*Kong. Res. J.* 4(3): 71-74, 2017 ISSN 2349-2694, All Rights Reserved,
**Publisher**: Kongunadu Arts and Science College, Coimbatore. www.kongunaducollege.ac.in/kongunadu_research_journal.php

DOI:10.26524/krj235

**RESEARCH ARTICLE**

# ASSESSMENT OF WATER QUALITY AND POLLUTION LOAD IN TEJASWINI RIVER NEAR THE MALAVETTUVAN TRIBAL SETTLEMENT, CHERUPUZHA PANCHAYATH, KERALA, INDIA

**Sangeeth Thekkan, Renjini Haridas and S. Paulsamy***
PG& Research Department of Botany, Kongunadu Arts and Science College (Autonomous), Coimbatore-641 029, Tamil Nadu, India.

## ABSTRACT

Rivers are one of the primary sources of water for drinking, irrigation and other domestic purposes. The present study deals with the water quality assessment of Tejaswini river of Cherupuzha Panchayath, Kannur district, Kerala. The water samples collected from five different sites were analyzed for parameters such as temperature, color, pH, BOD, DO, calcium, magnesium and *Escherichia coli*. The analysis of the physico – chemical and microbiological characters of the river water indicated that the water quality study of site I was affected severely because the study site is very near to the tribal settlements and also the tribes use this area mainly for sewage disposal. Study site II, III, IV and V, which are away from the tribal settlement, the river water is not polluted as it is very far away from the tribal settlement and also nearer to forest canopy. Water from study site I which not suitable for drinking and other domestic use. Therefore, source protection is suggested for the site I water bodies for the benefit of mankind because it is not safe for human consumption.

**Keywords:** Water quality, Tejaswini River, Malavettuvan tribal settlement.

## 1. INTRODUCTION

Water is essential to sustain life, and a satisfactory supply must be made available to consumers. Every effort should be made to achieve a drinking-water quality as high as practicable. Protection of water supplies from contamination is the first line of defence (1). Dirty water and poor sanitation cause more than 500,000 infant deaths a year in the Asia pacific region (2). The rapid industrialization, urbanization and modern civilization (increased population) have lead to the increasing demand for water in domestic, agricultural and industrial sectors (3).

Agricultural waste like Pesticides, fungicides and fertilizers as waste from agriculture human and animal faces, seepage from pit latrines and septic tanks, refuge dump, industrial, domestic and all municipal wastes released into water bodies are often responsible for water contamination. Contaminated water is responsible for health risks due to the spread of diseases such as dysentery, cholera, typhoid, diarrhea and so on (4). According to Grabow (5) the problem associated with polluted water supplies include camp bacteriosis, shigellosis, salmollosis, cholera and a varieties of other bacteria as well as fungi, viral and parasitic infection. The problem of water quality deterioration in the nation is mainly due to human activities such as disposal of dead bodies, discharge of industrial and sewage wastes and agricultural runoff which are major cause of ecological damage and pose serious health hazards (6).

The present study deals with the water quality assessment of Tejaswini river of Cherupuzha Panchayath, which is also known as Kariamkode River, is comparatively small among 44 rivers of Kerala. It originates from Brahmagiri hills of Coorg forest in Karnataka, enters Kerala near Pulingome and flows through Kannur and Kasargod district of Kerala finally drains at Arabian Sea. Which flows through the Malavettuvan tribal settlement between Odakally and Aratukadavu Tribals fully depend on the river water for their day to day activities.

## 2. MATERIALS AND METHODS

### *2.1. Study sites*

Tejaswini River also known as Kariamkode River originates from Brahmagiri hills of Coorg forest in Karnataka, enters Kerala near Pulingome and flows through Kannur and Kasargod district of Kerala and finally drains to Arabian Sea. The study area which lies between latitudes 11°41’ to 12°48’ N and longitudes 74°52' to 76°07'E (Fig. 1). The elevation of the hills ranges between 500-900 meters from Mean Sea level (MSL). The study area which lies on the Western Ghats region of North Kerala, which is rich in Biodiversity and indigenous population (Fig. 1). Malavettuvan tribal settlement near Aratukadavu which is situated on the banks of river Tejaswini. Tribals usally depend directly on river for their day to day water requirements. The main objective of the study is to assess the water quality and pollution load of the river water which is used by Malavettuvan colony of Aratukadavu.

