INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 6, Issue - 4, Apr – 2020
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.497
Received Date: 29/03/2020 Acceptance Date: 11/04/2020 Publication Date: 30/04/2020

Physiochemical and bacteriological analysis of waste water of Berhampur town, Ganjam, Odisha

[1]Dr Rasmita Padhy, [2] Himaja Habismati Gharai , [3] Subhashree Patro
P.G. Dept. of Botany and Biotechnology, \
Khallikote Autonomous College, Berhampur, Ganjam, Odisha
Email - [1]rashmitapadhy258@gmail.com, [2]himajahabismatig@gmail.com, [3]subhasree.patro@gmail.com

Abstract: *The study assessed the testing or different water samples which were collected from TEN different drains located in Berhampur town in Ganjam district, Odisha, India during January 2019. Samples were analysed for physiochemical parameter including temperature, pH, redox potential, TDS, TSS, DO, Total alkalinity,Chloride Total hardness. It is concluded that high temp.found in Gate Bazar and Giri market and low temperature found in Ankuli . pH which indicate little acidic in Giri market and Kath Mentu chaka,and normal Ph indicate Gate Bazar. But temperature, redox potential, pH are found normal range but other parameter like TDS found maximum in Jyoti Nagar and minimum in Lanjipali. TSS found maximum in Khoda singh minimum in Gopalpur Junction. Alkalinity amount high in Lanjipali and lowest in Gopalpur Junction.chloride content are found very low. In Jyoti Nagar hardness is highest ad very low in Kanth Mentu .Also the lowest value of DO indicates high polluted in Ankuli and highest value of DO indicates low polluted in Jyoti Nagar. pH level 6.6 to 7.2 could favour both indicator and growth of pathogenic microorganisms. Thus indicated pH levels seem to support bacterial growth. Here various types of microorganism are present but we only identified some bacteria by using simple staining method, Coccus, Bacillus shaped bacteria are found. We got both positive as well as negative stain bacteria .By using endospore staining method, there are two types of bacteria are found Bacillus and Staphylococcus. Further by using more advance technique we may found more bacteria which are harmful or beneficial for us. On the basis of the present findings, the following recommendation are proposed:* ***To clean up the sewage.***

Key Words: *Physiochemial, becterological, pathogenic, redox potential, alkalinility.*

1. INTRODUCTION:

Wastewater also referred to as ‘used water’ or ‘effluent’. The term wastewater has also been equated with sewage, implying that the definition is limited to used water (from domestic, industrial or institutional sources) carried off by sewers, thus excluding the uncollected runoff from urban settlements and agricultural systems. However, as urban and agricultural runoff can be heavily polluted (and potentially become mixed with other wastewater streams), they are also important elements of the wastewater management cycle. Wastewater is regarded as a combination of one or more of: domestic effluent consisting of black water (excreta, urine and faecal sludge) and grey water (used water from washing and bathing); water from commercial establishments and institutions, including hospitals; industrial effluent, storm water and other urban runoff; and agricultural, horticultural and aquaculture runoff (Raschid-Sally and Jayakody, 2008, p. 1). The climate change determinants affecting water quality are mainly the ambient (air) temperature and increase of extreme hydrological events .Soil drying-rewetting cycles and solar radiation increase may also be considered. Even though household sanitation facilities have increasingly being improved since 1990 risks to public health remain due to poor contaminate, leakages and ineffective sewage treatment. Various Physical characteristics of water such as temperature and light play a great role in the overall metabolism of the water body while chemical factors like dissolved gases, bicarbonates, nitrogen, phosphorus, silicon, calcium, magnesium etc. Largely govern its productivity (Nath et al;1994). In 2012, an estimated 842,000 deaths bin middle and low income countries were caused by contaminated drinking water, inadequate hand washing facilities and inappropriate sanitation services (WHO,2014). In adequate waste water management has also a direct impact on ecosystem and the services that provide (Corcoran et al,2010). Physical and chemical parameter include heavy metals, trace organic compounds, total suspended solid (TSS).The study of physicochemical analysis of waste water has great significance at that time where pollution is the major problem today’s life and the microbial analysis of sewage water very much useful to identify the microorganism and the disease cause by them for human life.

2. LITERATURE & REVIEW:

The various technical research paper on the assessment of water quality for different waste water and other water bodies are published. Kothari et al (2012) studied the physical and chemical parameters of dairy wastewater

