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Original Research Paper

Water Quality Status of a Polluted Pond, Bhabua Town (Kaimur), Bihar

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ABSTRACT

Considering the impacts of industrial effluents on the water quality of many ponds, reservoirs, lakes and rivers as reported in the literature, the present study of water quality of a polluted pond was undertaken. Several physico-chemical parameters of the polluted pond namely Suman Lal Ka Pokhara were analysed to evaluate its suitability for washing, pisciculture and irrigation purposes by determining parameters like water temperature, pH, conductivity, DO, alkalinity, total hardness, BOD, nutrients, etc. Water was found acidic. Contents of chloride and TDS were not within the limits accepted for irrigation. Other parameters also suggested that the pond is not fit for other purposes also.

INTRODUCTION

Water quality monitoring of aquatic systems like pond or Pokhara serves as a fundamental tool for planning and management. Ponds in monsoon season are often visualized as excess mass of water, evenly mixed from discharge of households situated nearby due to bathing, washing of clothes and animals and also due to night soil. The physical, chemical and biological characteristics of pond waters vary widely. Pond waters may vary physically in terms of high turbidity and negligible water current from municipal areas; chemically major ions in terms of nutrients and contaminants; biologically in terms of structure, population numbers and growth rates of plankton, periphyton, neuston, nekton, benthos and microorganisms. The impact of human activity directly affects pond habitat and can alter the physico-chemical environment of ponds.

Several researchers have studied water quality of ponds and reservoirs at global level. Sulthana et al. (2011) studied hydrochemistry and seasonal fluctuation of plankton of a pond of Tamil Nadu. Biswas & Tortajada (2001) have reviewed the study of water quality of dams for last 50 years at global level. Wani et al. (2002) studied the water quality of famous Dal Lake in Kashmir, which is the main tourist attraction in India. However, considerable loss in storage has been indicated with poor water quality and prominent eutrophication in ponds. Reddy et al. (2002) reported eutrophic status of famous Hussain Sagar lake joining the twin cities of Secunderabad and Hyderabad. According to them, the condition of the lake is hypereutrophic and its restoration may take long time because of accumulated nutrients in bottom sediments and continued addition of pollution load. Ganesan et al. (2004) studied seasonal variation in the water quality of Pilavakkal reservoir at Western Ghat in India with respect to biological and chemical parameters. They have reported 4.4-7.9 mg/L of dissolved oxygen, which was contributed to high production of planktonic community in the reservoir. Kumar et al. (2009) reported high pollution load attributed to the urbanization of the area during the study of ecological status of Veer Kunwar Singh Memorial Park pond at Ara (Bihar). Hatim & Ozlem (2005) studied water quality of Mamasin dam which is primary source of drinking water to Aksaray city in Turkey. They reported anaerobic conditions in the hypolimnion of the reservoir with stimulated algal growth in the water body giving reduced level of water quality. Singh et al. (2005) studied the water quality of six reservoirs of Damoder river basin. Considering the impacts of industrialization on the water quality of Suman Lal Ka Pokhara during February 2008 to July 2008 was undertaken to evaluate the physico-chemical characteristics of the water of the pond as well as to evaluate its suitability for various purposes.

MATERIALS AND METHODS

The pond is located at Bhabua town (Kaimur), Bihar at latitude 25°02'13"and longitude 83°33'33". In the present study, in order to get water samples that truly represent the water quality of the entire pond, integrated sampling was done. Three different sampling locations S_1, S_2 and S_3 were selected. The samples from the above three locations were collected

and mixed together to get an integrated sample. The samples were collected at 10 a.m. to ensure that no significant change in quality passes unnoticed. Water samples for physico-chemical analysis were collected in PVC containers. Samples for dissolved oxygen (DO) and biochemical oxygen demand (BOD) tests were collected separately in BOD bottles. The colorimetric measurements were done using visible spectrophotometer. All the chemicals used were of GR/AR grade. The collected water samples were analysed for various physico-chemical parameters by following the standards methods of APHA (1989). The results were compared with the guidelines of WHO (1996).

RESULTS AND DISCUSSION

Results of physico-chemical analysis of the pond are presented in Table 1. Maximum and minimum temperatures were recorded as 43°C and 8.60°C respectively. DO is the important parameter in assessing water quality and reflects the physical and biological processes, prevailing in the water. Water for the growth of organisms should have 7.6 and 7.0 mg/L of DO at 30° and 35°C respectively. Less amount of DO in waters gives rise to odoriferous products of anaerobic decomposition. DO in the pond was found between 2.1 and 4.2 mg/L and temperature ranged from 24-37°C. These values indicated negligible organic load. The pH of most natural water falls within the range of 6.5-8.5. Mostly waters are slightly alkaline due to presence of carbonates and bicarbonates. At Suman Lal Ka Pokhra, pH of water samples was found to vary from 6.3-6.8, indicating the slight acidic pollution.

Measurement of turbidity of water is useful in monitoring proper filtration and to determine the effectiveness of treatment process with different dosages of chemicals. In the pond the turbidity of water was found ranging between 30.8 and 68.2 NTU. These values are not well within the limits of IS: 10500, indicating the pollution. Chaudhari et al. (2001) have worked on some physico-chemical parameters of water samples of Chatri lake situated about 3 km away from Amrawati city, and reported very high value of turbidity (49.5-84.5 NTU) during February-May 1997 which was assigned to increase in sedimentation.

