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AN ASSESSMENT OF WATER QUALITY OF CHANDRAKUNDAM POND DURING PRE-MONSOON AND MONSOON SEASONS AT BHIMAVARAM TOWN, ANDHRA PRADESH, INDIA

***Jhansilakshmi and Reddi, E. U. B.**

Department of Environmental Sciences, Andhra University, Visakhapatnam

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ABSTRACT

Chandrakundam pond is one of the significant holistic faith ponds in Bhimavaram Town, Andhra Pradesh, India. In the present study aim is to assess the quality of Chandrakundam pond water for determining whether its suitability for drinking purposes otherwise sea water intrusion. For present study the Chandrakundam pond water samples were collected seasonally, pre-monsoon and monsoon during the year of 2013 from four different sampling stations. The water samples were analyzed for the physico-chemical parameters (pH, turbidity, EC, TDS, Cl^-, SO_4^{2-}, NO_3^-, D.O, TH, Ca^{2+}, Mg^{2+}, F^-, BOD, Na^+, K^+, Alkalinity using standard methods in laboratory. It is observed that the quality of pond water is not suitable for drinking and domestic purpose.

INTRODUCTION

The demand for water has increased over the years and this has led to water scarcity in many parts of the world. The situation is aggravated by the problem of water pollution or contamination. India is heading towards a freshwater crisis mainly due to improper management of water resources and environmental degradation, which has lead to lack of access to safe water supply to millions of people. As the urbanization process, water pollution problems have become increasingly evident and have led to serious ecological and environmental problems (Almasri *et al*., 2004). The urban aquatic ecosystem are strongly influenced by long term discharge of untreated domestic and industrial waste waters, storm water runoff and direct solid waste dumping (Kumar *et al*., 2011). The lakes or ponds have complex and fragile ecosystem, as they do not have self cleaning ability and therefore readily accumulate pollutants (Lokeswari *et al*., 2006). A pond is referred to as a man-made or natural water body which is between 1 m^2 and 2 ha (~5 acres or 20,000 m^2) in area, which holds water for four months of the year or more (Biggs *et al*., 2005). Rainwater is the main source of the pond to maintain the water level. The aim of analyzing the quality of chandrapushkarini pond water and to find out if there is sea water intrusion in the pond as it lies near to the coast.

Corresponding author: Jhansilakshmi
Department of Environmental Sciences, Andhra University, Visakhapatnam

MATERIALS AND METHODS

Description of the study area

Bhimavaram is one of the developing urban areas of Andhra Pradesh, India. Bhimavaram is located 107 Kms from Vijayawada & 270 Kms from Visakhapatanam. The study area cover the Chandrakunda pond, which is is situated at latitude $16^0$32'24 North and longitude $81^0$32'14 East (Fig.1). It is about 3km away from Bhimavaram town, beside Bhimaswara temple. The pond is about 2.5 sq.km and has a maximum depth of 5.2 meter and minimum depth of 1.3 meter observed during the study period. The region is entirely covered by Black-cotton soil. Someswara swami temple is present in Gunupudi, Bhimavaram. It is about 3 to 4 km distance from Bus stand. The temple looks as new one, and a holy pond (Chandra-kundam] is present in front of the temple. Lord Chandhimavaram was controlled by the Chola Empire. Under Kulothunga Chola I, Bhimavaram was ruled by his sons who served as viceroys. Various stone inscriptions have been found in the city dating from his reign (c. 1096 C.E.).

