RESEARCH PAPER | Environment | Volume : 3 | Issue : 8 | Aug 2013 | ISSN - 2249-555X

Study of Physico-Chemical Parameters of Wastewater From Some Selected Location on Amba Nalla, Amravati

KEYWORDS: waste, domestic activities, physical and chemical parameters

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ABSTRACT *The waste water from some selected areas on Amba Nalla, Amravati City has been studied. The various parameters studied include the physical parameters (pH, conductivity, total dissolved solids and total suspended solids) and chemical parameters (dissolved oxygen, total hardness, salinity, chlorine) The pH of the samples ranged from 7.67 ± 0.006 – 9.18 ± 0.008. Total dissolved solids ranged from 408.50 ± 0.003 – 1050.30 ± 0.270 mg/l. Total suspended solids ranged from 17100.00 ± 0.230 – 544400.00 ± 0.430 mg/l. The conductivity of the samples ranged from 657.60 ± 0.300 – 1420.00 ± 0.500μs/cm. The salinity concentrations ranged from 342.200 ± 0.040 – 601.250 ± 0.650 mg/l. The total hardness of the samples analyzed ranged from 1098.600 ± 0.300 – 2603.120 ± 0.500 mg/l. Dissolved oxygen was absent in the entire sample studied. The chloride contents ranged from 280.500 ± 0.120 – 987.670 ± 0.045 mg/l. Most of the physical and chemical parameters of waste water exceeded the ISI permissible level. With the results of this investigation, waste water should not be disposed into the environment or be used as irrigation water for agriculture.*

INTRODUCTION

Pollution of land, rivers and streams by waste has become one of the most crucial environmental problems of the 21st century. The rapid development of urbanization and industrialization led to the rising use of sewage for agricultural land irrigation and water pollution. Sewage provides water and valuable plant nutrients; it leads to the potential accumulation of heavy metals in agricultural soils (Abdel- Sabour, 2003; Zhang et al., 2008; Maldonado, 2008). The disposal of sewage sludge on soils as a fertilizer for agriculture or as a regenerative for soil is the most attractive application since the sludge act as a source of nutrients for crop production owing to their high content of organic matters (Walter et al., 1994). Sewage is made up of excrement, excreta, wastewater from cloth washing machines, waste from kitchen dishes, bathing water, paper fiber, food particles, vomit, garbage, etc. They also contain dissolved oxygen (DO) which includes: Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Oxygen Demand Index (ODI), and Total Oxygen Carbon (TOC). Domestic pollutants associated with organic matter inorganic dissolved solids and other unwanted chemicals cause serious ground water problems (Tyagi, 2000). During the past decade, widespread reports of ground water contamination have increased public concern about drinking water quality (Yanggen and Born, 1990). The waste water gets accumulated in the form of stagnant water and if there are any drinking water pipes near to that area, there is a chance for the intrusion of waste water in drinking water pipelines. Therefore, this present study was aimed to determine the physical and chemical parameters of waste water from some selected areas in on Amba Nalla, Amravati city, Maharashtra.

MATERIALS AND METHODS

Sample Collection and Preparation. Eight samples (4 samples from pit and 4 samples from ground) of sewage were collected in plastic bottles from four different locations on Amba Nalla, Amravati city, Maharashtra in the month of January, 2012. The samples were labeled as follows: Wadali a; Wadali b; Gopal Nagar a; Gopal Nagar b; Devi a; Devi b; Kholapuri Gate a and Kholapuri Gate b. Where a and b represent pit and ground sewage respectively. The collected samples were analyzed within 24 hours.

Sample analysis

Determination of pH and conductivity: The pH and conductivity of the samples were measured by using the water analysis kit (CENTURY CK 711). Chemical and physical parameters of the samples were determined by standard methods (APHA, 2000; Trivedy and Goel, 1984).

RESULTS AND DISCUSSION

Table 1. Physical parameters of waste water from some selected areas Amba Nalla, Amravati City.

