Rabiranjan Prusty *et al*, International Journal of Advances in Agricultural Science and Technology,
Vol.4 Issue.8, August- 2017, pg. 40-48 **ISSN: 2348-1358**
Impact Factor: 6.057

WATER QUALITY ASSESSMENT OF TALADANDA CANAL IN THE COMMAND AREA OF CUTTACK CITY

Rabiranjan Prusty[1], Trinath Biswal[2]*

[1]Department of chemistry, Jupiter Science College, Bhubaneswar, Odisha, India

[2]Department of Chemistry, VSS University of Technology, Burla-768018, India

ABSTRACT- The study was carried out to impose and discover the physico-chemical properties of Taladanda canal in Cuttack city. The sample is collected from five different locations (Jobra anikat, Ranihat, Chhatrabazar, Nuabazar and Kalyan Nagar) Cuttack city of Odisha during the month of January, May and July 2017.The various physico-chemical parameters of the collected water sample like p^H, COD (Chemical Oxygen Demand), TDS (Total Dissolved Solid), BOD (Biological Oxygen Demand), TH (Total Hardness), Chloride, Nitrate, Sulphates and Fluoride.EC(Electrical Conductivity) was analysed. The physico-chemical parameter like p^H is varied between 6.95 to 7.93.The p^H of the water was found to be acidic in monsoon season, alkaline in summer and winter season.TH value increases with increase in the value of chloride. The DO value is assorted between 5.3 mg l^{-1} to 7.06 mg l^{-1}. In winter the DO value will be higher. COD value will be higher than BOD value due to presence of chemically oxidizable matter.EC value will be higher in summer season. These parameter shows the degradation of water quality which gives the various anthropogenic activity like-utilization of agriculture and urban use, industrialization, construction activities due to building construction and Jaika project etc and other development purpose. The another part is from which untreated domestic and swage effluents of different type of solid waste dumped into the Taladanda canal. From time to time different solid waste of statue material is also dumped into the canal Taladanda increasing the pollution level during festival time.

Keywords: Fluoride, TDS, BOD, COD.

I. INTRODUCTION:-

Taladanda canal in Odisha is off-taking from right side of Mahanadi Barrage. The Taladanda Canal system was more than 140 years old and once it was the life line of people of undivided Cuttack district. [1] Partly the canal were dug up in 1862 by the East India Company for irrigation purpose of the people of undivided Cuttack district and It was later taken over by the British government, which completed it in 1869 and was the longest canal in Odisha. The canal was originally designed to provide irrigation, recreation and navigation and finally mixed with Bay of Bengal at Paradeep town. [2] Subsequently, there was a need to extend the canal to meet the industrial water requirement of number of large industrial

units in Paradeep as well as to meet the municipal requirement in that area. The Taladanda canal was designed to be a source of water for irrigation to six blocks of Cuttack and Jagasinghpur districts-Sadar Cuttack, Jagasinghpur, Balikuda, Tirtol and Ersama. The total length of the canal is 82.3 km. The Taladanda canal meanders through the city of Cuttack, starts at Jobra in Cuttack and it passes through Ranihat, Chhatrabazar and Nuabazar of Cuttack city and then enters to jagasinghpur district before finally linking to the Bay of Bengal at Paradeep (83 km). [3] Taladanda canal is used for supply of municipal and industrial water to Cuttack city Paradeep city. However the canal is contaminated by different polluting sources at its off taking locations by the addition of liquid effluents and urban solid waste, construction and demolition waste carried by Jaika project, and industrial effluents, solid waste, bio-medical waste of SCB medical college and other medicals, statue of goddess Durga and other during festival season resulting intensive water pollution of river Mahanadi and Taladanda canal. Presently the canal is in a dilapidated condition. [4] The deficiency of carrying capacity in the canal is mainly due to discharge of pollutants from municipal sources, industries for which its carrying capacity is not achieved and has become unsuitable for human consumption. Realising the importance of this problem the aims of our study is to determine the present pollution load of the canal and based on the finding suitable models for prediction of the pollution behaviour at different locations of Taladanda canal and its remedial measures. [5]