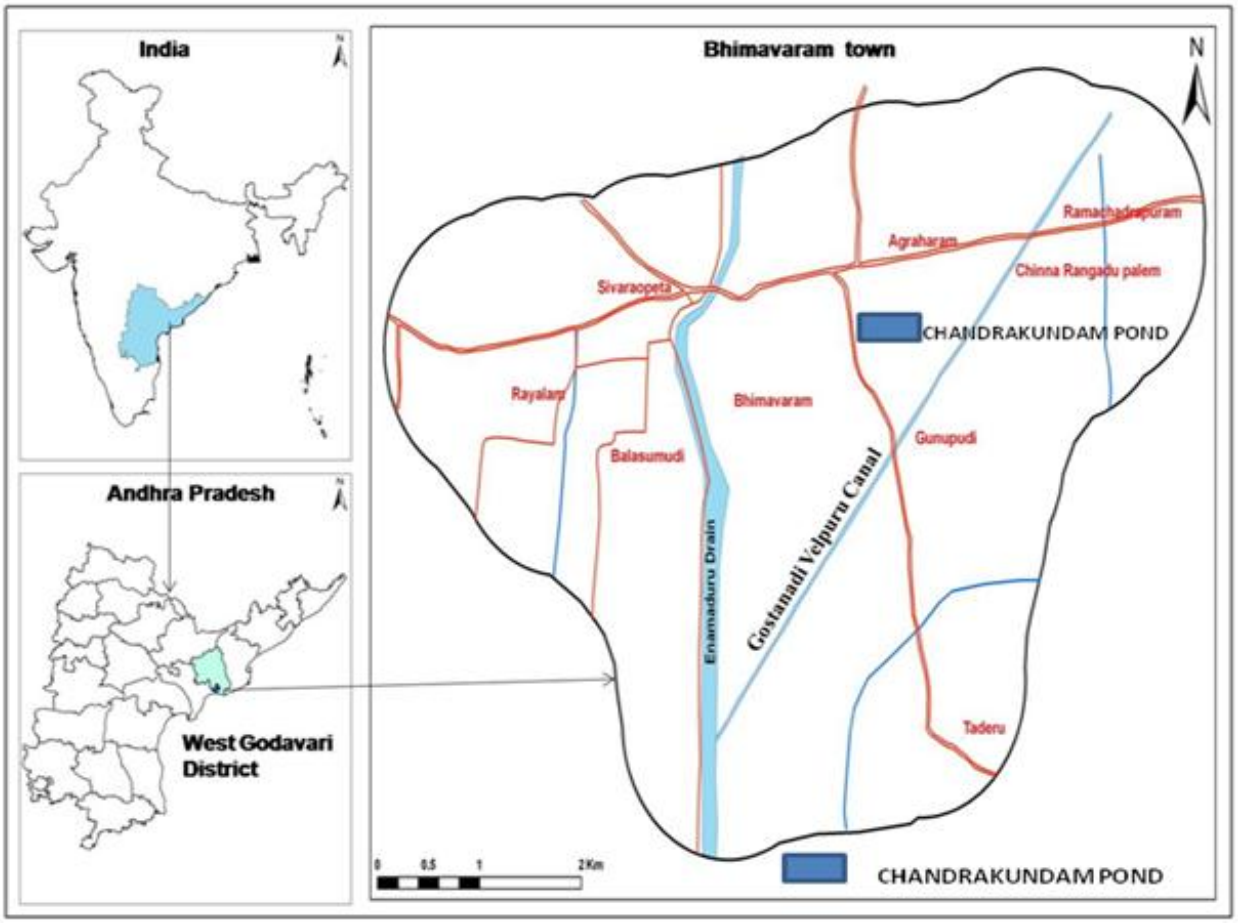

Fig.1. Map showing Chandrakundam pond in Bhimavaram Town, India

It was said that Chalukya Bheema from Eastern Chalukya dynesty laid foundation and constructed a Siva temple that is present Gunupudi Siva temple Somaramam in the year 890-810 A.D. It is one among the five Siva temples called as Pancharamas. Built during the 3rd century A.D., the Shivalinga in the temple is believed to assume a black-cum-brown colour on no-moon day and a kind of white on full-moon day. In front of the temple there is a pond called Chandrakundam. It is fully covered with lotus flowers.

Sample analysis

Water samples of Chandrakhundam pond were collected at four different locations ViZ. location 1 (East side), location 2 (West side), location 3 (South side) and location 4 (North side) during pre-monsoon and monsoon period of 2013. 1 Liter capacities of plastic bottles were used, which were rinsed with the water being sampled. The samples are transported to the laboratory of department of environmental science, Andhra University within 12 hrs. The analysis of water was done using procedure of standard methods (APHA, 1998) and all analysis was done in triplicate. The parameters analyzed were pH, turbidity, EC, TDS, Cl^-, SO_4^{2-}, NO_3^-, D.O, TH, Ca^{2+}, Mg^{2+}, F, BOD, Na^+, K^+ and Alkalinity.

RESULTS AND DISCUSSION

Chandrakundam Pond water analysis was performed. Water samples were collected from pond at four different sites in the study area. The findings of the present investigation are summarized in table 1.