*Correspondence:Dr. S. Paulsamy, Dean Academic and R&D, Kongunadu Arts and Science College, Coimbatore – 641029, Tamil Nadu, India. E-mail.: paulsami@yahoo.com

*2.2. Methods*

Five different study sites were selected in and around Malavettuvan tribal colony where each site is 200 meter apart lies in between Odakolly and Aratukadavu. Study site I is very near to the Malavettuvan tribal colony, from which people use water for their day to day domestic activities like bathing, washing etc. Study site II which is little bit away from the tribal settlement and study site III, IV and V which away from the tribal settlement and also nearer to forest canopy. The water samples were collected during June 2015 to July 2016. Samples were collected in a clean polythene container and brought to Botany Department laboratory, Kongunadu Arts and Science College, Coimbatore for further analysis. The samples collected were labelled properly and preserved in refrigerator at $4^0$C by r. The collection and analysis of samples had been done by Standard methods for examination of water and waste water (7). Water samples were analyzed for parameters such as temperature, color, pH, BOD, DO, calcium, magnesium and *E. coli*.

***2.3.*** **WATER QUALITY TEST PROCEDURE**

*2.3.1. Physico - Chemical Analysis*
*2.3.1.1. Temperature*

Temperature of the water was estimated using Thermometer.

*2.3.1.2. Color*

Water is taken in a beaker and the color is estimated visually.

*2.3.1.3. pH testing procedure*

Electrometric and colorimetric methods were used for the determination of pH value (8).

*2.3.1.4. Biological oxygen demand (BOD)*

The Biological oxygen demand was estimated using oxygen depletion method based on bio-assay procedure. (9)

*2.3.1.5. Dissolved oxygen*

Estimated using titrimetric and winkler's methods for determination of dissolved oxygen.

*2.3.1.6. Calcium*

Calcium is estimated by using EDTA as titrimetric method. (10)

*2.3.1.7. Magnesium*

Magnesium is estimated by using EDTA as volumetric method. (11).

*2.3.2. Microbiological Analysis*
*2.3.2.1. Coliform analysis*

Coliform bacteria and fecal coliform bacteria analysis was done by (Most Probable Number) MPN.

**3. RESULTS AND DISSCUSIONS**

Variation in the physico – chemical and microbiological properties of Tejaswini River water with respect to different sampling sites were studied during June 2015 to July 2016. Water samples were analyzed for parameters such as temperature, color, pH, BOD, DO, calcium, magnesium and *E. coli.* (Table. 1).

**Table 1. Water quality assessment of Tejaswini River Aratukadavu, of Cherupuzha Panchayath, Kannur.**

| Sample Collection Site | Temperature ($^0$C) | Colour | pH | BOD (mg/L) | DO (mg/L) | Calcium (mg/L) | Magnesium (mg/L) | Coliform bacteria (MPN) |
|---|---|---|---|---|---|---|---|---|
| **Site I** | 34 | Light brown | 8.4 | 17.80 | 1.20 | 350 | 320 | 9.4 |
| **Site II** | 32 | Dark green | 7.6 | 15.64 | 2.44 | 345 | 300 | 5.6 |
| **Site III** | 30 | Colourless | 7.4 | 12.40 | 4.52 | 342 | 280 | 1.2 |
| **Site IV** | 29 | Colourless | 7.2 | 8.42 | 6.46 | 340 | 250 | 0.2 |
| **Site V** | 26 | Colourless | 7.2 | 7.82 | 6.82 | 338 | 245 | 0.2 |

*3.1. Temperature*

In the present investigation temperature showed a drastic difference at all the sites. Water temperature ranged between 26˚C to 34˚C at various study sites. In study site I, temperature recorded is 34°C, which is nearer to the tribal settlement, were the tribal use this sites mainly for their domestic activities. In study site II, the temperature recorded is 32˚C which is little bit away from the tribal settlement, so that the water is only little bit affected as compared to with site I. In the study sites III, IV and V there is a great variation in temperature compared to site I and II. The temperature recorded in site III, IV and V is 30˚C, 29˚C and 26˚C respectively. These sites are away from tribal settlement and these areas are not affected as much when compared with study sites I and II. Temperature is an important physical parameter of water quality which has a direct effect on aquatic life

because it reduces the dissolved oxygen (DO) concentration in the water, thus making oxygen less available for respiration (12). Temperature also affect chemical reactions and reaction rates within the water, thereby influencing its suitability for use (13).