II. MATERIAL AND METHODS: -

The water sample was collected in a plastic container from five different locations of Taladanda canal in Cuttack city nearby (Ranihat, Chhatrabazar, Nuabazar, Kalyan Nagar, Jobra anikat) [6] and the different seasonal values (Summer-A_1, Monsoon-A_2, winter-A_3) for each parameter were calculated from monthly sample data as per the method [7]

Location-1 (Kalyana Nagar)

Location-2 (Ranihat)

Location-3 (Nuabazar)

Location-4 (Jobra Anikat)

Location-5 (Chhatra Bazar)

Collection and analysis of water sample;

Water sample was collected during summer and monsoon and winter season in the month of May, July and January of 2017 in the morning hour. [8] Water sample filed in the plastic bottle and kept in the refrigerator. The various physico-chemical parameter i.e. pH, DO, BOD, TH, COD, Sulphate, Chloride, Fluoride, TDS and EC[9]. Of the water sample was analysed by using suitable methods and instruments. [10]

By using the digital P^H meter the pH of the water sample was measured. DO, BOD, Chloride [11] and TH were measured by APHA method [12]. COD and nitrate were explained by EPA [13] .EC determined by conductivity meter. [14]

The results obtained were subjected to two-way ANOVA using MS Excel 2010 data analysis tools. [15]

III. RESULT AND DISCUSSION: -

Table – 1: Physicochemical parameters showing mean± SD in summer season

PARAMETER	SAMPLING LOCATION				
	LOCATION-1	LOCATION-2	LOCATION-3	LOCATION-4	LOCATION-5
PH	6.83 ± 0	6.84 ± 0	6.86 ± 0	6.83 ± 0	6.85 ± 0
EC(mho/cm)	311 ± 0	319 ± 0	317 ± 0	314 ± 0	318 ± 0
COD(mg/I)	76.33	60.53±0.433	65.33±0.588	56±1	68.54±0.588
BOD(mg/I)	3.34 ± 0.056	3.17 ± 0.064	3.31 ± 0.048	2.98 ± 0.059	3.11 ± 0.2
TH(mg/I)	48.59 ± 0.563	38.37±0.563	47.54±1.152	31.37±0.562	42 ± 1
TDS(mg/I)	253.35±1.163	179.52±1.229	209.56±0.563	199.64±1.628	147.52±0.563
DO(mg/I)	4.98 ± 0.052	4.13 ± 0.120	4.77 ± 0.052	5.01 ± 0.120	4.92 ± 0.052
CHLORIDE (mg/I)	46±1	34±1	40±1	29±1	32±1
FLUORIDE (mg/I)	0.24±0.01	0.17±0.01	0.23±0.02	0.13±0.01	0.20±0.01
NITRATE (mg/I)	4±1	3±1	3±1	2±1	4±1
SULPHATE (mg/I)	25±1	19±1	21±1	14±1	22±1
PHOSPHATE (mg/I)	3±1	2±1	3±1	3±1	4±1

Table – II: Physicochemical parameters showing mean± SD in monsoon season

PARAMETER	SAMPLING LOCATION				
	LOCATION-1	LOCATION-2	LOCATION-3	LOCATION-4	LOCATION-5
PH	7.12±0	7.14±0	7.12±0	7.16±0	7.15±0
EC(mho/cm)	303±0	298±0	304±0	301±0	299±0
COD(mg/I)	43±1	30.39±1.53	38.62±0.588	26.79±1.17	31.37±0.588
BOD(mg/I)	2.71±0.057	2.70±0.058	2.79±0.059	2.99±0.058	2.77±0.119
TH(mg/I)	31.71±1.623	25.69±0.588	29±1	21±1	28±1
TDS(mg/I)	198.74±0.058	128.33±0.052	162.03±0.052	90.98±0.052	154.56±0.052
DO(mg/I)	5.61±0.058	4.82±0.061	4.32±0.058	3.72±0.049	4.51±0.058

CHLORIDE (mg/I)	**31±1**	**19±1**	**27±0.4**	**18.33±1**	**24±1**
FLUORIDE (mg/I)	**0.28±0.01**	**0.17±0.01**	**0.23±0.01**	**0.15±0.01**	**0.22±0.01**
NITRATE (mg/I)	**4±1**	**3±1**	**4±1**	**2±1**	**4±1**
SULPHATE (mg/I)	**24±1**	**17±1**	**13±1**	**12±1**	**21±1**
PHOSPHATE (mg/I)	**2±1**	**3±1**	**2±1**	**4±1**	**3±1**

Table – II: Physicochemical parameters showing mean± SD in winter season

PARAMETER	**SAMPLING LOCATION**				
	LOCATION-1	**LOCATION-2**	**LOCATION-3**	**LOCATION-4**	**LOCATION-5**
PH	**6.85±0**	**6.83±0**	**6.87±0**	**6.86±0**	**6.84±0**
EC(mho/cm)	**305±0**	**309±0**	**307±0**	**310±0**	**305±0**
COD(mg/I)	**42±1**	**29.02±1.53**	**35.34±0.588**	**25.26±1.17**	**33.38±0.588**
BOD(mg/I)	**2.98±0.057**	**3.01±0.058**	**3.02±0.059**	**2.82±0.058**	**2.91±0.119**
TH(mg/I)	**29.52±1.623**	**25.69±0.588**	**20.33±1**	**21.12±1**	**20.04±1**
TDS(mg/I)	**198.95±0.058**	**127.44±0.052**	**159.32±0.052**	**109.93±0.052**	**152.23±0.052**
DO(mg/I)	**5.26±0.058**	**4.52±0.061**	**3.99±0.058**	**5.07±0.049**	**5.04±0.058**
CHLORIDE (mg/I)	**29±1**	**18±1**	**26±0.4**	**22±1**	**27±1**
FLUORIDE (mg/I)	**0.20±0.01**	**0.18±0.01**	**0.21±0.01**	**0.11±0.01**	**0.19±0.01**
NITRATE (mg/I)	**2±1**	**4±1**	**4±1**	**3±1**	**4±1**
SULPHATE (mg/I)	**23±1**	**19±1**	**11±1**	**15±1**	**20±1**
PHOSPHATE (mg/I)	**3±1**	**4±1**	**4±1**	**4±1**	**2±1**

During summer and monsoon and winter the pH value will be changes. pH will be higher in monsoon than summer season and winter season.it varied between 6.83 to 7.16 .The high pH may due to higher algal growth and also growth of extensive aquatic plants due to eutrophication and reduced microbial activity. The low pH value is due to high input of raw sewage into the river water and wastes effluents coming from the drains which directly join at this location. There was a significant difference in pH values both with respect to seasons as well as locations.

EC of water samples of all location was high in summer season in comparison to monsoon season and winter season. In location 2 the conductivity level was very high i.e 319 mg/L as compared to other locations. One of the reasons could be an inflow of urban waste as well as discharge of untreated municipal waste into the river containing heavy ionic concentrations. Two-way ANOVA revealed that there was significant difference in conductivity of different samples with respect to different location, however the season wise variation is not significant

In case of DO content of water samples, it was recorded maximum in monsoon season than summer and winter where it ranges varies 5.61 mg/L at location 1 to 3.72 mg/L at location 4. But the values of DO in both the seasons were well within the limits of drinking water standards of 6 mg/l. DO values has never been zero in any of the drains, which shows their interaction to atmosphere due to some turbulence. Two-way ANOVA results significant difference in DO of water samples both with respect to seasons as well as with respect to sampling location.

BOD was more in summer than monsoon and winter season. The value will be ranges from 2.98 mg/l to 3.34 mg/l. The higher value of BOD during summer was due to input of organic wastes and enhanced bacterial activity. Two way ANOVA analysis showed significant difference in BOD of water samples both with respect to seasons.

COD was recorded higher in summer than monsoon than winter and maximum in summer season. In summer COD were ranged from 56 mg/L at location 4 to 76.33 mg/L at location 1. During monsoon season its value varies between 26.79 mg/L at location 4 to 43 mg/L at location 1. High COD at location 1 have been reported to be associated with high organic matter content and sewage disposal in rivers. COD values were invariably higher than BOD indicating the presence of considerable quantity of chemically oxidizable matter most of which were non-biodegradable. High COD values clearly indicate that the river water is polluted. Two-way ANOVA revealed that there was significant difference in the COD of water samples in both season wise and location wise.

TH of water samples found to be higher in summer than monsoon and winter season. TH of water samples value ranged between 31.37 mg/L at location 4 to 48.59 at location 1 mg/l in summer season and in monsoon season varies between 21 mg/l at location 4 to 31.71 mg/L at location 1. The permissible limit for total hardness is 300 mg/l. Hence all the water samples in the present study area were within the permissible limit. According to the results of two ways ANOVA, there was significant difference in TH of water samples both with respect to seasons ($p < 0.001$) as well as with respect to sampling locations

Chloride content of water samples was recorded higher in pre-monsoon than monsoon. Its value ranges between 29 mg/L at location 4 to 46 mg/L at location 1 in summer season.

During monsoon season its value ranges between 18.33 mg/L at location 4 to 31 mg/L at location 1. In this investigation samples of Taladanda canal water were within the permissible limit. Two-way ANOVA showed significant difference in chloride of water samples with respect season. However, the location wise difference was not significant

Nitrate (NO_3^-) and Phosphate (PO_4^{3-}) values are found to be less than 3 mg/l, but significant amount of PO_4 has been observed from all the drains discharging the water to Taladanda canal. NO_3 can be toxic to certain aquatic organisms even at concentration of 1 mg/l whereas PO_4 may cause algal bloom in Taladanda canal.

TDS was maximum in summer than monsoon and winter season. During summer its value ranged from 147.52 mg/L to 253.35 and in monsoon season it varies from 90.98 mg/L to 198.74 mg/L and all the values are within the permissible limit for water i.e. 500 mg/L. Two way ANOVA revealed that there was no significant difference in TDS of water samples both with respect to seasons and different sampling locations. This is perhaps decrease in water level in the canal.

Sulphate (SO_4^{2-}) is found to be within the range. They are available in abundance in nature as sodium sulphate and magnesium sulphate. Sodium (Na) is present as common salt, which reacts with water to make sodium hydroxide and hydrogen. In the analysis, it is found to be less than 25 mg/l as an average.

Fluoride levels of water in monsoon season were higher than summer and winter. During summer its value ranged from 0.13 mg/L at location 4 to 0.24 mg /L at location 1. In monsoon season it varies from 0.15 mg/L at location 4 to 0.28 mg/L at location- 1. The permissible level of fluoride in portable water is 1.5 mg/L. Two-way ANOVA revealed that there was significant difference in fluoride concentration with respect to seasons while the location wise difference was not significant.

IV. CONCLUSION:-

The assessment of pollution load and proper-eco-management study of Taladanda canal in this paper may help the people of Odisha, especially Cuttack city as they depend on Taladanda canal for their day to day life. [16] Threatened rising of organic and inorganic waste levels which a consequence of human activity is definitely going to hammer on water quality and its ecosystem directly or indirectly. [17] These anthropogenic consequences obviously hamper the aesthetic properties of aquatic systems and impose potential health hazards not only aquatic organisms but also other terrestrial life forms including human beings. So to sustain the river quality healthy, [18] we should be mostly concern about the waste and its disposal system. [19] The local drain water which take effluents from the city should kept clean and create awareness among the people. [20]

REFERENCES:-

[1] APHA,2005. Standard methods for examination of water and waste water. 21 Edn., A merican Public Health Association. Washington D.C., USA.

