Global Journal of Science Frontier Research
Biological Science
Volume 13 Issue 7 Version 1.0 Year 2013
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Water Quality Assessment of Tulashi Tank of Kolhapur District (M.S.), India

By K. B. Koli & D. V. Muley

The New College, India

Abstract- Water of Tulashi tank is utilized for pisciculture, irrigation and domestic purposes. It is an urgent need to assess the water quality. The Physico-chemical parameters of Tulashi tank were studied during January to December, 2011. The results discovered that there was a significant seasonal variation in some physico-chemical parameters. Water temperature ranges from 22.16 to 28.64°C, turbidity 0.68 to 2.95 NTU. Transparency 32.45 to 44.56 cm. The pH 7.10 to 8.85, DO 6.48 to 8.52 mg/l, CO2 1.89 to 5.98 mg/l, Alkalinity 126.42 to 162.42 mg/l, Total Hardness 82.46 to 156.26 mg/l. Phosphate 0.19 to 1.94 mg/l, Nitrates 2.17 to 12.45 mg/l and Chlorides 37.26 to 43.48 mg/l. Above values are within the acceptable limits of BIS standard for drinking water therefore the water is potable and suitable for pisciculture.

Keywords : *water quality; tulashi tank; kolhapur district.*

GJSFR-C Classification : *FOR Code: 960608*

Strictly as per the compliance and regulations of :

Water Quality Assessment of Tulashi Tank of Kolhapur District (M.S.), India

K. B. Koli [α] & D. V. Muley [σ]

Abstract- Water of Tulashi tank is utilized for pisciculture, irrigation and domestic purposes. It is an urgent need to assess the water quality. The Physico-chemical parameters of Tulashi tank were studied during January to December, 2011. The results discovered that there was a significant seasonal variation in some physico-chemical parameters. Water temperature ranges from 22.16 to 28.64°C, turbidity 0.68 to 2.95 NTU. Transparency 32.45 to 44.56 cm. The pH 7.10 to 8.85, DO 6.48 to 8.52 mg/l, CO2 1.89 to 5.98 mg/l, Alkalinity 126.42 to 162.42 mg/l, Total Hardness 82.46 to 156.26 mg/l. Phosphate 0.19 to 1.94 mg/l, Nitrates 2.17 to 12.45 mg/l and Chlorides 37.26 to 43.48 mg/l. Above values are within the acceptable limits of BIS standard for drinking water therefore the water is potable and suitable for pisciculture.

Keywords: water quality; tulashi tank; kolhapur district.

I. Introduction

Water is very important life supporting material. Every living organism needs water, without which neither the life nor any development is possible. Thus it is very much essential for a healthy growth. But it may become harmful for life, if one uses water polluted with harmful or with toxic substances and poor sanitation. (Gupta and Gupta, 1997) 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 programmes (Lloyd, 1992). We depend on water for domestic needs, irrigation, sanitation and disposal of wastes. The quality and quantity of surface water bodies like lakes and tanks depend upon the climate, catchments, geography of the area and the inputs and outputs both natural and manmade (Gray, 1994). The water quality of lakes can be degraded due to microbiological and chemicals contaminants. In water natural impurities are in very low amounts. Lakes, dams, rivers are important source of fresh water.

The quality of water is described by its physical, chemical and microbial characteristics. But, if some correlations were possible among these parameters, then significant ones would be fairly useful to indicate the quality of water (Dhembhare,1997) The study of important, because fluctuation in the water quality has an influence on the biotic communities (Aher and Mane,2007). This information is important to be communicated to the general public and the Government in order to develop policies for the conservation of the precious fresh water resources (Ali et al.., 2000). The aims of this study were designed to monitor seasonal variation in water quality parameter of Tulashi tank so as to assess its status and suitability through the potability and aquaculture point of view and to compare observed levels of studied parameters with the corresponding WHO and BIS guidelines values for drinking-water quality and pisciculture.

II. Materials and Methods

Tulashi tank was artificial earthen (with masonary spillway) type of dam. It is situated about 48 km from Kolhapur city, towards the south-west side and constructed in 1966 – 1969. It is situated at Latitude 16° 31'15 " East and longitude 74° 01' 00 " North. Its average length is 1522 meter and average height is 48.68 m. The Catchment area of the project is 34.92 Sq. Km and Water storage capacity is 91.92 M.cum. Average rainfall in this region is 1.778 m. The scope of the scheme is a lift irrigation project on Tulashi river near Burambali (Tal-Radhanagari) for irrigating land in Tulashi valley only. Tulashi Irrigation Project construction was completed in 1977-78 (Govt Gazette of Kolhapur) by Maharashtra Krishna Valley Development Corporation Pune. The water is utilized for irrigation, pisciculture as well as domestic purposes.