quality such as nitrates, sulphides, phosphates, chlorides and Total hardness. They founded that nitrogen and phosphate removal is achieved to be 49% and 83 % respectively. Sheekh et al (2012) investigated the treatment efficiency of wastewater by using single or mixed cultures of cyanobacteria and they found that single culture was better than mixed culture. The lower efficiency of mixed culture is due to competition between cultures for nutrients and also found that organic matter removal (COD) is between 20 – 57.1 %. Sriram et al in 2012 highlighted a review on the current scenario in thecultivation of microalgae in wastewater for nutrient removal. Patil. P.N et al [2012] studied "Physico-chemical parameters for testing of water" .The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as color, temperature, acidity, hardness, pH, sulphate, chloride, DO, BOD, COD, alkalinity used for testing of water quality. Heavy metals such as Pb, Cr, Fe, Hg etc. are of special concern because they produce water or chronic poisoning in aquatic animals. Some water analysis reports with physicochemical parameters have been given for the exploring parameter study. Guidelines of different physic-chemical parameters also have been given for comparing the value of real water sample. Pratiksha Tambekar, pravin P. Morey, R.J. Batra and R.G. Weiginnwar (2013) have studied physico-chemical parameter evaluation of water quality around Chandrapur (Maharashtra). Two sampling stations were selected at the downstream of Chandrapur City. The water sample was collected from the Wardha River at 3 different selected stations. Over a period 12 months during the year 2013. The various physicochemical parameters were studied. Ramalingam manikannan, Subramanian asokan and A.H.M.S. Ali [2013]have studied Seasonal variation of physicochemical properties of the great vedaranyam swamp point calimere wildlife Sanctuary, South east coast of India. The present study was attempted on the physico chemical variability in this area. The seasonal variation study was carried out to examine level of varying physicochemical parameters such as Temperature, Salinity, pH, Dissolved oxygen, Nitrate, Nitrite, Electrical conductivity, Phosphate, Turbidity, Total dissolved solid, and water depth. The present base line information of the physicochemical properties of water would from a useful tool for further ecological assessment and monitoring of this wetland of point calimere wildlife sanctuary. Mane A. V. et al [2013] studied "Water quality and sediment analysis at selected locations of Pavana river of Pune district, Maharashtra" Present investigation aims at insight about the level of contaminants of surface water, groundwater and sediment analysis of selected locations of Pavana river of Pimpri- Chinchwad area of Pune district. An attempt has been made to assess the water quality, sediment and weed analysis of the samples. A higher value of TDS was observed at groundwater site G4 with 834.27 mg/l while it was lower at surface water site 1 by 65.12 mg/l. Dissolved oxygen content of the water samples was observed quite well in limit but it was lower with 1.6 mg/l at surface water site 4 while higher at surface water site 2 with 5.23 mg/l. In the present study, highest value of COD was observed by value of 120 at surface water site S4 while was lowest with only 64 mg/l at groundwater site G4. As expected groundwater samples showed higher values of hardness content as compared to surface water samples of Pavana river.

3. MATERIALS &METHOD: Description of study area : Water samples were collected from TEN different drains located in Berhampur town in Ganjam district, Odisha, India during January 2019.The place Berhampur otherwise known as "THE SILK CITY" because it is famous for its silk sarees, temple and unique culture. It is situated at 19'32'' North latitude,84'78 East longitude and 31 meters elevation About the sea level. So keeping in view on all these facts in mind TEN drains were selected for detailed study.

Figure 1. SATELLITE MAP OF BERHAMPUR, GANJAM, ODISHA

TABLE 1.
(Location of sampling points of water collection in Berhampur Town, Odisha**)** **SAMPLING**

SL NO.	LOCATION OF DRAINS /SAMPLING POINTS	CODE NO.
1	Shree Tower (Near Relax Parlor)	Sample-A
2	Jyoti nagar 2nd lane	Sample-B
3	Gopalpur Junction	Sample-C
4	Khoda singh (Near Kalinga Nagar)	Sample-D
5	Gate Bazar	Sample-E
6	Lanjipali	Sample-F
7	Ankuli	Sample-G
8	Gosani Nuagaon Road	Sample-H
9	Giri Market Chhak	Sample-I
10	Kath Mentu Chhak	Sample-J

Samples were collected in 500ml glass bottles for all physico-chemical parameters, pre-cleaned by washing with detergent rinsed in tap water. Before sampling, the bottles were rinsed two times with sample water before being filled with the sample. The sampling were done in the morning 8 AM to 10AM and the containers were dipped and filled at a depth of 20-30cm below the surface of drain. The sample was then transported to laboratory and stored in a cool place for further analysis.

3.1. DISCUSSION:

Temperature is the most important factors in the aquatic environment. It affects the physical and chemical properties of water, aquatic vegetation, organism and their biological activities. The permissible limit of pH in drinking water is within 6.5-8.5 according to Bureau of Indian standard (BIS). Water with pH greater than 7.0 is considered basic or alkaline .So above the pH value consider that all water samples are in alkaline or basic form. Generally pH of waste water ranges 5.5 to 8.0. Redox potential Higher values indicate the presence of higher contents of dissolved salts in water (Abdullah and Musta 1999). Total dissolved solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metal dissolved in a volume of water in mg/l. There is no gas and colloids in TDS. Shrivastava and Kanungo (2013) reported the range of TDS in between 152.12 -265.97gm/l.The value of total suspended solids falls within the standard range of 0.01 to 0.0186gm/l recommended by Davis(1993).

Dissolved oxygen is the dissolved gaseous form of oxygen. DO enters water by diffusion from the atmosphere and as a by product of photosynthesis by algae and plants . Shrivastav and kanungo, (2013**)** reported a range of DO 2.43 to 4.45 organic matter, salt and particles. Chloride, Concentration can be an important parameter for detection of contamination by sewage Trivery and Khatavker (1986) reported chloride concentration ranges between 10-25mg/l.The uptake or release of Co_2 by organisms may change the proportion of carbonates and bicarbonates in water **(**Boyd,1984). Alikunhi (1957) has classified waters having alkalinity over 100ppm.Hardness of water is a measure of its capacity to form precipitate with soap and scales with certain anions presents in the water. Hardness of water mainly depends upon amount of calcium or magnesium salt.

