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PHYSIO-CHEMICAL ANALYSIS OF WASTEWATER SAMPLES FROM DRAINAGE SYSTEMS OF BERHAMPUR MUNCIPALITY AREA OF ODISHA

[1]B K Mohanty, Rasmita Padhy, M. Mohapatra, G. Sabat, Suresh Kumar Behera , Sauranshu Jena, Jitendra Kumar Behera

[1]P.G. Department of Botany & Biotechnology, Khallikote Autonomous College, Berhampur-760001, ODISHA, INDIA

ABSTRACT: From the above investigation; by taking some minor parameters to analyse the physiochemical testing with the different samples from different sampling point of Berhampur town, Odisha; It was concluded that Alakapuri drainage, Kalinga nala drainage, Ambapua drainage respectively showing high level of contamination or pollutant level. In many parameter like, pH – which indicate little acidic, TDS – maximum in no., another important point like redox potential, high indicates high amount of solids, salts, ions, etc. Also the lowest value of dissolved oxygen, hardness and organic compound also found maximum in sample. Lastly it was showing the bitter test indicating the pollutant level.
Key words: Wastewater, Drains, physio-chemical analysis

*Corresponding autor: B K Mohanty, P.G. Department of Botany & Biotechnology, Khallikote Autonomous College, Berhampur-760001, ODISHA, INDIA Email : mohantysir57@yahoo.com

INTRODUCTION

Water is, quite literally, the liquid of life. All living creatures need water to survive, this is way water is called 'the stuff of life'. Every single cell in our body requires water in order to function property. Water keeps our garden blooming and full of life .Photosynthesis is the process by which plants create their food using the sun's light.

Water has both physical and chemical properties, which plays an important role in the living world. As the topic of physical change the turning of water into ice or vapour doesn't constitute a chemical change because the same molecules make up the liquid, solid and vapour state of water. The only difference between ice, steam and water is this; molecule in ice essential has no freedom. A chemical change occurs when new molecules are formed as a result of the change. Chemical parameter tends to lose more of chronic health risk through build up heavy metal through some components like nitrates/nitrites and chlorides can have a more immediate impact. Physical parameters affect aesthetic and taste of the drinking water and may complicate the removal of microbial pathogens. Fecal contamination was determined with the presence of bacteria. Waste water, is pumped directly into the sea or into fresh water bodies without any form of treatment .In other parts of developed country laws and outdated system heavily compromises wastewater treatment efforts. Fresh water bodies and marine water into which wastewater is discharged may pollute and rendered unsafe for human use .Wastewater discharged on lands can teach into underground water tables and potentially contaminate aquifers& underground water. One common effect of wastewater is the eutrophication of fresh water bodies and oceans. If one part of the ecosystem chain is destroyed, it can upset its entire food chain. Wastewater for irrigation may contain unsuitable chemicals and higher concentration of nutrients needed for crops, faecal sewage is discharged directly into the sea. The smell and such behaviour do not encourage tourism to that area.

The wastewater that originates from toilets fixtures, dishwater and food preparation sinks .They chemicals, particulate matter and is very pathogenic. This is known as 'Black water '.As that of 'gray water', food fixtures .Gray water is treated very differently from Black water & usually suitable for reuse. 'Yellow Water' is basically urine collected with specific channels and not contaminated with either black water or grey water.

There are two types of points of source of wastewater as ;domestic sewage and Non-sewage .Domestic sewage includes all domestic as home dwellings, public restroom, hotels ,restaurants ,hospitals and other health centre .They all produce high volume of wastewater .Non-sewage include water from floods (storm water) ,runoff (rain water running through cracks in the ground and into gutters) ,water from car garage and cleaning centre .Wastewater is also generated from agricultural facilities .Water used for cleaning in animal farms ,washing harvested produce and cleaning form equipment. Smart wastewater management is key to poverty reduction. The adding of biological, chemical (both organic and inorganic), Physical and radiological impurities .These impurities may give water bad taste, colour ,odour ,turbidity and cause hardness ,corrosiveness ,staining or frothing. Interventions to improve water quality for preventing diarrhoea, systematic required and meta analysis. Globally ,only 20 % of wastewater produced receive proper treatment (UNESCO) . Treatment capacity typically depends on the income level of the country, thus treatment in high-income countries, compared to only 8% in low-income countries. Water of good quality is required for all living organisms and most water bodies become contaminated by the incorporation of anthropogenic society.

