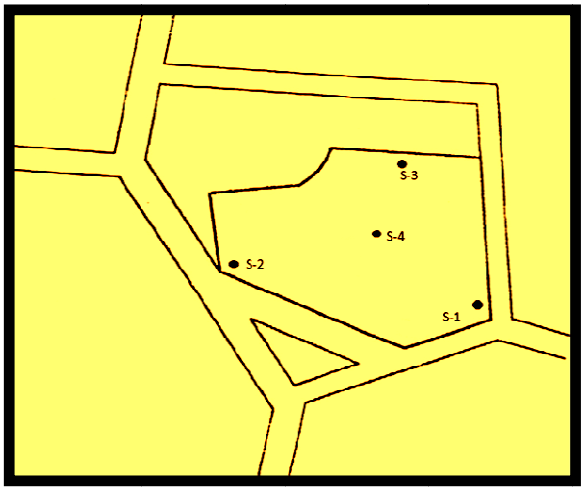

Figure 2: (B) Sampling stations of Dewale Lake

3. Result and Discussion

The physic – chemicalparameters of lake water samples collected during Feb 2009 to Jan 2010 is presented in Table 1. Water appeared to be greenish in colour with suspended materials and particulate matter.

Table 1: Seasonal variation of Physico – chemical parameters in Dewale Lake during Feb. 2009 to Jan. 2010.

Parameters	*Pre - monsoon*	*Monsoon*	*Post – monsoon*
Temp	31.4	28.9	27.3
Chloride	23.04	15.95	21.72
pH	7.7	7.5	7.57
BOD	7.29	9.02	11.07
DO	5.21	7.35	8.82
CO_2	7.5	4.5	8.2
Conductivity	0.835	0.427	0.472
Salinity	0.57	0.43	0.23
Turbidity	1.9	2.86	1.47
Alkalinity	186	161.4	229.4
Hardness	107.1	187.5	106.2
COD	36.2	46.37	68.78
Acidity	328.2	179.6	258.2
Silicates	176.59	348.43	604.13

- **Temperature** -Maximum temperature was observed in the pre - monsoon and minimum in post – monsoon (Table 1; Fig.3). These observations are in agreement with (Kumar et. al. 2006; Gayathriet. al. 2013; Balakrishna et. al. 2013;Shiddamallayya and Pratima 2011). Decrease or increase in water temperature is attributed to the climatic conditions, water environment such as turbidity and humidity. The change in water temperature is caused due to change in the atmospheric temperature with change in the seasons (Agarwal and Rajwar, 2010). The moderate temperature during monsoon season may be due to cooling effect of the water mass that entered the lake after heavy monsoon rains during this period (Chattopadhyay and Banerjee, 2007). Temperature influences the bacterial growth, responsible for the decomposition of organic matter for nutrient recycling,(Mohamed and Korium, 2009).
- **Chloride -** In the present investigation the maximum level was observed during the pre-monsoon, (Table 1; Fig 3). High level during the pre - monsoon may be due to high content of chloride left behind by evaporation which also indicates pollution of animal origin, (Shashikala, 2007; Mohamed and Korium, 2009; Patil and Auti, 2005). Low level during monsoon may be due to mixing of the rain water. (Patra, and et al., 2010), the tolerance limit of chloride is 250mg/l(BIS) the lake water is fairly within the permissible limit.

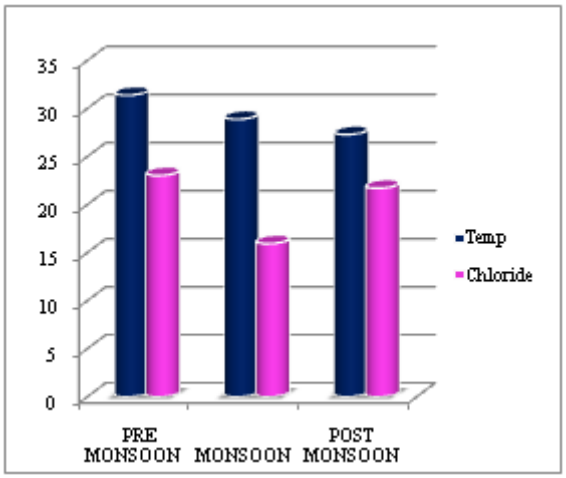

Figure 3: Histograms showing temperature and chloride content of the lake.