3.2. PHYSICO-CHEMICAL ANALYSIS: Analysis is carried out for various water qulity parameters such as temperature, pH, redox potential, TDS, TSS, DO, Total alkalinity,,Chloride Total hardness

3.3. BACTERIOLOGICAL ANALYSIS OF WATER SAMPLE Analysis is carried out for various water types by different bacterial staining methods such us, Staining methods: Simple staining of bacteria, Gram staining of bacteria, Bacterial spore staining.

4. RESULT:

The values of the physicochemical parameters observed in the present study may serve as an indicator of pollution level of the study area. Temperature was measured by using Thermometer. Temperature ranges from 16^0c to 25^0c in the post winter season and the result was shown in Table-2, Graph-1. Maximum temperature was in the sample E & I and minimum in sample G**.** The pH of the water sample collected from different sewage was ranging from 6.65 to 7.31, and the result was shown in Table-2,Graph-2. Redox potential of 10 samples were ranging from -0.03 to 0.19mV,and the result was shown in Table-2,Graph-3. TDS ranged from 0.05gm to 1.04gm per litre in post winter Season and the result was shown in Table-2,Graph-4 .Maximum TDS was in the sample B and minimum was in sample A. Amount of TDS increased due to increased amount of dissolving contents. TDS are composed mainly of bicarbonates, chlorides, carbonates, phosphates, and nitrates of calcium, magnesium, sodium, and potassium,

manganese, salt, and other material. TSS ranged from 0.16 to 1.12 g/lit in Post winter Season and the result was shown in Table-2,Graph-5. Maximum TSS was in sample G and minimum was in sample I. Dissolved oxygen ranged from 25.022 to 95.086 mg/lit in post winter season.

Maximum DO was recorded in sample B and minimum was in sample G. Alkalinity ranges from 0.185 to 0.346 show in Table-2,Graph-7. During this study the total alkalinity ranged from 0.175 to 0.346 g/l in post winter season. Maximum alkalinity was observed in sample G where as minimum was in sample C. Total hardness ranged from 0.016 to 0.257 g/l in post winter Season and the result was shown in Table-2,Graph-8. Maximum hardness was observed in sample B and minimum was observed in sample A. The chloride concentration in the study area ranged from 0.34 to 0.068 gm/lit in Post winter season and the result was shown in Table-2,Graph-9. Maximum chloride concentration was in sample B and minimum was in the sample J.

4.1. BACTERIOLOGICAL TEST:-

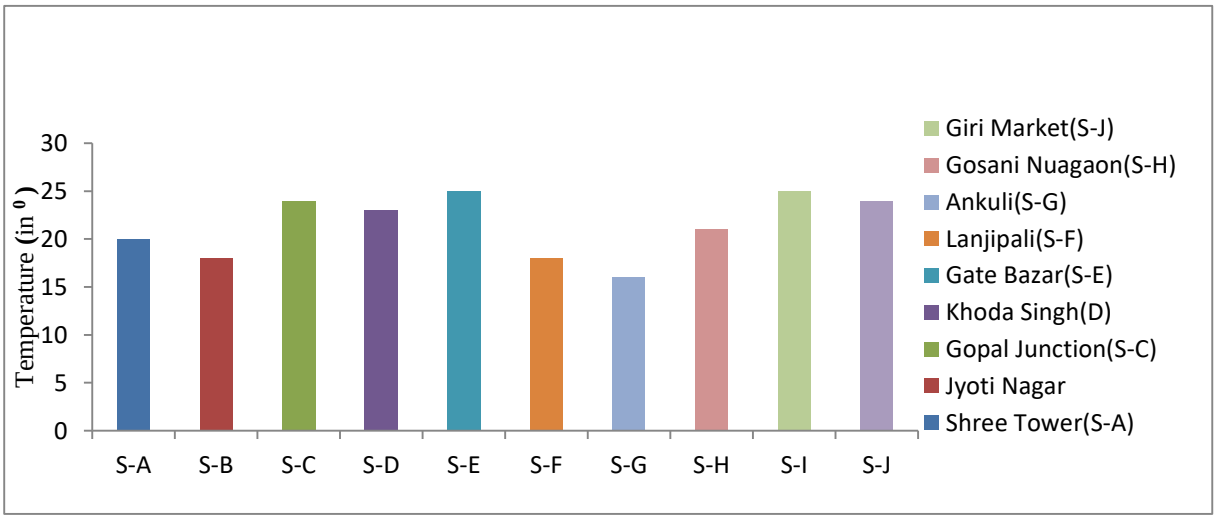
Bacteriological analysis represents one aspect of water quality.It use from the concentration and type of bacteria present. Bacterial stain is the simplest method to identify different bacteria. Stain are deep blue. Here cocci, bacillus are present every sample and sample B and H diplococcus tetrad, sample A, I and J are Cocobacillus, Diplococci, Staphylococci and other samples are Cocobacillus, Staphylococci types found in simple staining. Because of waste water both Gram +ve and –ve bacteria are present more amount.But minimum and maximum amount is not count in sample.Gram +ve bacteria show purple colour bacteria and –ve bacteria show pink colour bacteria in gram staining In the sample, the endospore of Bacillus & Staphylococcus are found. However Bacillus are most abundantly in endospore staining.

TABLE 2.

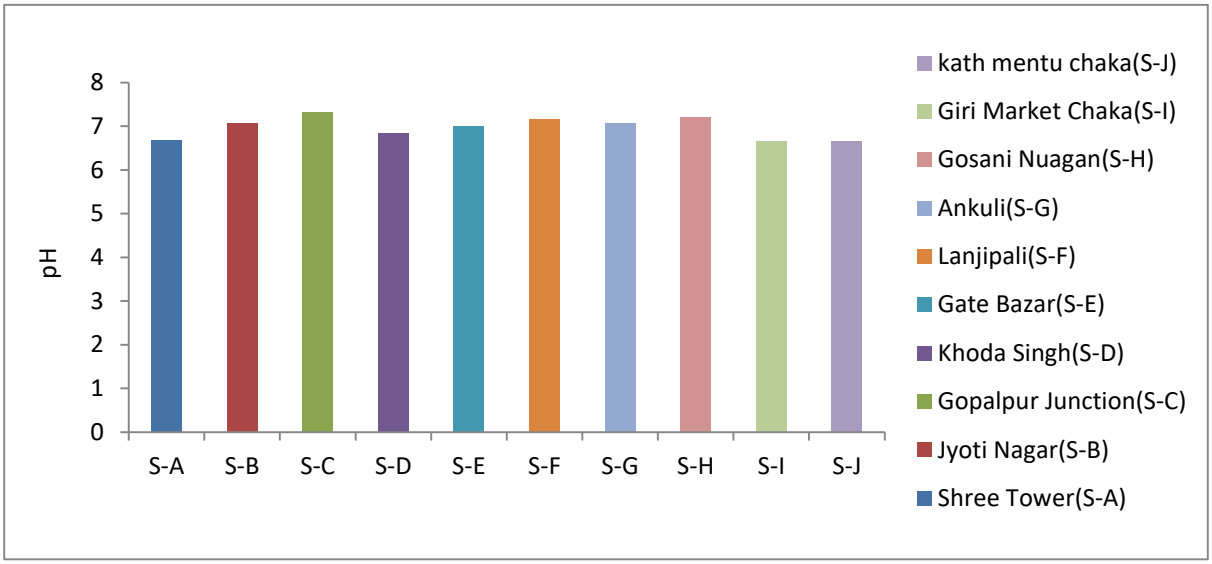
Sample No.	Temp (^{0}c)	pH	Redox potential (mv)	TDS (g/l)	TSS (g/l)	D.O (mg/l)	Alkalinity (g/l)	Total hardness (g/l)	Chloride (g/l)
S-A	20	6.67	0.19	0.05	0.6	45.059	0.219	0.016	0.042
S-B	18	7.06	-0.03	1.04	0.52	95.086	0.287	0.257	0.068
S-C	24	7.31	-0.18	0.44	0.64	70.967	0.175	0.026	0.036
S-D	23	6.83	0.18	0.76	1	69.029	0.317	0.046	0.059
S-E	25	7	0	0.6	0.72	60.054	0.253	0.037	0.045
S-F	18	7.16	-0.10	0.88	0.64	45.040	0.346	0.057	0.056
S-G	16	7.06	-0.03	0.84	1.12	25.022	0.336	0.037	0.057
S-H	21	7.20	-0.13	0.92	0.96	51.546	0.185	0.050	0.056
S-I	25	6.66	0.20	0.88	0.16	48.210	0.287	0.045	0.053
S-J	24	6.65	0.22	0.2	0.96	47.521	0.200	0.025	0.034