Study of physico-chemical parameters were carried out during the period of January, 2011 to December, 2011. By considering the morphometry and human activities sampling sites were selected at different places along the tanks, From all the four stations of tank, water samples were collected from the periphery at about 1 to 1.5 meters depth fortnightly. The water samples were collected in plastic cans of 2-3 litapacity and brought to the laboratory to study various parameters.

Temperature and pH were recorded at the time of sample collection using portable kit. The determination of dissolved oxygen, free carbon dioxide, hardness, chlorides, total alkalinity, inorganic phosphate and nitrate were analyzed in the laboratory as per the standard procedure and metrology

Author α: Department of Biology, The New College, Kolhapur,(M.S.) India. e-mail: y2k2429@gmail.com

Author σ: Department of Zoology, Shivaji University, Kolhapur, (M.S.) India. e-mail: drdvmuley@gmail.com

described by Gelt man et al. (1978), Trivedi and Goel (1984) and APHA, AWWA, WPCF (1998).

III. Results and Discussion

The results of physical properties of water from Tulashi tank was given in table 1 and the results of chemical properties of water from Tulashi tank was shown in table 2.

Table 1: Physical parameters of Tulashi Tank, Kolhapur District

Month	Temperature (^{0}C)	Turbidity (NTU)	Transparency (cm)	pH
Jan	22.16	2.25	40.10	7.10
Feb	22.48	2.90	32.45	7.65
Mar	24.56	2.95	35.46	7.45
Apr	26.48	1.20	32.48	7.80
May	28.64	1.45	30.40	8.10
Jun	27.45	1.65	42.56	8.28
Jul	26.47	1.74	39.42	8.13
Aug	25.12	1.56	38.85	8.12
Sept	25.47	1.90	35.42	7.90
Oct	24.18	0.85	44.56	8.08
Nov	23.56	0.68	45.26	8.10
Dec	22.58	1.56	46.18	8.26

Table 2 : Chemical parameters of Tulashi Tank, Kolhapur District (values are in mg/l)

Month	Dissolved Oxygen	Free CO_2	Alkalinity	Hardness	Phosphate	Nitrate	Choloride
Jan	7.35	2.52	132.45	83.42	0.35	2.17	38.12
Feb	6.48	2.98	126.42	82.46	0.31	2.45	39.23
Mar	6.88	2.13	132.46	96.43	1.2	2.22	37.26
Apr	8.14	2.78	128.46	107.12	1.06	2.43	38.10
May	8.52	1.56	142.45	156.26	0.82	2.46	42.26
Jun	8.46	2.47	131.47	145.72	0.19	2.17	41.15
Jul	8.42	4.23	152.47	110.49	0.89	2.45	43.48
Aug	8.26	4.23	158.45	102.45	0.67	6.48	42.45
Sept	8.10	4.59	148.46	98.24	1.46	12.45	41.27
Oct	8.49	5.58	162.42	95.47	1.85	11.56	40.48
Nov	8.10	5.98	158.46	91.46	1.92	6.42	42.26
Dec	8.13	6.12	152.47	87.48	1.94	4.23	39.45

Surface water temperature was fluctuated between 22.28 ± 0.32 ^{0}C to 28.96 ± 0.65 ^{0}C at Tulashi tank. The minimum temperature was recorded in the month of January (22.16^{0}C) and maximum in May (28.64^{0}C). The seasonal pattern in temperature fluctuation was recorded as low in winter season, while high in summer season. Swaranlatha and Rao (1998) have recorded minimum water temperature during winter and maximum during summer (May, June) of Banjara Lake.

Turbidity is an important limiting factor in the productivity of freshwater ecosystems. It was recorded within the range from 0.68 to 2.95 NTU. The minimum turbidity was observed in the month November of maximum in March. Arvindkumar (1995) observed that maximum transparency value was in December and minimum in August at freshwater tropical wetland of santhal Pargana (Bihar).