Waste Sample and locations		pH	TDS mg/l	TSS mg/l	Conductivity l μs/cm
Wadali	A	8.12 ± 0.005	950.32 ± 0.012	18800± 0.250	1304.50 ± 0.300
	B	7.67 ± 0.006	550.56± 0.004	476010 ±0.050	797.00 ± 0.200
Gopal Nagar	A	9.18 ± 0.008	780.50± 0.024	23006± 0.500	1087.40 ± 0.600
	B	8.45 ± 0.005	408.50± 0.003	544400± 0.430	657.60 ± 0.300
Devi	A	8.62 ± 0.005	1050.30± 0.270	17100± 0.230	1420.00 ± 0.500
	B	8.01 ± 0.012	578.00± 0.008	485550± 0.300	893.50 ± 0.600
Kholapuri Gate	A	7.93 ± 0.040	876.30± 0.043	19960± 0.300	1194.30 ± 0.400
	B	7.64 ± 0.009	501.20± 0.076	490010± 0.200	708.00 ± 0.120

a = Pit Sewage b = Ground Sewage;

Volume : 3 | Issue : 8 | Aug 2013 | ISSN - 2249-555X

Table 2: Chemical parameters of waste water from some selected areas Amba Nalla, Amravati City.

Waste Sample and locations		Total hardness mg/l	Cl mg/l	Salinity mg/l	DO mg/l
Wadali	A	1987.200 ± .050	540.500 ±0.008	468.600 ± 0.450	NIL
	B	1098.600± 0.300	280.500 ± 0.120	342.200 ± 0.040	NIL
Gopal Nagar	A	2122.250± 0.400	580.600± 0.340	513.800 ± 0.200	NIL
	B	1301.170± 0.005	440.610± 0.040	421.000 ± 0.030	NIL
Devi	A	2302.070± 0.320	745.510± 0.050	541.300 ± 0.230	NIL
	B	1520.230± 0.200	430.300± 0.015	443.000 ± 0.180	NIL
Kholapuri Gate	A	2603.120± 0.500	987.670± 0.045	601.250 ± 0.650	NIL
	B	1760.850± 0.230	506.500± 0.100	454.500 ± 0.100	NIL

a = Pit Sewage b = Ground Sewage.

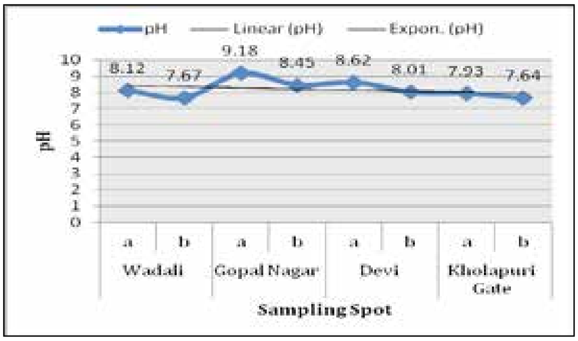

Fig no.1: pH content of waste water from selected area on Amba Nalla, Amravati city.

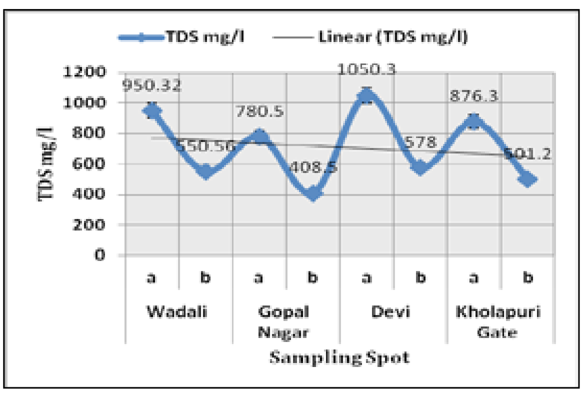

Fig no.2: TDS mg/l content of waste water from selected area on Amba Nalla, Amravati city.

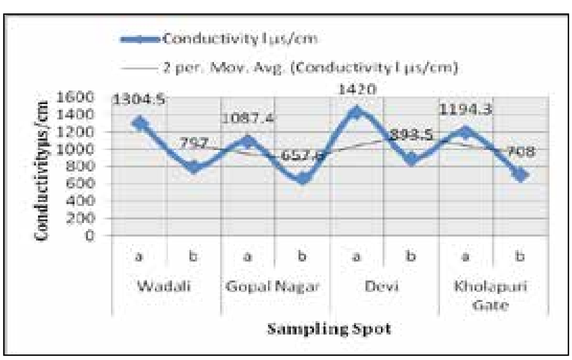

Fig no.3: Conductivity in µs/cm content of waste water from selected area on Amba Nalla, Amravati city.