GRAPH

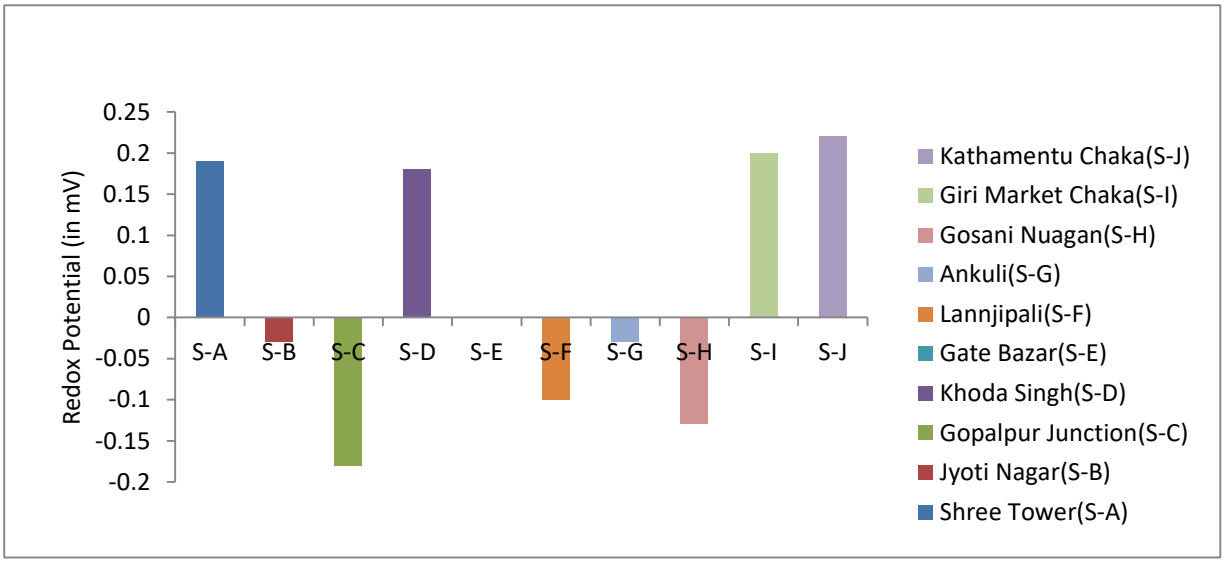
TEMPERATURE



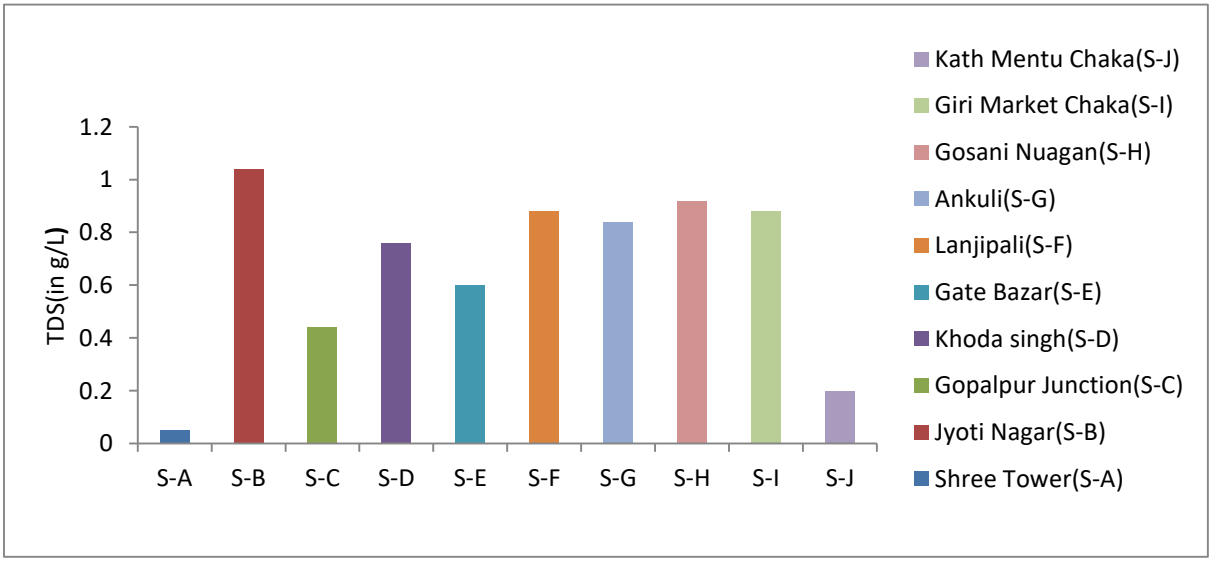
PH



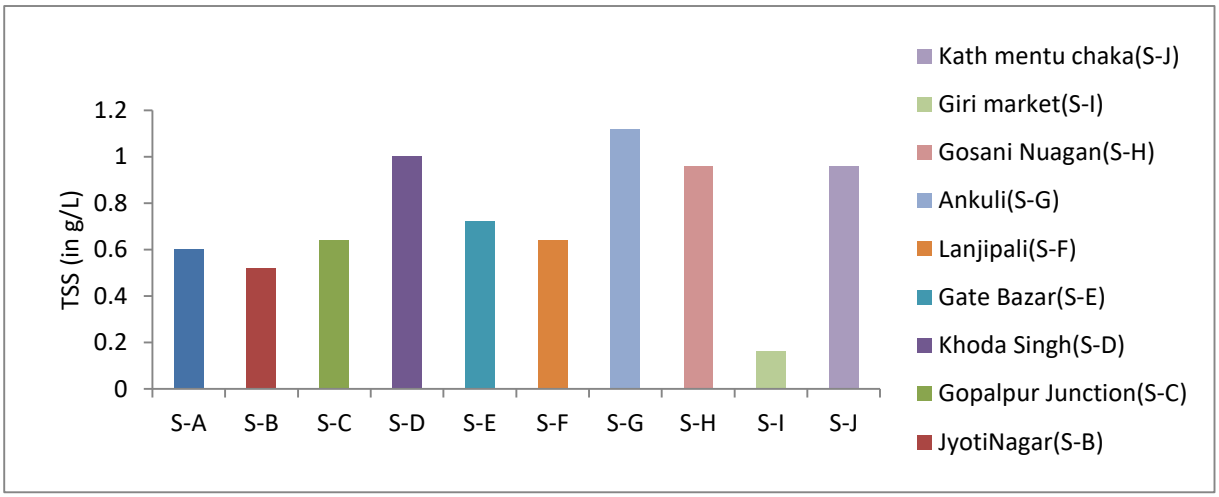
REDOX POTENTIAL



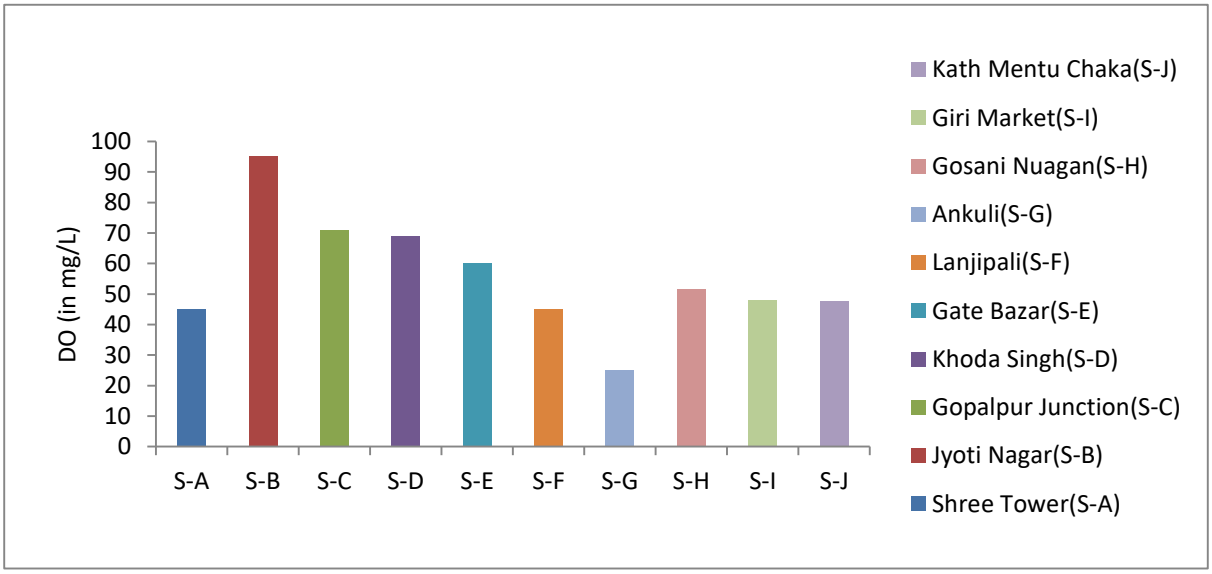
TDS



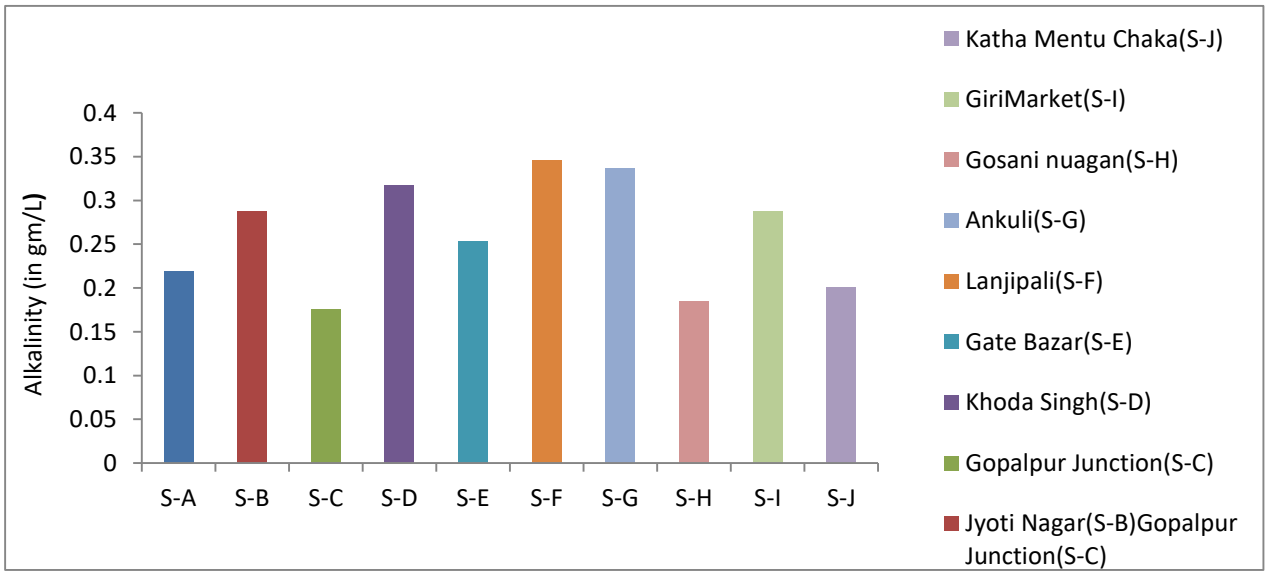
TSS



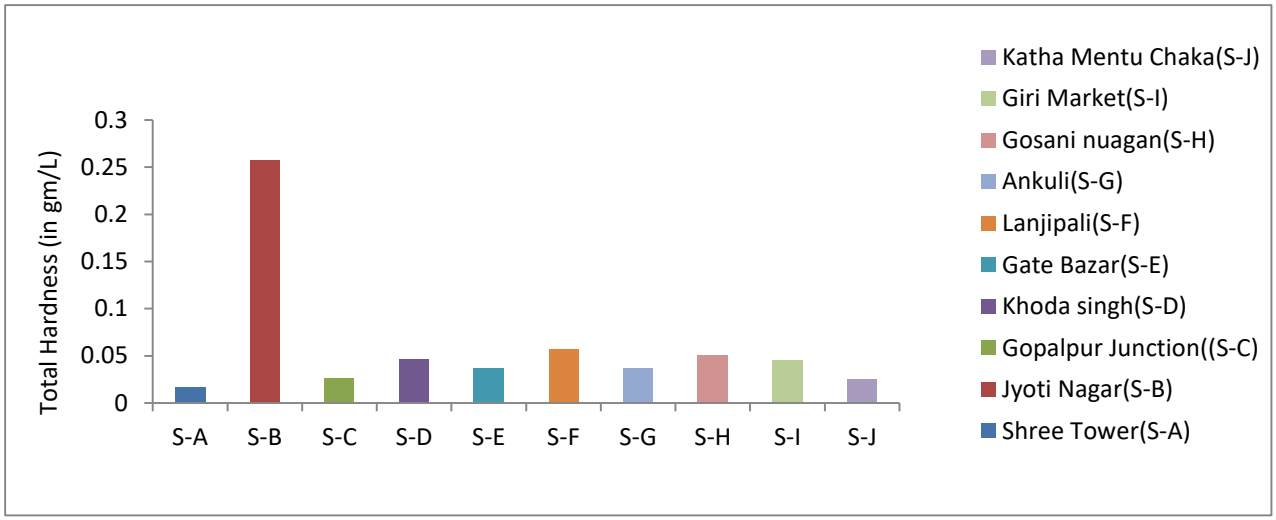
DISSOLVED OXYGEN



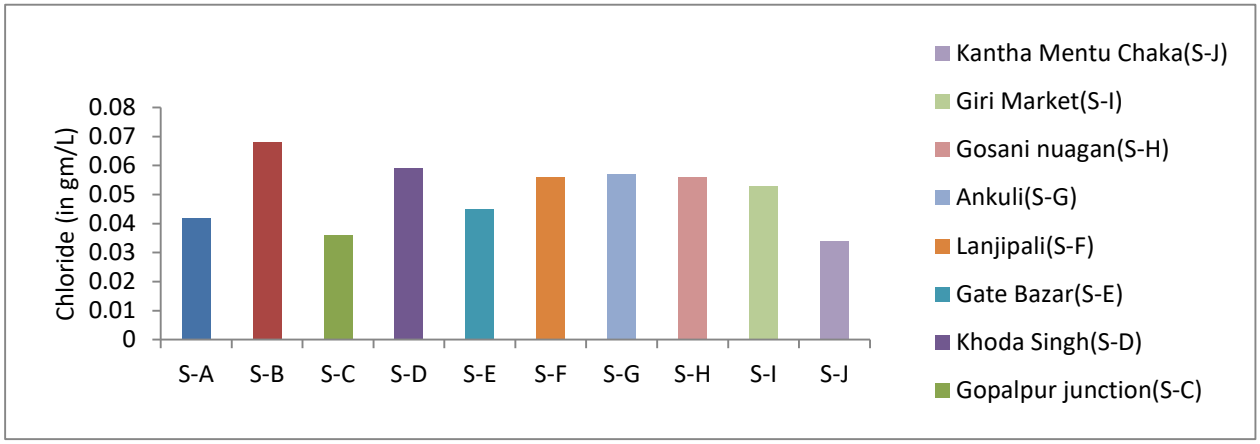
ALKALINITY



TOTAL HARDNESS



CHLORIDE



5. DISCUSSION:

Temperature is the most important factors in the aquatic environment. It affects the physical and chemical properties of water, aquatic vegetation, organism and their biological activities. The permissible limit of pH in drinking water is within 6.5-8.5 according to Bureau of Indian standard (BIS). Water with pH greater than 7.0 is considered basic or alkaline .So above the pH value consider that all water samples are in alkaline or basic form. Generally pH of waste water ranges 5.5 to 8.0. Redox potential Higher values indicate the presence of higher contents of dissolved salts in water (Abdullah and Musta 1999). Total dissolved solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metal dissolved in a volume of water in mg/l. There is no gas and colloids in TDS. Shrivastava and Kanungo (2013) reported the range of TDS in between 152.12 -265.97gm/l.The value of total suspended solids falls within the standard range of 0.01 to 0.0186gm/l recommended by Davis(1993). Dissolved oxygen is the dissolved gaseous form of oxygen. DO enters water by diffusion from the atmosphere and as a by product of photosynthesis by algae and plants . Shrivastav and kanungo, (2013**)** reported a range of DO 2.43 to 4.45 organic matter, salt and particles. Chloride, Concentration can be an important parameter for detection of contamination by sewage Trivery and Khatavker (1986) reported chloride concentration ranges between 10-25mg/l.The uptake or release of Co_2 by organisms may change the proportion of carbonates and bicarbonates in water **(**Boyd,1984). Alikunhi (1957) has classified waters having alkalinity over 100ppm.Hardness of water is a measure of its capacity to form precipitate with soap and scales with certain anions presents in the water. Hardness of water mainly depends upon amount of calcium or magnesium salt.