- **pH**–It is the measure of the intensity of acidity or alkalinity and measures the hydrogen ion concentration in water. Most of the plant and animal species can survive a narrow range of pH from slightly acidic to alkaline. So, pH is important for biotic compound. In the present study pH range was recorded between 7.5 to 7.7. Maximum pH was observed during pre - monsoon and minimum during monsoon. Similar observation were made by (Helen et al., 2008; Koshy and Nair,2000; Pejavar, 2002; Shashikala, 2007; Mohamedand Korium, 2009; Patra et al.,2010) (Table 1; Fig 4). Suitable pH for most aquatic organisms ranges from 6.5-8.5which is the prescribed limit given by BIS 1983 and National River Water Quality standard. Rise in pH can be correlated with increase in temperature. High pH indicates higher productivity. Thus, we can say that water is not polluted with respect to hydrogen ion concentration.
- **BOD**–It is the quantity of oxygen required for the metabolic activities of microorganisms for the degradation of organic matter present in water.Higher values are observed in post monsoon indicating higher rate of organic decomposition and favourable condition for microbial activity. (Patra et al., 2010; Nayak et al., 2004; Nayak and Behera, 2004).Minimum BOD value in pre monsoon (Table 1; Fig 4), may be the caused due to decrease in the level of water and increase in zoo planktons and phytoplanktons (Mishra and Patel, 2007)

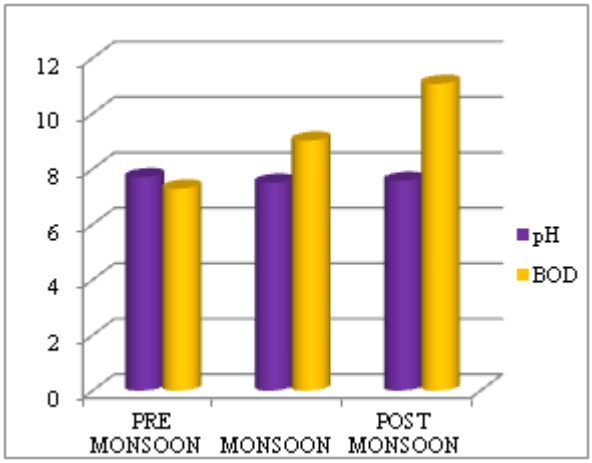

Figure 4: Histograms showing pH and BOD content of the lake.

- **DO–** It is one of the most important parameter in the analysis of water and reflects the physical and biological process prevailing in water.D.O. is required by plants and animals for respiration. D.O. shows inverse relation with temperature. It is the indicator for organic pollutant. Minimum values observed during pre-monsoon (Table 1;Fig 5) are in agreement with those made by (George and Koshy, 2008; Koshy and Nair,2000; Radhika et al., 2004; Sharma and Walia, 2014),low level of O2 during pre - monsoon may be due to utility of O_2 by bacteria and other animal as well as decomposition of organic matter (Mohamedand Korium, 2009; Patil and Auti, 2005; Meshram, 2005;Patra et al.,2010). High values in the post monsoon may be due to the increase in the photosynthetic activity.
- **CO_2 –** Free CO_2 in water may be produced due to decomposition of organic matter and respiratory activities of aquatic organisms. High values in post monsoon (Table

1, Figure 5)may be due to process of anaerobic digestion of dead aquatic plant and fluctuation in the DO.

Figure 5: Histograms showing DO and CO_2 content of the lake

- **Conductivity -** Electrical conductivity of water indicates pollution. In the present study the EC values were maximum in pre monsoon and minimum in the monsoon (Table 1; Fig 6) (Mohamedand Korium, 2009). The high value may be due to bathing, domestic waste sewage, low level of conductance may be due to dilution of salts by rain water (George and Koshy, 2008; Koshy and Nair, 2000, Helen et al., 2008).
- **Salinity–**The salinity act as a limiting factor in the distribution of living organisms and its variation is caused by dilution and evaporation and influence the distribution of fauna(Gibson 1982).High values were observed during the pre-monsoon, and lowest in the post monsoon (Table 1; Fig 6). Salinity higher in the pre monsoon may be due to evaporation leaving high content of chloride. It can be correlated with conductance, as chlorides increase electric conductance increases.
- **Turbidity -** Values were maximum during monsoon and minimum in post monsoon (Table 1;Fig6) Higher values in monsoon may be due to the addition of the influx of run off during the monsoon (Shashikala, 2007; Patil and Auti, 2005: Sahib, 2004).