**Fig. 1. Map showing the study area**

*3.2. Color*

In the present study the color of the water near the study site I is brown in color as the study site is nearer to the tribal settlement, dark green in study site II and in study sites III, IV and V the water is colorless as the study sites are close to forest area.

*3.3. pH*

pH is an important parameter for existence of most biological life forms. Aquatic organisms are affected by pH because most of their metabolic activities are pH dependent (14). The pH range of aquatic life is 6.5 to 9.5 (USEDA; 2002) and domestic use is 7.0 to 9.0 (ICMR; 1975). In the present study, pH values of water samples between "7.0 to 7.6". The study sites I have the pH values of 8.4 which is at moderate value of domestic use. In study site II pH value is 7.6 and in study site IV and V pH values is 7.2.

*3.4. Biological oxygen demand*

Biological Oxygen Demand (BOD) is an important parameter of surface water quality and which indicates the level of organic matter contamination in surface water (15).The value of BOD ranges between 7.82 mg/L to 17.80 mg/L from site I to site V respectively. Values reported in site II is 15.64 mg/L, site III is 12.40 mg/L and site IV is 8.42 mg/L. There is a great variation in the BOD values of site I and site V because site I is located near to the tribal settlements so that the level of pollution in water is high compared to other four sites eventually the BOD will be more in study site I. In study site V, which is located nearer to forest canopy and away from the tribal settlements then the chance of polluting water will be less when compared to other four sites so that the BOD will be less in study site V.

*3.5. Dissolved oxygen*

Dissolved oxygen (DO) plays an important role in water quality determination. Dissolved oxygen is one of the most important factors for aquatic life and most species become distressed when DO levels drop to 4-2 mg/L (16). There are two main sources of DO in water i.e., diffusion from air and photosynthetic activity within water. Oxygen demanding waste like organic wastes causes rapid deletion of dissolved oxygen from water. Maximum value of DO was found in site IV and site V 6.46 mg/L and 6.82 mg/L respectively and minimum value was in site I ( 1.20 mg/L) followed by site II( 2.44 mg/L). The site study site I and II are very near to tribal settlement.

*3.6. Calcium*

Calcium determines the hardness of the water. In the present investigation the maximum value of calcium was reported in site I as 350mg/L during the study period and minimum value of calcium was reported in the study site V as 328mg/L. Values reported in site II is about 345mg/L, site III is 342 mg/L and site IV is about 340 mg/L. There is a great variation in the presence of Calcium in site I to site V because site I is situated near the tribal settlement and site V which is situated away from tribal settlement and near to forest area.

*3.7. Magnesium*

In the present investigation, the maximum value of magnesium was reported in site I as 320mg/L and minimum value reported at site V is 245 mg/L, site II reported 300mg/, site III 280 mg/L and site IV 250 mg/L. High concentration of magnesium proves to be diuretic and laxative in action which reduces the utility of water for domestic uses while a concentration above 500mg/L imparts an unpleasant taste to water and renders it unfit for drinking (4).

*3.8. Microbiological analysis*

Higher sewage contamination would lead to increase in numbers of Coliforms in natural waste bodies. Normally faecal pellets contain several species of bacteria including human pathogens (12) .The settlement of Malavettuvan tribal colony is near the Tejaswini River, which flows through the forest in Aratukadavu of Pulingome. The tribals use the river water for drinking and other purposes. In the present investigation faecal Coliform bacteria reported in site I of the study area is 9.4 MPN/1L because study site I is near to the tribal settlement,

where the tribal use the areas for their domestic purposes like washing the clothes, bathing etc and also the sanitary wastes are spills near the study area. So that the maximum number of Faecal coliforms are found in the areas near study site I. In study site II the presence of faecal coliforms bacteria is about 5.6 MPN/L as it is little bit away from the tribal settlements. The study site III, which have reported less when compared with study site II about 1.2 MPN/L. The study site IV and V reported very less number of faecal coliforms bacteria about 0.2 MPN/L and 0.2 MPN/L, which is away from the tribal settlement as there are only fewer disturbances to this area. So that the faecal coliforms are very less when comparing with other three study sites. The water near the tribal settlement is not fit for drinking and other household purposes as the number faecal coliform bacteria more. The number of Coliform bacteria is less in the study sites IV and V so that water in these study sites can be used for drinking and other house hold purposes.