Transparency is the property of water by which it allows light to pass. Light is an essential factor in freshwater environments for survival of hydrophytes and acts source of oxygen as a byproduct of photosynthesis. Transparency was varied from 32.45 cm to 44.56 cm. Lower transparency values were observed in February and higher in October. This pattern in transparency was also observed by Agarwal and Thapliyal (2005) in Bhilangana River from Tehri Dam reservoir of Uttaranchal.

The pH of the water samples was alkaline throughout study period. pH was recorded within the range from 7.10 to 8.28. Minimum pH was observed in the month of March and maximum in the month of June. Altindag et al (2009) also reported that pH was fluctuated between 8.18 to 8.21 in Karaman stream of Antalya, Turkey. pH range within 6.0 to 8.5 range is good for culturing tropical fish species (Huett, 1977)

and, it is the recommended levels for drinking water (WHO, 1984): Federal Environmental protection Agency (FEPA) recommended pH 6.5-8.0 for drinking and 6.0-9.0 for aquatic life. The cheap rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are eventually responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month. The factors like temperature bring about changes in the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate- bicarbonate equilibrium is affected more due to change in physico- chemical condition (Karanth, 1987; Tiwari,1988). Change in pH is due to discharge of agricultural wastes, human anthropogenic activities and surface runoff.

The dissolved oxygen was recorded within the range from 6.48 to 8.52 mg/l Minimum dissolved oxygen was recorded in the month of February and maximum in the month of May. The amount of dissolved oxygen in water was not constant but fluctuates, depending on temperature, depth, wind and amount of biological activities such as degradation (Adeniji, 1986; Ibe, 1993): Naz and Turkmen (2005) have reported that in summer, dissolved oxygen concentration decreased due to high temperature. The dry season showed a significantly higher oxygen content than the wet at Kangimi reservoir, Kaduna state Nigeria.

The free carbon dioxide content in the water samples of Tulashi tank was within the range from 1.89 to 5.98 mg/l. High content of free carbon dioxide was recorded in the month of November and minimum in May (Sikabira, 2010) also recorded the similar results regarding free CO2 content from freshwater bodies.

Alkalinity in the water samples of Tulashi tank varied from 126.42 to 162.42 mg/l. Minimum alkalinity was recorded in February and maximum in October. Similar observations have been made by Holden and Green (1960) and Tailing and Rzoska (1967) on Rivers Sokoto and Nile in Egypt respectively.

The hardness was fluctuated from 82.46 to 156.26 mg/l. The minimum hardness was recorded in the month of February and maximum in May. The similar results were obtained by Ravichandran et al. (2009) from the study of ponds from Phosphate content was fluctuated between 0.19 to 1.94 mg/l. It was observed as minimum in June and maximum in December. The phosphate content in any water body was quite opposite in relation to dissolved oxygen and phytoplankton population. Many earlier workers have also reported similar findings (Ghavzan et al., 2006).

Nitrate content in the water was recorded within the range from 2.17 to 12.45 mg/l. Minimum nitrate content was observed in the month of January and maximum in September.

The chloride content in water samples was recorded from 37.26 to 43.48 mg/l. Minimum chloride content was recorded in the month of March and maximum in July. Chourasia and Adoni (1985) also found similar behavior of chlorides in their studies on Sagar Lake with summer maxima and winter minima.

Almost all parameters during the present study meet the water quality norms as per BIS New Delhi. Now it is clear that, the tank is not polluted by human anthropogenic activities and agricultural runoff from surrounding areas. Hence, it is appropriate for human consumption. Moreover, tank is used for irrigation, fishery and domestic purposes. As water is not contaminated, it is potable.