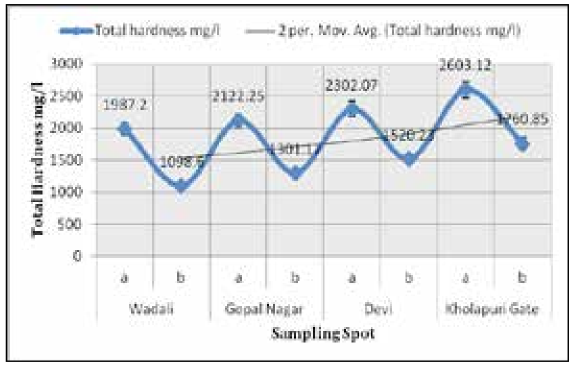

Fig no.4: total hardness mg/l content of waste water from selected area on Amba Nalla, Amravati city.

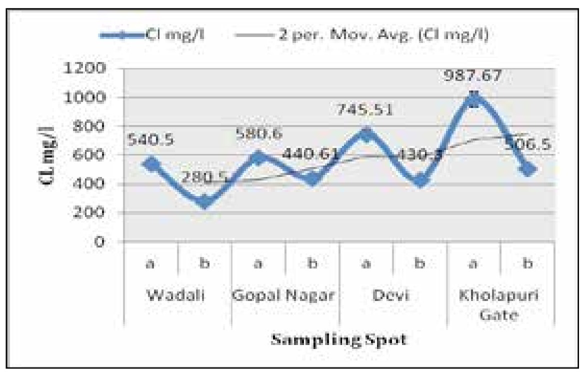

Fig no.5: Cl mg/l content of waste water from selected area on Amba Nalla, Amravati city.

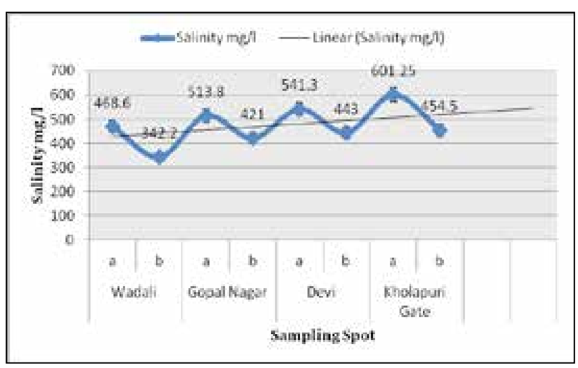

Fig no.6: salinity mg/l content of waste water from selected area on Amba Nalla, Amravati city.

Volume : 3 | Issue : 8 | Aug 2013 | ISSN - 2249-555X

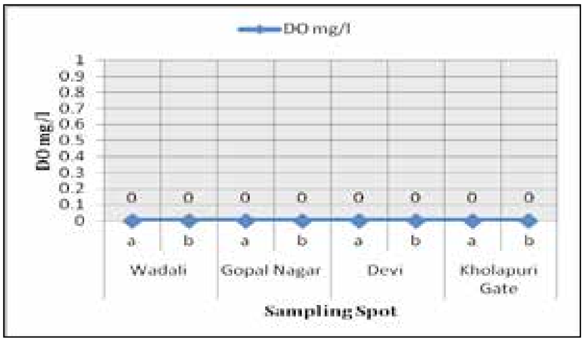

Fig no.7: DO mg/l content of waste water from selected area on Amba Nalla, Amravati city.

The physical parameters of the sewage from some selected areas Amba Nalla, Amravati city, Maharashtra were presented in Table 1 and Fig 1-7.

1. pH:
The pH of the samples ranged from 7.67 ± 0.006 – 9.18 ± 0.008. Gopal Nagar a had the highest pH value (9.18 ± 0.008) while, Wadali b had the lowest value (7.67 ± 0.006). The increase in pH can be attributed to organic pollution, alkaline chemicals, soap and detergents produced due to commercial and residential activities. The pH of the samples are within the permissible limit (6.5 – 8.5) by W.H.O for aesthetic quality except sample Gopal Nagar a (9.18 ± 0.008) and Ca (8.62 ± 0.005). pH of the samples were similar to the range 8.0 – 9.4 reported by Krishnan et al., (2007).