The municipal waste in the city is maintained by Berhampur municipal corporation (BMC). Usually the solid waste was dumped outskirt of the city. with the aim of better management of urban waste ,the council in its general body meeting held in may 2013 devised to improve the present sanitation facilities & the solid/liquid water management system is the city . For the new garbage dumping, over 31.62 acres of land was acquired at Mohuda and the estimated cost of the project was about Rs 70 crores. Water quality parameter furnish the basis for judging the suitability of water for its designated uses and for improving the existing conditions [1].The ecological behaviour of ponds changed by a number of physical, chemical, factors, such as climate, geological differences etc.[2] Physiochemical parameters play a vital role in determining the distribution pattern and quantitative abundance of organisms inhabiting a particular aquatic ecosystem .The causative factors for the pollution of water are industries, agriculture and domestic activities [3].

The main objective of this work to analyse various physic-chemical analysis of the ground water waterborne well water ,municipality supply water , & different deep bore well ,drainage water ,swamp ,from different location of the Berhampur town ,Ganjam district ,Odisha ;which is affect the people in the city dominantly for various purpose .So the aim was to check the quality of drinking water ,whether it is safe for further use ,as compare to the standards provided by WHO (world Health Organisation-1986) and ICMR (Indian council of medical research).

MATERIAL &METHODS:-

Description of Study Area

Water samples were collected from various drainages i.e. From ten places located in Berhampur urban area of Odisha, India during January to April of 2017. The place Berhampur is a coastal town situated 17 Km away from the bag of Bengal in Ganjam District of Odisha ,India ,it's geographical situation is 19.32 North latitude , 84.78 East longitude and 31 meters elevation above the sea level ..There are various old & newly constructed drainage system in this town made by BMC (Berhampur municipal corporation).Much more information is not available on the water quality , the dissolved elements ,the level of pollution load ,aquatic macrophytes and other suspended particles ;so keeping all these facts in mind 10(ten)drainage were chosen for detailed study.

TABLE 1: **Location of drainage/sampling points of Berhampur city with sample numbers (code)**

S.No	Location of drainage/sampling points of Berhampur city	Code no.
1.	Alakapuri	Sample-1
2.	Kalinga nala, khodasing	Sample-2
3.	Ambapua Drainage	Sample-3
4.	Near roland college nala	Sample-4
5.	Jail training school, lanjipalli	Sample-5
6.	New Bus stand drain	Sample-6
7.	Dhobanala ,Lochapada	Sample-7
8.	Corporation Road Drain	Sample-8
9.	Drain near Hotel Moti	Sample-9
10.	Canal Road Gandhi Nagar	Sample-10

SAMPLING

Drainage water from sampling sites for sampling were collected in 500ml BOD-bottle for DO, BOD,COD and other sample were collected in normal glass bottle for other physio-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 sample. The sampling were done between 11am to 3pm and the containers were dipped and filled in the drainage water.

The sampling were done from different locations of Berhampur town including Alakapuri ,Kalinga nala, Khodasingi, Ambapua Drainage, near Roland College Nala, Jail training school, Lanjipali, New Bus Stand Drain ,Dhobi Nala, Lochapada, Corporation Road Drain , Drain near Hotel Moti, canal road Gandhi nagar which include drainages and the analysis were done by taking different parameters including P^H, temperature, dissolved oxygen, chloride, total suspended solids, total dissolved solids ,chemical oxygen demand ,biological oxygen demand, redox potential, nitrite, total alkalinity, total hardness. The above parameters were estimated [4].