## 4. CONCLUSION

By analysing the physico – chemical and microbiological characters of the river water indicate that the study site I affect severely because the study sites is very near to the tribal settlements also the tribals use this area mainly for spilling out the toilet waste . Study site II which is away from the tribal settlement and in study site III, IV and V the river water is not polluted as it is very far away from the tribal settlement and also nearer to forest canopy. So the study site I which not suitable drinking and other domestic use. Therefore, source protection is proposed for the site I bodies of water for the benefit of mankind because they were not safe for human consumption.

## REFFERENCES


1. WHO, (1996). Guidelines for Drinking - Water Quality - Health criteria and other supporting information, International programme on chemical safety. World Health Organization. Geneva. Second Edition – Vol. 2.
2. Economic Review. (2005). State planning Board, Kerala.
3. Athira, N. and D.S. Jaya, (2014). Assessment of water quality status of Anjarakandy River in Kannur district of Kerala. *Asian J. Environ. Sci.* **9**(2): 68-74.
4. Divya, K.R. and K. Manonmani, (2013). Assessment of water quality of river Kalpathypuzha, Palakkad District, Kerala, *J. Environ. Sci. Toxicol. Food Tech.* **4**(4): 59-62.
5. Grabow A K (1996). Properties of ordinary water substance in all its phases, water vapour, waterand all the Ices. American chemical society Monogram no. 81, New York, Reinhold publishing corp. p.73
6. Meitei, N.S., V. Bhargava and P.M. Patil, (2004). Water quality of Purna River in Purna town, Maharastra state. *J. Aquatic Biol.* **19**: 77-78.
7. Anonymous, (1965). Standard methods for examination of water and waste water. *Amer. Publ .Hcl. Assoc*. New York 765.
8. IS 3025-11, (1983). Methods of sampling and test (physical and chemical) for water and wastewater, Part, 11: pH value [CHD 32: Environmental Protection and Waste Management].
9. IS 3025-44, (1993). Methods of Sampling and Test (physical and chemical) for Water and Wastewater, Part, 44: Biochemical Oxygen Demand (BOD) [CHD 32: Environmental Protection and Waste Management]
10. IS 3025-40, (1991). Methods of sampling and test (physical and chemical) for water and waste water, Part, 40: Calcium [CHD 32: Environmental Protection and Waste Management]
11. IS 3025-46, (1994). Methods of Sampling and Test (Physical and Chemical) for Water and Wastewater, Part, 46: Magnesium [CHD 32: Environmental Protection and Waste Management].
12. Firozia, J. and M.G. Sanalkumar, (2012). Hydrology and water quality assessment of Achencovil river in relation to pilgrimage season, *Int. J. Sci. Res. Publ*. **6**(12): 1-5.
13. Metcalf and Eddy, (2003). Wastewater Engineering Treatment and Reuse, Forth Edition., New York, USA: McGraw Hill.
14. Wang, W., A. Wang, L. Chen, Y. Liu and R. Sun, (2002). Effect of PH on survival. Phosphorus concentration adenylate energy charge and $Na^+$ $K^+$ ATPase activities of penaeus chinensis osbeck juveniles, *Aqu. Toxicol.* **60**: 75-83.
15. Vineeta Kumari and Girdhari Lal Chaurasia, (2015). Study of Water Quality Status of Sai River in Uttar-Pradesh With Reference to Water Quality Index Assessment. *Int. J. Innov. Res. Sci. Eng. Technol.* **4**(1).
16. Francis-Floyd, R. (2003). Dissolved Oxygen for Fish Production. Fact Sheet FA 27. Florida: Department of Fisheries and Aquaculture, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida.