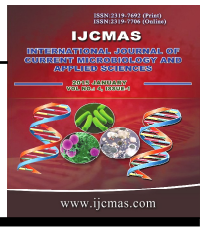
Int.J.Curr.Microbiol.App.Sci (2015) 4(1): 533-536

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 1 (2015) pp. 533-536**
http://www.ijcmas.com



Original Research Article

Study of physico-chemical characteristics of domestic wastewater in Vishnupuri, Nanded, India

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Keywords

COD,
BOD,
TSS,
TDS and
Domestic
wastewater

A B S T R A C T

Water plays an important role in the life of human beings. In the last few decades, limitless urbanization has caused a serious pollution problem due to the disposal of sewage to the water bodies. The present study focussed on the physico-chemical parameters of wastewater in Vishnupuri, Nanded. All parameter were analyzed as per the standard methods given in American Public Health Association (APHA, 1989). Water quality parameters such as pH, Total Dissolved Solid (TDS), Total Suspended Solid (TSS), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Ammonical Nitrogen, Nitrate and Phosphate were analyzed. In our study, it was found that BOD, COD, Ammonical Nitrogen and Nitrate value were above permissible limit whereas TSS, TDS, pH, Phosphate were within the permissible limit.

Introduction

Water is one of the most valuable natural resource for all living creatures on the earth and essential for the sustenance of life as exemplified by its diversified uses such as drinking, cooking, washing, irrigation, farming, industrial activities etc. Water may contaminated by various means that may be chemically or biologically and may become unfit for drinking and other uses. Domestic wastewater contains a large amount of organic matter, nitrate, phosphate, detergents, inorganic salt, oil etc. (Rathore *et al*., 2014). Such organic matter is the rich source of starch, protein and lipids etc. (Garode and Sonune, 2014).

Most of the Indian towns and cities do not have access to safe drinking water. Naturally Ground water recharged through rain water. Ground water areas that are recharged at higher rate are generally more vulnerable to pollution (Dubey, 2013). Rapid increase in population and change in life style in India have resulted in a dramatic increase in the generation of municipal waste (Dhere *et al.*, 2008).

Studies of water quality in various effluents revealed that man made activities have an important negative impact on water quality in the downstream sections of the major rivers. This is a result of cumulative effects from upstream development but also from inadequate wastewater treatment facilities (Chang, 2008).

Almost 70% of the water in India has become polluted due to the discharge of domestic sewage and industrial effluents into natural water source, such as rivers, streams as well as lakes (Sangu and Sharma, 1987). About 95% of rural population living in India depends on ground water for domestic use (Moharir *et al*., 2002). According to WHO about 80% of water pollution in developing country like India is carried by domestic waste. The improper management of water systems may cause serious problems in availability and quality of water (Subba Rao and Subba Rao, 1995). The aim of present study is to analyze the quality of domestic wastewater.

Materials and Methods

Sample site and sample collection: The domestic wastewater samples were collected from drainage at Vishnupuri, Nanded. Samples were collected in the month of April to June 2014 according to standard procedures from American Public Health Association (APHA, 1989).

Domestic wastewater sample were collected from about 40-50 cm below the surface, to avoid the collection of surface impurities. Before sampling, 5L polythene bottles were rinsed with 0.1N chromic acid, than washed twice with distilled water. During sample collection hand gloves were used for safety. The water samples were analyzed to determine their physicochemical characteristics. This analysis was done according to APHA.

Result and Discussion

In the present study, comparative analyses of physicochemical parameter of wastewater in Vishnupuri, Nanded were carried out during April to June 2014. The physicochemical parameters under study were pH, TSS, TDS, BOD, COD, Ammonical Nitrogen, Nitrate, and Phosphate. Each experiment was performed in triplicates sets. The data were shown in Table No.1.

pH: pH is the hydrogen ion activity and a measure of acidity and alkalinity in aquatic bodies. The variations were recorded in the pH level. The values of pH were ranges from 7.0 to 8.0. The lowest pH value was 7.0 and highest pH value was 8.0. If pH is above 7, this will indicate that water is probably hard and contains calcium and magnesium (David, 2004).

The values of pH were within the accepted range. Similar result was obtained by Paula Popa *et al* in 2012, while working on study of physico-chemical characteristics of wastewater in an urban agglomeration in Romania.