RESULTS AND DISCUSSIONS

Temperature

Temperature is a key physical property of water. It has direct or indirect effect on Quality of water. Water temperature expresses how hot or cold water is technically, heat is an indicator of the kinetic energy of water, or every of motion. Increasing temperature indicates increasing energy or molecular motion of water. Also the solubility of oxygen decreases with increasing temperature. During this study , the temperature of wastes water ranged from 27°c to 30°c.Maximum temperature i.e. 30°c was observed in sample 1,sample 4 and sample 10 whereas minimum temperature i.e. 27°c was observed in sample 2, sample 6, sample 7and sample 8.

pH

The normal pH values of drainage sample range from 6 to 8.Maximum pH was recorded in two samples, i.e. 7.2 in sample 2 & sample 4 where as minimum pH observed in sample 10 which is 6.4 .The pH measures hydrogen ion concentration. It indicates the acidity or alkalinity of a solution. Pure water has a pH of 7, acid solutions have a pH less than 7, & alkaline solutions a pH greater than 7.Pipe & pumping equipment can be corroded in a short time if they carry water that is acidic in nature i.e. low P^H. Most organisms have adapted to life in a pH ranging from 6.5 up to 8.5. It has been [5,6] reported that the range of p^H 6.93 to 7.55 and 7.5 to 8.4 respectively.

REDOX POTENTIAL

Drain water sample was analysed for redox potential using calibrated meter. Redox potential observed in sample of drain water range from -032 to 010 mV. Maximum redox potential was observed in sample-6 and minimum observed in sample-9

TOTAL DISSOLVED SOLID

Solid material in wastewater may be dissolved, suspended or settled. The term “total solids” refers to matter dissolved or suspended in waste water. Total dissolved solids (TDS) are solids in water that can pass through a filter. This include mainly carbonate, Bicarbonate, Sulphate, Phosphate, Nitrate, Calcium, Magnesium, Sodium, Organic ions and other ions. In this present investigation, the TDS ranged from 0.32gm to 1.03gm/lt. maximum TDS was observed in sample 1, whereas minimum TDS measured in sample 7. If TDS concentration is too high or too low, the growth much aquatic life can be limited and death may occur. The investigation reported higher concentration of TDS [7,8]. Amount of TDS increased due to increased amount of surface run off [9].

TOTAL SUSPENDED SOLIDS

The term “total solids” refers to matter dissolved or suspended in waste water. Total suspended solids (TSS) are solids in water that can be trapped by a filter paper. TSS can include a wide variety of material, such as slit, decaying plant and animal matter, industrial wastes, sewage. In this experiment, TSS ranged from 0.008 to 0.12 gram/l. Maximum TSS was observed in samle-6 and minimum observed in sample-2. Amount of TDS increased due to increased amount of surface run off [9].It has been[5] reported tht, the range of TDS was between 152.12 - 265.97gm/l. High TSS in a water body can often mean higher concentration of bacteria, nutrients, pesticides and metals in the drainage water which was observed in samle-6 having maximum TSS value. It may contain many disease-causing agents and are harmful to health.

DISSOLVED OXYGEN (DO): The range of DO in the observed sampling points ranged from 6.7 to 7.1 mg/L which indicated that range was very narrow between sampling sites.

Table No: 2 Variation in Physio-Chemical Characteristics of 10 different sample points (Drainage Systems) of Berhampur Municipality

Sample No.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Name of Drainage System	Alaka puri	Kalinga nala, Khodasi ngi	Ambapua Drainage	Near Roland College Nala	Jail Training nala, lanjipalli	New Bus Stand Drain	Dhoba Nala	Corpo ration Road drain	Drain Near Hotel Moti	Canal Road Drain, Gandhi Nagar
Temp(°c)	30°c	27°c	28°c	30°c	29°c	27°c	27°c	27°c	29°c	30°c
pH	7.1	7.2	7.1	7.2	6.9	6.9	6.9	6.9	6.7	6.4
Redox Potential (mV)	-002	-003	-005	-003	007	009	007	005	-032	-015
TDS (g/l)	1.036	0.764	0.988	0.348	0.780	0.548	0.324	1	0.884	0.696
TSS (g/l)	0.024	0.008	0.016	0.008	0.096	0.12	0.028	0.076	0.032	0.116
Nitrate, mg/L	223	211	284	286	260	250	230	290	296	234
D.O (mg/l)	7.1	7.0	6.92	7.0	7.1	6.9	7.1	6.8	7.0	6.7
Alkalinity (mg/dm^3)	95.5	90	64	58	63	54	80	56	76	72

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