RESEARCH ARTICLE

Seasonal Variation of Physicochemical and Microbial Parameters of water of Nal-Damayanti Sagar Dam, Morshi, Dist. Amravati, MS, India

Ghaware AU and Jadhao RG*

Department of Zoology, Shri Shivaji Science College, Amravati, 444603 Maharashtra. India.

*Correspondent author- Dr. R.G. Jadhao, Associate Professor, Department of Zoology, Shri. Shivaji Science College, Amravati

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ABSTRACT

This study was aimed to estimate current status of Physico-chemical characteristics and level of pollution indicator bacteria and their variation at whole stretch of dam. Some environmental parameters such as Temperature, pH, Turbidity, Dissolved oxygen, Sulphates and Nitrates were monitored. In addition, the microbial analyses involved total viable bacterial and fungal counts. The results of physicochemical parameters showed varied value; from conclusions revealed that large number of sewage drains in Morshi and agricultural discharge is mainly responsible for pollution in Nal-Damyanti Sagar Dam.

Keywords: Environment, DO, Sulphate, Agricultural Discharge.

INTRODUCTION

Water is one of the abundantly available substances in nature, which man has exploited more than any other resources for the sustenance of life. Water of good quality is required for living organisms. Dams are the most important water resource. Unfortunately, the dams are being polluted by indiscriminate disposal of sewage, industrial wastes and human activities. The dams are always the victims of the negative impacts of urbanization. Most water bodies become contaminated due to incorporation of untreated solid and liquid waste. Now a days due to increased human population and man-made conditions, the water quality is deteriorating everywhere Jayabhaye (2008).

Water quality provides current information about the concentration of various solutes at a given place and time. Water quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions. For optimum development and management for the beneficial uses, current information is needed which is provided by water quality programmers. Prevention of river pollution requires effective monitoring of physicochemical and microbiological parameters Chandra et al. (2006). In most countries, the principal risks to human health associated with the consumption of polluted water are microbiological in nature WHO (1997). The bacteriological examination of water has a special significance in pollution studies, as it is a direct measurement of deleterious effect of pollution on human health APHA (1981). Coliforms are the major microbial indicator of monitoring water quality (Brenner et al., 1993; Grant, 1997). The detection of *Escherichia coli* provides definite evidence of fecal pollution. This work aimed to assessment of the water quality of Nal-damyanti Sagar dam and relates the physicochemical characteristics and microbial quality of water with standard guidelines for safe consumption or usage.

MATERIALS AND METHODS

Water samples for physic-chemical analysis were collected from Nal-damyanti sagar Dam, geographical coordination Longitude 21° 16' 35" N and Latitude 78° 3' 26" E. Morshi, (M.S) India, during Feb 2010-Jan 2011 in the early morning between 8 am to 11 am in the first week of every month from Feb10-Jan11. The samples were collected in acid washed plastic container from a depth of 5-10 cm. below the surface of water. Samples were aseptically collected in sterile brown bottles (500 ml capacity), transported to laboratory and stored at 4^0C until bacteriological analysis completed within 6 h of sampling.

Physicochemical Analyses: The physico-chemical characteristics of the dam water like water temperature, turbidity, pH, Sulphates and nitrate were determined in summer, monsoon and winter according to standard methods APHA (2005); Trivedy and Goel (1984).

Bacteriological analysis: Spread plate method was used for enumeration of Total Viable Bacterial Count at 37^0C and Fungal count at 25^0C.

RESULTS AND DISCUSSIOINS

Physicochemical Analyses

Temperature: The temperature of water affects some important physical properties and characteristics of water such as density, viscosity, conductance, salinity, solubility of dissolved gases etc. and also, chemical and biological reaction rates increase with temperature.

In present investigation, the maximum value was recorded 25.45 ± 1.06 (°C) recorded during summer; minimum value was recorded 19.72 ± 0.58 (°C) recorded during winter. Low temperature recorded in winter may due to lesser solar radiation, low atmospheric temperature and high temperature in summer because of low water level, high solar radiation and clear atmosphere. Similarly, results have been reported by (Anita *et al.,* 2005; Jawale and Patil, 2009).

pH: In present investigation, the maximum value was recorded 7.50 ± 0.35 recorded during summer; minimum value was recorded 6.45 ± 0.02 recorded during monsoon. pH range shows that the water of all sampling sites of dam was slightly alkaline and acidic in nature. High value of pH during summer might be due to low water levels and concentration of nutrient in water. pH shows high significant positive relationship with water temperature. Similar trend was also reported (Narayana *et al.,* 2008; Reddy Vasumathi *et al.,* 2009; Kadam *et al.,* 2007; Anita, 2002).