Table 1. Physico-chemical parameters, in mg/L of Chandra pond, Bhimavaram town

Physic-chemical parameters	pre-monsoon	monsoon
pH	8.9±0.7	7.52±0.9
Turbidity	28±0.8	29±1.20
EC	1500±56.20	2520±56.0
TDS	885±38.10	1436±30.04
Cl^-	140±3.5	110±1.23
SO_4^{2-}	66±9.7	59±1.2
NO_3^-	7.4±0.4	7.8±0.10
D.O	7±1.5	5±1.0
TH	1000±89.2	1300±80.23
Ca^{2+}	223± 22.5	256±14.9
Mg^{2+}	150.8±12.5	209.6±8.5
F^-	0.56±0.23	0.54±0.4
BOD	5.1±0.7	5.89±0.2
Na^+	340±22.8	400±43.7
K^+	58±13.4	78.09±5.6
Alkalinity	158±18.9	142±15.8

Concentration of all parameters are expressed in mg/L except pH, Turbidity (NTU) and EC (µS/ho).

The pH value in the Pond water was found to be (8.9±0.7) (Table1 and Fig. 2) in pre-monsoon season which indicates that the water is slightly alkaline in nature when a compared to WHO permissible limits (6.5-8.5). This was indicative of high temperature that reduces the solubility of CO_2 (Jan *et al.*, 2002). The results of Table 1 revealed that the pond water contained the highest BOD value (5.89±0.2 mg/L) (Fig. 2) in monsoon season. These values exceeded the permissible limit of 5 NTU set by WHO, (2004). High values are attributed to absence of self purification cycle owing to the stagnation of lentic water in the ponds (Gupta, 1989). A high BOD value

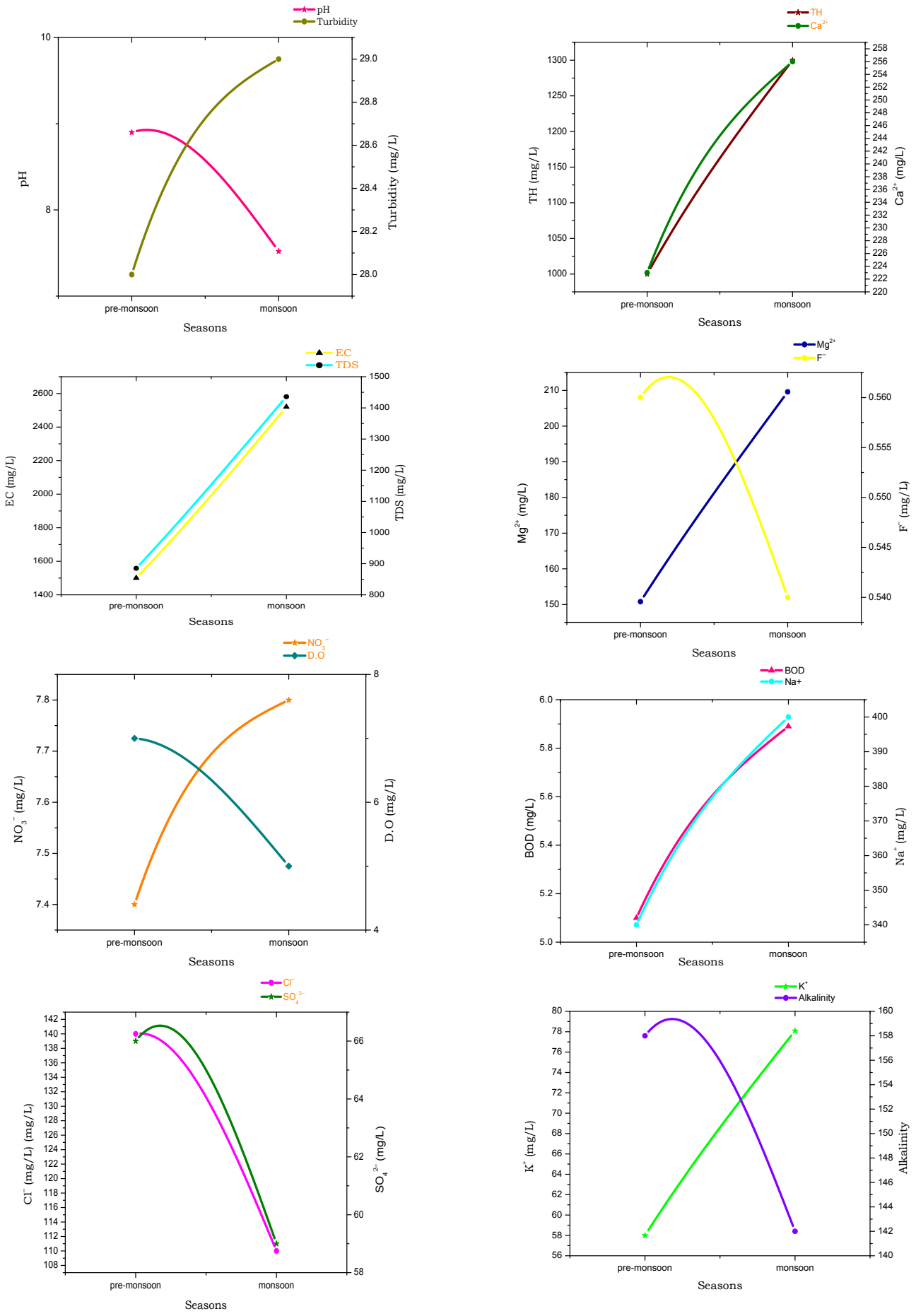

Fig. 2. Graphs showing pre-monsoon and monsoon seasonal variations in physico-chemical parameters ( ) of Chandrapushkarini pond

indicates that the pond waters are polluted. This can be due to the leaches of organic waste entering to this pond. The maximum value of turbidity was observed in monsoon season (29±1.20 mg/L) (Table1 and Fig. 2) and minimum was observed in the period of pre-monsoon (28±0.8mg/L) (Table1 and Fig. 2), while compare to prescribed permissible limit of 5 NTU set by BIS. Surface runoffs and domestic wastes mainly contributed to the increased turbidity during monsoon season.
The maximum value of EC was recorded (2520±56.0 mg/L) (Table1 and Fig. 2) in the period of monsoon while minimum (1500±56.20 mg/L) (Table1 and Fig. 2) was recorded in the period of pre-monsoon season, these values exceed the BIS prescribed limit of drinking water 300 uS/ho. Similarly, calcium values were found to be high (256±14.9) (Table1 and Fig. 2) in monsoon period when compare to pre-monsoon period (223± 22.5 mg/L) (Table1 and Fig. 2). These values exceed the BIS prescribed limit of drinking water 75 mg/L. Sodium concentration (Table 19) was also found high in the period of monsoon (400±43.7 mg/L) (Table1 and Fig. 2) while minimum value was recorded in the period of pre-monsoon (340±22.8 mg/L) (Table1 and Fig. 2). These values exceed the BIS prescribed limit of drinking water 200 mg/L.

TDS values were found (1436±30.04 mg/L) (Table1 and Fig. 2) in monsoon season these values exceed the BIS prescribed limit of drinking water 500 mg/L. The variation of TDS in pre-monsoon to monsoon seasons is due to siltation and rainfall (Chaudhari *et al.,* 2004). But contrary results of TDS were reported by Sawyer *et al.,* (2003) in their study. The BIS desirable limit for sulphate in drinking water is 200 mg/L (BIS 10500, 2004)**.** Based on the above limits Sulphate levels ((Table1 and Fig. 2) were found within the permissible limits of BIS in pre-monsoon and monsoon seasons. The fluoride values were found to be within the permissible limits as per WHO, (2004) standards. Total hardness was found high during monsoon (1300±80.23) (Table1 and Fig. 2) than pre-monsoon season (1000±89.2 mg/L) (Table1 and Fig. 2). These values exceed the BIS prescribed limit of drinking water 300 mg/L. The highest level of total hardness in the monsoon season was at Chandrakundam Pond, which may be due to sewage waste and tazzia immersion. similar kind of results was obtained by Mishra *et al*,, (2008) in aquaculture ponds in Orissa, but contrary results was observed by Vyas *et al*., (2006) in upper lake.

The maximum value (209.6±8.5 mg/L) (Table1 and Fig. 2) of Magnesium was recorded in the monsoon season and minimum value (150.8±12.5) (Table1 and Fig. 2) in pre-monsoon These values exceed the BIS prescribed limit of drinking water 30 mg/L. Alkalinity was found slightly high (158±18.9 mg/L) (Table1 and Fig. 2) in pre-monsoon season, these values exceed the BIS prescribed limit of drinking water 200 mg/L. This might be attributed to increase the rate of organic decomposition during which CO_2 is liberated, which reacts with water to form HCO_3, thereby increasing the alkalinity in pre-monsoon whereas in monsoon season alkalinity was decrease due to dilution caused by the rain water. Similar results have been reported by Shinde *et al*., (2010). In the present study the higher chloride content was found in pre-monsoon and minimum in monsoon period but none of the sampling sources crossed the maximum permissible limit (250 mg/L) set by WHO, (2005). The potassium content of pond water in the monsoon season ((Table1 and Fig. 2) was found to be higher (78.09±5.6mg/L) due to the flow of domestic waste water released by major residential area into this pond. Similar results were reported by Lang *et al.,* (2006) on surface water in Guiyang, China. Dissolved Oxygen (D.O) is a measure of oxygen concentration present in a given water sample. The concentration of oxygen reflects whether the process undergoing is aerobic or anaerobic. The maximum value (7±1.5 mg/L) (Table1 and Fig. 2) of D.O was recorded in pre-monsoon and minimum in monsoon (5±1.0 mg/L) (Table1 and Fig. 2). This is due to increase in temperature and duration of bright sunlight has influence on the % of soluble gases (O_2 and CO_2). The long days and intense sunlight during summer season to accelerate photosynthesis by phyto plankton, utilizing CO_2 and giving off oxygen. This possibly accounts for the great qualities of O2 recorded during pre-monsoon (Krishnamurthy *et al*., 1990). Very high concentrations of cations - calcium, magnesium and sodium, and anions - nitrate, phosphate and sulphate in pond water may be attributed due to the process of seepage through the soil naturally.