References Références Referencias

1. Adeniji, H. A. (1986): Some limnological precautions for fish farmers. Kainji lake Reaserch Institute Annual Report. pp.- 54-56.
2. Adoni, A. D., Joshi, G., Ghosh, K., Chourasia, S. K. and Verma, H. G.(1985): Workbook on Limnology.
3. Agrawal, S. S. (1987): Hydrobiological survey of Janaktal tank, Gwalior (M.P) Proc. All India Semi. Ichthyol. 20-26.
4. Ali M. A., Salam A., Azeem M., Shafique and Khan, B.A. (2000): Studies on the effect of seasonal variations on physical and chemical characteristics of mixed water from Rivers Ravi and Chenab at union site in Pakistan. J. Res. B. Z. Univ. Multan, 2: 1–17.
5. Altindag, A., Buyurgan, O., Kaya, M., Ozedemir, E. and Dirican, S. (2009): A survey on some physico-chemical parameters and zooplankton structure in Karaman stream, Antalya, Turkey. J. Animal. Vet. Adva. 8(9): 1710-1716.
6. APHA, AWWA and WPCF, (1998): Standard methods of examination of water and waste water,20th Edn., American Public Health Association, Washington DC., USA., pp: 1213.
7. Arvind, Kumar (1995): Some limnological aspects of the freshwater tropical wetland of santhal Pargana(Bihar) India.J. Eniv. and Poll.,2(3): 137-141.
8. BIS., (2003-09): Bureu of Indian Standards. IS 10500 :Edition 2.2 Drinking water specification IS10500, New Delhi.
9. Chourasia, S. K. and Adoni, A. D. (1985): Zooplankton dynamics in a shallow eutrophic lake. In: proc. Nat. Symp. Pure and Appl. Limnology (Ed. A. D. Adoni), Bull Bot. Soc. Sagar, 32: pp. 30-39.
10. Dhembhare, A. J. and Pondhe, P. M. (1997): J. Aqua. Biol., Vol.12 (1 and 2): 32-33.
11. Ghavzan, N. J., Gunale, V. R. and Trivedy, R. K. (2006): Limnological evaluation of an urban fresh water river with special reference to phytoplankton. Pollut. Res., 25(2), 259-268.
12. Gray, N.F., (1994): Drinking water quality Problems and solutions.Chichester, UK: John Wiley and Sons.

13. Gupta, S. K., Gupta, R. C., Gupta, A. B, Seth, A. K., Bassin, J. K. and Gupta, A. (2000): Recurrent acute respiratory infections in areas with high nitrate concentrations in drinking water. Environ Health Perspect. 108:363–366.
14. Gupta, G. and Abd El-Hamid, Z., (2003): Water quality of lake Qarun, gypt.International Journal of Environmental Studies, 60, 651–657.
15. Huett, M. (1977):Text Book of Fish Culture, Breeding and cultivation of fish. 2nd edition, News Book Publ. University Press, Cambridge, Pp438.
16. Ibe, P. A. (1993): A general review of pollution dynamics of aquatic macro invertebrates of the tropical fresh water system. Unpublished MSc. Thesis, University of Jos Nigeria, 88pp.
17. Karanth, K. R. (1987): Groundwater Assessment Development and Management Tata McGraw Hill publishing company Ltd., New Delhi, 725p.
18. Lloyd, R. (1992): Pollution and Fresh Water Fish, Fishing News Books.
19. Shaikh, N. and Yeragi, S. G. (2003): Seasonal temperature changes and their influence on free Carbondioxide (CO_2), Dissolved oxygen (DO) and pH in Tansa river of Thane District, Maharashtra. J. Aqua. Biol., Vol. 18 (1), P. 73-75.
20. Naz, M. and Turkmen, M. (2005): Phytoplankton biomass and species compositon of lake Golbasi, Hatay. Turkey. Turk. J. Biol. 29: 49-56.
21. Ravichandran, M, and Meena, R. (2009): 'Ethical Issues in Environmental Management' in the book Ethics and Environment, ed., Ranga Reddy A., Mittal Publications, New Delhi.
22. Aher, S. K. Mane, U. H. and Pawar, B. A. (2007): A study on physico-chemical parameters of Kagdipura Swamp in the relation to pisiculture near Aurangabad, Maharashtra
23. Sekabira, K., Oryem-Origa, H., Basamba, T. A., Mutumba, G. and Kakudidi, E. (2010): Assessment of heavy metal pollution in the urban stream sediments and its tributaries. Int. J. Environ. Sci. Tech., 7 (3), 435-446.
24. Swarnalatha, P. and Rao, A. N. (1998): Ecological studies of Banjara lake with reference to water pollution Hyderabad. J. Envi. Biol., 19(2): 179-186.
25. Tiwari, R. K. (1988): Studies on the utility of some aquatic micro invertebrates indicators on water quality in upper and lower lakes of Bhopal. Proc. Nat. Symp. Past, Present and Future of Bhopal lakes. pp. 67-76.
26. W.H.O. (1984): Guidelines for drinking water quality vol. 2 Health criteria and other supporting information. Geneva. pp. 327.