Biochemical Oxygen Demand: The BOD is an indication of the organic load of domestic wastewater. The lowest value of BOD recorded as 56±2.4mg/L and highest value of 96±2.9 mg/L. The values were found to be beyond the permissible limit. Higher contents of organic load are the causative factors for maximum BOD levels.

The high value of BOD may be due to extensive use of organic nutrients. Increase in BOD which is a reflection of microbial oxygen demand leads to depletion of DO which may cause hypoxia conditions with consequent adverse effects on aquatic biota (Sukumaran *et al*, 2008).

Chemical Oxygen Demand: The COD is another parameter used to characterize the organic strength of domestic wastewater. The minimum COD value was recorded as 180±1.82 mg/L and the maximum of 300±2.5 mg/L was observed. The present

data showed high levels of COD. This indicates that the effluent is unsuitable for the existence of aquatic organisms due to the reduction in DO content (Goel, 1997).

Ammonical Nitrogen: The minimum concentration of Ammonical Nitrogen was found to be 13±0.006 mg/L and maximum concentration was 146±1.6 mg/L. In water, Ammonia exists in two forms ammonium ion (NH_4^+) and free ammonia (NH_3) depending on the pH of water. At higher pH, ammonia is toxic to aquatic organisms and also for terrestrial organisms (Princic *et al*., 1998).

Nitrate: The concentration of nitrate was recorded in the range of 48±1.02 mg/L to 182±1.5 mg/L. The concentration of different forms of nitrogen gives a useful indication of the level of Micronutrients in the wastewater and hence their ability to support plant growth. These values were higher than permissible limit i.e. 50 mg/L. High levels of nitrate and phosphate can lead to eutrophication, which increases algal growth and ultimately reduces dissolved oxygen in the water.

Phosphate: Phosphate comes from fertilizers, pesticides, industry and cleaning compounds. Natural sources include phosphate containing rocks and solid or liquid wastes. The lowest value of phosphate was recorded as 0.4±0.04 mg/L and highest value was 2.1±0.05mg/L. These values were less than the permissible limit.

Total Dissolved Solid: Total dissolved solids are a measure of total inorganic substances dissolved in water. During the study, lowest TDS value was 200±1.5 mg/L and highest value was 1440±1.8 mg/L. The TDS concentration was less than the permissible limit.

Table.1 Analysis of physicochemical parameters of Domestic wastewater

Sample No.	pH	BOD	COD	Ammonical Nitrogen	Nitrate	Phosphate	TDS	TSS
1	7.5	56±2.4	300±2.5	50±0.23	181±1.03	1.4±0.02	260±1.3	65.43±1.02
2	7.5	73±3.6	200±4.3	13±0.006	181±1.1	0.4±0.04	200±1.5	57.37±1.21
3	8.0	62±2.8	200±3.9	17±0.002	48±1.02	1.0±0.01	1440±1.8	43±1.35
4	8.0	80±1.06	214±2.7	146±1.6	83.81±1.2	1.9±0.04	1228±1.04	43.14±1.06
5	7.0	96±2.9	276±4.8	138±1.9	76.90±1.4	1.6±0.02	1327±1.97	55.3±0.96
6	7.5	63.43±3.2	211±2.02	129±1.04	182±1.5	2.1±0.05	268±1.09	89±1.16
7	7.5	66±1.4	180±1.82	93±2.1	74±1.9	1.05±0.02	483±1.25	70.45±1.07

± Standard Deviation

Total Suspended Solid: In sample the minimum value of TSS recorded as 43±1.35mg/L and maximum value was 89±1.16 mg/L. The total suspended solids are composed of carbonates, bicarbonates, chlorides, phosphates and nitrates of Ca, Mg, Na, K, Mn organic matter, salt and other particles. The values of TSS were within permissible limit.

Similar work was done by Dubey Savita in 2013 while studying on analysis of physico-chemical parameters of Kshipra river water at Ujjain, India. Similar work was also done by Lokhande *et al* in 2011, while studying on physico-chemical parameters of waste water effluents from Taloja industrial area of Mumbai, India.

In conclusion, From the result of physico-chemical analysis of domestic wastewater effluents, it was concluded that BOD, COD, Ammonical Nitrogen and Nitrate showed higher values compared to the standards values prescribed by WHO, whereas the values of pH, TSS, TDS and phosphate were within the permissible limit. Such effluent should not be discharged in to the nearby water body or soil without treatment. They are unfit for irrigation. Such effluent should be discharged after treatment.

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