2. TDS:
Total dissolved solids ranged from 408.50 ± 0.003 – 1050.30 ± 0.270 mg/l. Sample Devi a had the highest content (1050.30 ± 0.270 mg/l) of total dissolved solids while Gopal Nagar b had the lowest content (408.50 ± 0.003). Total dissolved solids is a measure of the combined content of all inorganic and organic substances contained in molecular, ionized or micro granular suspended form. High total dissolved solids content generally indicate hard water, which can cause scale buildup in pipes, valves and filters. Threshold of accepted aesthetic criteria for human drinking water is 100 mg/l. Research has shown that exposure to high total dissolved solids is compounded in toxicity when other stressors are present, such as abnormal pH, high turbidly, or reduced dissolved oxygen with the latter stressor acting only in the case of anmaila. High total dissolved solids concentrations can produce laxative effects and can give an unpleasant mineral taste to water. High total dissolved solid concentrations are also unsuitable for many industrial applications. High total dissolved solids may also reduce water clarity, contribute to a decrease in photosynthesis, combine with toxic compounds and heavy metals and could lead to an increase in water temperature.

3. TSS
Total suspended solids ranged from 17100.00 ± 0.230 – 544400.00 ± 0.430 mg/l. Gopal Nagar b had the highest concentration (544400.00 ± 0.430 mg/l) while Devi a had the lowest concentration (17100.00 ± 0.230). The high amount of the total suspended solids is mainly due to the discharge of domestic waste (Palanivel and Rajaguru, 1999). High concentrations of suspended solids can cause many problems for stream health and aquatic life by blocking light from reaching submerged vegetation and reduces the rates of photosynthesis causes less dissolved oxygen to be released into the water by plants. If light is completely blocked from bottom dwelling plants, the plants will stop producing oxygen and will die. As the plants are decomposed, bacteria will use up even more oxygen from the water. High total suspended solids can also cause an increase in surface water temperature, because the suspended particles absorbed heat from sunlight.

4. Conductivity:
The conductivity of the samples ranged from 657.60 ± 0.300 – 1420.00 ± 0.500 µs/cm. Sample Devi a had the highest conductivity (1420.00 ± 0.500 µs/cm) while Gopal Nagar b had the lowest conductivity (657.60 ± 0.300 µs/cm). Electric conductivity of water is directly related to the concentration of dissolved ionized solids in the sewage. Ions from the dissolved solids in waste water create the ability for the sewage to conduct an electrical current.

The chemical parameters of sewage samples investigated in this study were presented in Table 2.

5. Salinity:
The salinity concentrations ranged from 342.200 ± 0.040 – 601.250 ± 0.650 mg/l. Kholapuri Gate a had the highest salinity concentration (601.250 ± 0.650 mg/l) while Wadali b had the lowest (342.200 ± 0.040 mg/l) concentration of salinity might be due to discharge of domestic wastes containing high concentration of chlorides. The results of salinity obtained in this study were lower than the results reported by Krishnan et al.,(2007).

6. Hardness:
The total hardness of the samples analyzed ranged from 1098.600 ± 0.300 – 2603.120 ± 0.500 mg/l. Sample Kholapuri Gate a had the highest concentration (2603.120 ± 0.500 mg/l) while Wadali b had the lowest concentration (1098.600 ± 0.300 mg/l). Total hardness represents the concentration of calcium and magnesium. The total hardness of the samples investigated were high when compared with the desirable limit which is 200 mg/l in water as per ISI and higher than results obtained by Krishnan et al., (2007) and Roy and Kumar,(2002). Permanent hardness is mainly caused by chlorides and sulphates (Roy and Kumar, 2002).

7. DO:
From the investigation carried out, dissolved oxygen was absent in the entire sample studied. This suggests that most of the discharges are organic in nature and hence require oxygen for decomposition. High decomposition of organic substances in sewage, indicate high pollution load and also reduces the dissolved oxygen. The deficiency of the oxygen in the samples is shelter for bacteria and other pathogens, which are anaerobic and injurious to human health. The results were similar to the results obtained by Krishnan et al., (2007).

8. Chloride:
The chloride contents ranged from 280.500 ± 0.120 – 987.670 ± 0.045 mg/l. Wadali b had the lowest Chloride concentration (280.500 ± 0.120 mg/l). The high concentration of chloride is due to dissolution of salts from domestic activities.

CONCLUSION
The levels of the parameters investigated exceeded the permissible limit for domestic water purposes, agriculture purpose and fish production. The waste water must be treated before disposed into the environment for avoiding health hazards.

AKNOWLEDGEMENT
We are Grateful to University Grant commission for the funding this research under Major Research Project F. no. 39-314/2010. Basically this research paper is based on initial research work. We are grateful MNC, Amravati for provide valuable information regards major sewer of Amravati City. It's our immense pleasure to acknowledge our Principal Dr. V.G, Thakare for their support and encouragement during work.

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