Table 1 : Seasonal variation in physic-chemical and microbial parameters of Nal-Damyanti Sagar Dam, Morshi (During Jan10-Dec 11)

Parameter	Summer	Monsoon	Winter
Temperature	22.45 ± 1.06	22.77 ± 0.28	19.72 ± 0.58
pH	7.50 ± 0.35	6.85 ± 0.21	6.45 ± 0.02
Dissolve oxygen	6.4 ± 0.06	6.8 ± 0.18	7.3 ± 0.075
Turbidity	42.26 ± 0.47	47.62 ± 1.16	43.56 ± 0.86
Sulphate	17.69 ± 0.18	19.48 ± 0.39	16.03 ± 0.79
Nitrate	0.65 ± 0.024	0.73 ± 0.06	0.67 ± 0.028
Total Bacterial Count	25 ± 4.4	26.5 ± 2.87	15.5 ± 1.65
Total Fungal Count	2 ± 0.70	6.25 ± 1.6	10 ± 1.58

Dissolved oxygen: It is a very important water quality parameter and is also an index of physical and biological processes going on in water. In present investigation, the maximum DO value was recorded 7.3 ± 0.075 mg/l during winter and minimum value 6.4 ± 0.06 mg/l during summer. Kataria et al. (2006) reported that depletion of dissolve oxygen in water is due to high temperature and increased microbial activity, on their study on water quality of Dahod dam, India. The level of DO was found minimum in summer. This is because of the low solubility of gases at high temperature (Hynes, 1978).

Turbidity: Suspension of particle in water interfering with the passage of light is called Turbidity. Turbidity has been long known to hinder disinfection by shielding microbes, some of them perhaps pathogens. In the present investigation, the maximum turbidity value was recorded 47.62 ± 1.16 during monsoon and minimum turbidity value 42.26 ± 0.47 was during summer. These observations were also supported by (Prasanna and Ranjan, 2010, Shraddha *et al.,* 2008; Trivedi *et al.,* 2009). High values of turbidity in monsoon may be due to influx of rain water from catchments area, cloudiness, less penetration of light, washes silts, sand, high organic matter and low transparency due to suspended inert particulate matter. However, low values of turbidity in summer may be due to clear atmosphere, evaporation of water and high light penetration.

Sulphate: Sulphate is present in fertilizers they contribute to water pollution and increase sulphate concentration in water body. In the present investigation, the maximum sulphate values obtained 19.48 ± 0.39 mg/l during monsoon and minimum value 16.03 ± 0.79 mg/l during winter. Maximum sulphate concentration during monsoon may be due to the dilution and utilization of sulphate by aquatic plants. However, the low sulphate concentration was noted during winter may be due to biodegradation and low water level. Similarly, results have been reported (Reddy *et al.,* 2009; Telkhade *et al.,* 2008; Shanthi *et al.,* 2006).

Nitrate: Nitrate is the most highly oxidized form of nitrogen compounds commonly present in natural waters, because it is a product of aerobic decomposition of organic nitrogenous matter. In the present investigation, maximum values of nitrate obtained 0.73 ± 0.06 mg/l during monsoon and minimum value obtained 0.65 ± 0.024 mg/l during winter season. Nitrate levels in surface water often show a marked seasonal fluctuation with higher concentration being found during monsoon month compared to winter months. Similarly results have been reported (Gohram, 1961, Rajashekhar *et al.,* 2007).

Microbial analysis:

Total bacterial count: High bacterial density in water indicates sewage contamination. As long as *E. coli* is present in water, there is every possibility of the presence of some pathological bacteria in water and this will affect or alter the diversity of organisms and sometime obstruct the aquatic organisms especially fishes and crabs. Bahadoor *et al.,* (2004); Obiri *et al.,* (2003) reported the interaction between coliform bacteria and its aquatic environment. In the present investigation, maximum bacterial count in CFU/ml obtained 26.5×10^4 during monsoon and minimum value obtained 15.5×10^4 during winter season. Continuously increase in population of Morshi around the dam area is mainly responsible for increased level of pollution. Most of sewage water often added from residential area. Higher bacterial population during monsoon is due to increased land run off and higher faecal inputs in to dam from connecting rivers and various sources. An increase in the bacterial level after rainfall was reported by (Shehane *et al.,* 2005). THB load in the present study is significantly correlated with dissolve oxygen.

Total fungal count: In the present research shows that maximum fungal count in CFU/ml obtained 10×10^3 during winter and minimum count value obtained 2×10^3 during summer season. Total fungal count found to be higher in winter season than the respective level found in summer and monsoon. Shridhar and kaveriappa (1989) also observed that the total number of water fungi was lowest during summer season. Occurrence of maximum number of fungal species during winter and spring season in the present study might be due to moderate temperature and slightly higher percentage of organic and inorganic matter.

CONCLUSION

The obtained results of the present study concluded that the water quality along the studied area in Nal-Damyanti Sagar Dam was remarkably influenced by wastewater discharge from drains located on its sides regarding both physicochemical and microbial characteristics. Agricultural and sewage wastes are the key factors in this environmental problem. The water of Nal-Damyanti Sagar Dam is subjected to fecal pollution and continuous monitoring of microbial quality of water is recommended to control the spreading of pathogens transmitted by contaminated water.

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