[2] Pradhan U.K., Shirodkar P.V. and Sahu B.K., 2009. Physicochemical evalution of its seasonal changes using chemometric techniques, Current Science, 96(9), 1203-1209.

[3]. Sujitha P. C., Mitra Dev D., Sowmya P. K. and Mini Priya R., 2012. Physicochemical parameters of Karamana river water in Trivandrum district, Kerala, India. Internat ional journal of Environmental Sciences (3) : 1417-1434.

[4] APHA (1992). Standard Methods for Examination of Water and Waste Water, 18th edition. American Public Health Association, Washington, DC, US.

[5] Chetana S.A. and Somashekar R. K. (1997). Evaluation of water quality index of the river Cauvery and its tributaries. Current Science (Current Science Association and Indian Academy of Science, Bangalore), 72(9): 640–646.

[6] Alam M.B. and Sattar M.A. (2007). Assessment of arsenic contaminant ion in soils and waters in some areas of Bangladesh. Water Science Technology, 42:185–192.

[7] Mishra K.N. and Ram S. (2007). Comprehensive study of phytoplanktonic community growing in polluted ponds of Janupur City (U.P). Journal of Phytological Research, 20 (2): 317-320.

[8] Abdel A.M. Water quality of Lake Bardawil Egypt. Journal of Egyptian Academy Society for Environmental Development, 61:79-83.

[9] Girija T.R., Mahanta C. and Chandramouli V.(2007). Water quality assessment of an untreated effluent impacted urban stream: the Bharalu Tributary of the Brahmaputra River, India. Environmental Monitoring and Assessment, 130: 221–236

[10] Khan F., Husain T. and Lumb A. (2003). Water quality evaluation and trend analysis in selected watersheds of the Atlantic region of Cannada. Journal of Environmental Monitoring Assessment,. 88:221-242.

[11] Pagariya S. K.(2012). Analysis of water quality using physico-chemical parameters of Kolura pond in post- monsoon season. International Journal of Chemical and Physical Sciences

[12] Smitha, Ajay D. and Shivashankar P. (2013). Physico chemical analysis of the freshwater at river Kapila, Nanjangudu industrial area, Mysore, India. International Research Journal of Environmental Sciences

[13] Dash M. and Panda T. (2010). Water quality and phytoplankton population in sewage fed river of Mahanadi, Orissa, India. Journal of Life Sciences, 2(2) : 81-85.

[14] Venkateshraju K., Ravikumar P., Somasekha R.K. and Prakash K.L.(2010). Physicochemical and bacteriological investigation on the river Cauveryo Kollegal stretch in Karnataka. Journal of Science Engineering and Technology

[15] Singh, V.K., Singh, K.P. and Mohan, D. (2005): Status of heavy metals in water and bed Sediments of river Gomati – A tributary of the Ganga river, India, Environmental Monitoring and Assessment

[16] Suthar Surindra, Sharma Jitender, Chabukdhara, Nema A.K. (2010): Water quality assessment of river Hindon at Ghaziabad, India: Impact of industrial and urban waste water, Journal of Environment Monit Assess

[17] Hutchinson,G.E.(1957): A treatise on limnology, volume I, John Wiley and Sons, Inc., New York.

[18] Gaikwad, V.B. (2000): Water quality monitoring of Godavari river in and around Nashik, Ph.D. Thesis Submitted to University of Pune, India.

[19] MERI Report, (2001): the study water quality of Godawari river in Nashik City, Maharashtra Engineering Research Nashik-422004

[20] APHA, AWWA, WPCF (1989): Standard Methods for the examination of water and Waste Water, 17th Ed (Clescerina, L.S. Eds., Trussell, R.R., Greenberg, A.E.), APHA, Washington D.C. U.S.A.