Conclusion

In this present investigation the concentration of hardness, pH, turbidity, EC, TDS, D.O, Ca^{2+}, Mg^{2+}, BOD, K^{+}, Alkalinity and sodium are observed to be high in Chandrakundam pond. This can be attributed to the seepage of seawater into the pond as this pond is located 30km far bay of Bengal. This can be indicated that the Chandrakundam pond is highly polluted and unsafe for human use. Prevention of immersion of idols of Goddess and God along with flowers, fruits and worship materials are suggested to avoid further deterioration of Chandrakundam pond water quality.

REFERENCES

Almasri. M.N, J.J. Kaluarachchi, 2004: Assessment and management of long-term nitrate pollution of ground water in agriculture-dominated water sheds. *Journal of Hydrology* 295: 225-245.

APHA 20th edition. 1998: Standard methods for the examination of water and wastewater. *American Public Health Association, Washington,* D.C.

Biggs. J, P. Williams, M. Whitfield, P. Nicolet, A. Weather by 2005: Aquatic Conserv: Mar. Freshw. Ecosyst., 15, 693-714.

BIS, 2004: Indian Standards specifications for drinking water. IS: 10500. *Bureau of Indian Standards*. New Delhi.

Chaudhari, G.R.D. Sohani and V.S. Shrivastava 2004: Groundwater Quality In dexnearindustrial area. *Indian J. of Env. Protection*, 24(1): 29-32.

Gupta, S. 1989: pollution ecology of some ponds in urban vicinity of Jodhpur Ph.D. Thesis. University of Jodhpur, Jodhpur

Jan, M.R., Shah, J. and Shah, *H.J.Chem.Soc*. Pak. 2002: 2;124-129.

Krishnamurthy R. 1990: Hydrobiological studies of Wohar reservoir Aurangabad (Maharashtra State) India. *J. Envian. Biol*. 11(3): 335-343.

Kumar V, Arya S, Sonkar P, Minakshi, Dhaka A,Chanchal 2011: Water Quality Status of Historical Antiya Tall at Jhansi City as a Primary Data for Sustainable Approach. *Recent Research in Science and Technology*; 3(8): 52-55.

Lang, Y., Liu, C., Zhao, Z; Li, Sand Han. G. 2006: Geochemistry of surface and groundwater in Guiyang, China: Water interaction and pollution in a Krast hydrological system. *Applied Geochemistry*, 21 (6): 887-903.

Lokeshwari H. and Chandrappa G.T. 2006: Impact of heavy metal contamination of Bellandur Lake on soil and cultivated vegetation, *Curr Sci*., 91(5), 584

Mishra R R, Rath B, Thatoi H 2008: Water quality assessment of aquaculture ponds located in Bhitarkanika mangroov ecosystem, Orissa India Turkish J, Fish Aquat Sci (8): 71-77.

Sawyer, C.N., MC Carthy PL, Parkin G. F. 2003: Chemistry for Environmental and Engineering Science 5^{th}ed. MC. Graw-Hill Higher education, New York, 752p.

Shinde S.E, T.S. Pathan, K.S. Raut, P.R. More AND D.L. Sonawane 2010: Seasonal variations in Physico-Chemical characteristics of Harsool-Savangi Dam, District Aurangabad, India. *The Ecoscan* 4(1): 37-44.

Vyas A, Bajpai A, Verma N 2006: Water quality improvement after shifting of idol immersion site. A case study. *J. Environ., Sci., Eng*., 48: 129-134

WHO, 2004: Guidelines for Drinking-water Quality. Third Edition. Volume 1: Recommendations. World Health Organization, Geneva.

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