6. CONCLUSION:

Water is the most required a biotic factor and it is getting polluted day .Taking 10 different waste water sample of Berhampur town measuring the minor parameters to analyze the physico-chemical testing with the different samples from different sampling point. High temp. found in Gate Bazar and Giri market and low temperature found in Ankuli . pH which indicate little acidic in Giri market and Kath Mentu chakka,and normal Ph indicate Gate Bazar. But temperature, redox potential, pH are found normal range but other parameter like TDS found maximum in Jyoti Nagar

and minimum in Lanjipali. TSS found maximum in Khoda singh minimum in Gopalpur Junction. Alkalinity amount high in Lanjipali and lowest in Gopalpur Junction. chloride content are found very low. In Jyoti Nagar hardness is highest ad very low in Kanth Mentu .Also the lowest value of DO indicates high polluted in Ankuli and highest value of DO indicates low polluted in Jyoti Nagar. Here pH level 6.6 to 7.2 could favour both indicator and growth of pathogenic microorganisms. Thus indicated pH levels seem to support bacterial growth. Here various types of microorganism are present but we only identified some bacteria by using simple staining method, Coccus ,Bacillus shaped bacteria are found. When we do gram stain procedure we got both positive as well as negative stain bacteria .By using endospore staining method, there are two types of bacteria are found Bacillus and Staphylococcus. Further by using more advance technique we may found more bacteria which are harmful or beneficial for us.

7. RECOMMENDATION:

On the basis of the present findings, the following recommendation are proposed:

- To clean up the sewage.
- Alternate sources of domestic use of water should be provided when the canal water is not available.
- Further studies are needed to characterize the organic compound of sewage water.

8. FUTURE SCOPE OF WORK:

- Analysis of more trace element and find heavy metal present in waste water.
- To identify the other microorganisms like virus, protozoa etc.
- Staining method is common initial method for identifying the microorganism, but using PCR and other modern technique we can find out the accurate pathogen which are harmful for us.
- By bioremediation technique we can use some microbes for water pollution control.

REFERENCE:

1. Abdullah, M. H., & Musta, B. (1999). Phreatic water quality of the turtle islands of East Malaysia: Pulau Selingaan and Pulau Bakkungan Kechil. Borneo Science, 6, 1–9.
2. Alikunhi, KH (1957) : Fish culture in India, Farm Bulletin No.20, ICAR, New Delhi ;1 -6.
3. Boyd, C. E. (1979). Water Quality in Warm Water Fish Ponds. University Press, Alabama, USA, pp: 59.
4. Corcoran, E., Nellemann, C., Baker, E., Bos, R., Osborn, D. and Savelli, H.(eds). (2010). Sick Water? The Central Role of Wastewater Management in Sustainable Development. United Nations Environment Programme/United Nations Human Settlements Programme/GRID-Arendal (UNEP/UNHabitat).
5. 5.Davis, J. (1993) : Survey of Aqua culture effluents permitting and standards in the South. Southern Regional Aquacuiture Centre, SRAC Publications, USA, 465(4).
6. Jain, N. and Shrivastava, R.K.(2014): " Comparative Review of Physicochemical Assessment of Pavana River" IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSRJESTFT) e-ISSN: 2319-12402, ISSN: 2319-2399.Volume 8, Issue 6 Ver. III , 2530.
7. Kothari,R., Vinayak V. Pathak, Virendra Kumar, D.P. Singh "Experimental study for growth potential of unicellular algae *Chlorella pyrenoidosa* on dairy waste water: An integrated approach for treatment and biofuel production." Bio-resource Technology 116.
8. Mane, A. V., Pardeshi, R. G.and Gore, V. R., Walave, R. L., Manjrekar, S. S. and Sutar ,G. N.(2013) : "Water quality and sediment analysisat selected locations of Pavana river of Pune district, Maharashtra," Journal of Chemical and Pharmaceutical Research, 5(8):91-102.
9. Nath., et al .(1994): "From publication monitoring the sedimentary carbon in an artificially disturbed deep –sea sedimentary environment" on Research Gate.
10. Patil, P.N., Sawant, D.V.and Deshmukh, R.N. (2012): "Physicochemical parameters for testing of water – A review" International Journal of Environmental Sciences Volume 3,No 3.
11. Raschid-Sally, L. and Jayakody, P. 2008. Drivers and Characteristics of Wastewater Agriculture in Developing Countries: Results from a Global Assessment. IWMI Research Report No. 127. Colombo, International Water Management Institute (IWMI).
12. Sriram,S and Sreenivasan.,R.:"Microalgae Cultivation in Wastewater for Nutrient.
13. Tambekar, P., Morey, P. and Batra, R.J. (2013): Physico- chemical parameter evolution of water quality around Chandapuer District, Maharashtra, India, Journal of Chemical and Pharmaceutical Research. 5(5):27-36.
14. Trivery, R K and Khatavker, SD (1986): Phytoplankton ecology of the river Krishna in Maharastra with reference to Bio-indicators of pollution., Asian Environ.,; 31-42.
15. WHO (2011): "Geneva Guideline for drinking water quality, volume.1: Recommendations" 3rd Ed.