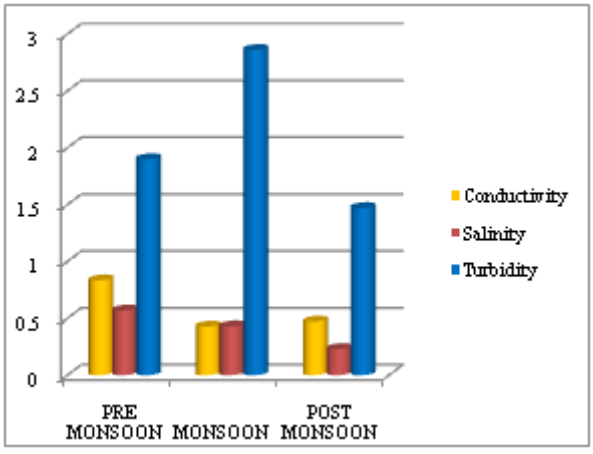

Figure 6: Histograms showing Conductivity, Salinity and Turbidity content of the lake.

- **Alkalinity–** Alkalinity is a measure of the buffering capacity of a solution or the capacity of bases to neutralize acids without an increase in pH. Alkalinity is due to carbonate (CO_3^{2-}), bicarbonate (HCO^{3-}) and hydroxides. Maximum values were observed in post monsoon and minimum in monsoon (Table 1, Fig 7). This is in accordance with the Roy et al. (2010).
- **Hardness–**Hardness is used as an indicator of water quality which depends on the concentration of carbonates and bicarbonates, salts of calcium and magnesium or sulphate chloride or other anions. It is found to be highest in the monsoon, (Table 1; Fig 7).The result showed that water of the lake is hard (Thorat,2000; Patil and Auti,2005). Increase in hardness of water may be due to leaching of road and dissolution by flood waters as reported by Reshma Bhalla et al. (2007).
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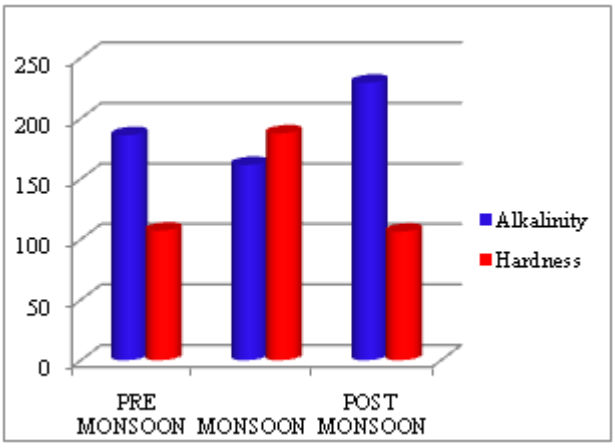

Figure 7: Histograms showing Alkalinity and Hardness content of the lake

- **COD–**It is a method to determine the organic load of water body i.e. susceptibility to oxidation. It is maximum in post – monsoon and minimum in pre – monsoon (Table 1, figure 8). Enhanced level of COD may be due chemical pollutants(Patra and et al., 2010).
- **Acidity–**It is higher in pre – monsoon and lower in monsoon. Higher level may be due to low level of water and lower due to dilution of water by rain (Table 1; Fig 8).
- **Silicates–**Maximum in post – monsoon may be attributed to the increased level of organic decomposition which adds silica to water body (Table 1; Fig 8).

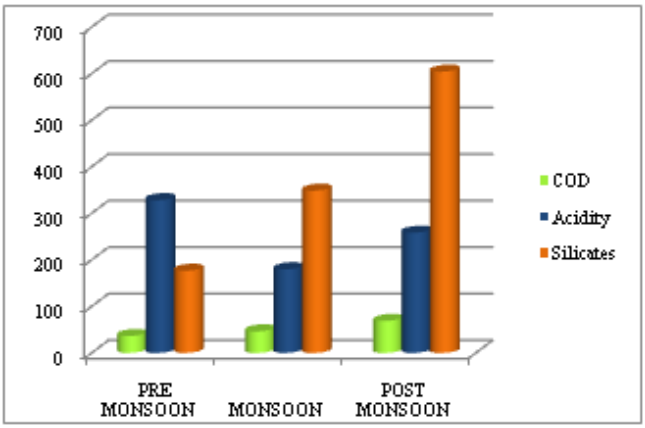

Figure 8: Histograms showing COD, Acidity and Silicates content of the lake

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