BOD of water samples collected from the pond ranged from 0.9-1.8 mg/L. Thus, according to the classification of Royal Commission, the water is clean and safe with respect to BOD (Manivasakam 2002).

During investigation by Prasad et al. (2005) of water samples of eleven villages of Sikar district in Rajasthan in premonsoon season of 2005, TDS, conductivity, alkalinity hardness and DO were reported in excess which is similar to the present work. They pointed out that the water of the villages of Sikar district has become polluted due to discharge of domestic and agricultural waste. Waterborne diseases were also commonly found in this area.

The water samples collected from the present pond were found to have an electrical conductivity ranging from 210-326 micromho/cm. TDS, total hardness, calcium and magnesium values of the water sample ranged between 379-618 mg/L, 320-338mg/L, 83.1-98.6 mg/L and 43.5-48.0mg/L respectively. These values are above the desirable limits. Thus, the water is not safe for drinking with respect to TDS, hardness calcium and magnesium.

CONCLUSION

From the parameters studied, it is concluded that the water is not safe for drinking purpose as well as washing and pisciculture. The values of chloride and TDS are not well within the limits. Hence, it is concluded that the Suman Lal ka Pokhra is not fit for irrigation use.

Table 1: Water quality data of Suman Lal Ka Pokhra (Pond). From Feb. 2008 to July 2008.

Month	February	March	April	May	June	July	Limits of IS : 10500
Temperature (°C)	24	27	30	35	37	34.5	-
pH	6.3	6.3	6.4	6.3	6.8	6.8	6.5-8.5
Turbidity (NTU)	30.8	34.6	41.9	42.6	40.7	68.2	5
DO (mg/L)	4.2	3.9	3.6	3.9	3.4	2.1	14.6
BOD (mg/L)	0.9	1.2	1.2	1.8	1.4	1.2	-
Conducitivity (µmho/cm)	210	214	229	278	326	310	-
Hardness (mg/L)	330	328	320	328	332	338	300
TDS (mg/L)	379	488	507	604	585	618	500
Ca (mg/L)	85.2	85.6	89.8	92.4	98.6	83.1	75
Mg (mg/L)	44.7	45.6	43.7	48.0	46.4	43.5	30
Cl^- (mg/L)	98.4	96.3	167.2	168.3	172.9	168.0	250
HCO_3^- (mg/L)	232	236	272	260	220	244	200

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REFERENCES

APHA.1989. Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington, D.C. 17th edition.

Biswas, A.K. and Tortajada, C. 2001. Development of large dams: A global perspective. Intema J. Water Resources Deve., 17: 9-21.

Chaudhari, U.S., Johari, S. and Chaudhari, P.R. 2001. Trophic status of Chatri lake in the vicinity of Amravati city. Ind. J. Environ. Health, 43: 135-137.

Ganesan, M., Jayabalan, N. and Jegatheesan, K. 2004. Environmental status and seasonal variation in the water quality studies of Pilavakka Reservoir at Western Ghats in India. J. Plant Archives, 4: 195-201.

Hatim, E. and Ozlem, G. 2005. Influences of wastewater discharges on the water quality of Mamasin dam watershed in Aksaray, Central Anatolian part of Turkey. J. Environ Geology, 48: 829-834.

Kumar Shivchandra, Singh, A.K., Shankar, B. and Roy, N.P. 2009. A study on ecological status of Veer Kunwar Singh Memorial Park pond at Ara (Bihar). J. Haematol. & Ecotoxicol., 4 (1): 38-42.

Manivasakam, N. 2002. Physico-chemical Examination of Water, Sewage and Industrial Effluents. 4th Edn., Pragati Prakashan, Meerut, 232-234.

Prasad, M., Kumar, D. and Singh, R.V. 2005. Drinking water quality of some of the villages of Shekhawati region in Sikar district of Rajasthan, India. Proc. of 2nd Intern. Congress of Chem. & Environ., Indore, pp. 453-455.

Reddy, R. C., Kelkar, P. S., Rao, R.R. and Pande, S.P. 2002. Eutrophic status of Hussainsagar lake in Hyderabad. J. IAEM, 83, 14-19.

Singh, A.K., Mondal, G.C., Singh, P.K., Singhs, Singh, T.B. and Tewary, B.K. 2005. Hydrochemistry of reservoirs of Damodar river basin: Weathering process and water quality assessment. J. Environ. Geology, 48: 1014-1028.

Sulthana, M., Vasanthi, R. and Jayaprakash, J.N. 2011. Hydrochemistry and seasonal fluctuation of plankton in Arasankulam pond at Veppampattu in Thiruvallur district of Tamil Nadu, India. Nat. Env. Poll. Tech., 10(3): 467-470.

Wani, M. M., Bhargava, R., Gairola, A. and Kundangar, M.R.D. 2002. Status of water quality in Dal Lake. Ind. J. Environ. Protec., 22: 121-128.

WHO 1996. Guidelines for Drinking Water Quality. 2nd Edn., World Health Organization, Geneva.