Global Advanced Research Journal of Agricultural Science (ISSN: 2315-5094) Vol. 3(10) pp. 317-320, October, 2014.
Available online http://garj.org/garjas/index.htm

Full Length Research Papers

Environmental Impact Assessment of Effluents from Oko-Oba Municipal Abattoir at Agege, Lagos State, Nigeria

Ojo, J.O

Department of Animal Production and Health Sciences, Faculty of Agricultural Sciences,
Ekiti State University, Nigeria.
Email: profhealth@yahoo.com; Tel: +234-7033963299

Accepted 12 October, 2014

Effluents samples obtained from Oko Oba Municipal abattoir at Agege, Lagos State, Nigeria were analyzed for physicochemical and bacteriological properties. Water samples from the Abesan stream into which the effluents were discharged and groundwater samples around the area were also analyzed. The physicochemical parameters determined were Total Dissolved Solids (TDS); Total Suspended Solids (TSS); Biochemical Oxygen Demand (BOD); Nitrate Concentration; Turbidity and Total Coliform (TC). Values obtained for abattoir effluent samples from drainages within and outside the abattoir analyzed were significantly high ($p<0.05$). The values obtained for groundwater and Abesan stream water were significantly high ($p<0.05$), though by comparison there were little differences in the values obtained for each parameter determined for the water samples from these sources. However coliform values obtained are significantly higher than that obtained for the abattoir effluents.

Keywords: Abattoir, Effluents, Physicochemical, Bacteriological, Surface water, Groundwater, Coliform.

INTRODUCTION

Environmental health comprises of those aspects of human health including quality of life that are determined by physical, chemical, biological, social and psychological factors in the environment (WHO, 1993). Abattoir effluents refer to water ladened with waste materials generated from an abattoir. Such waste materials are highly nitrogenous, biodegradable with high concentration of suspended and dissolved solids, fat scraps, blood, gut contents, detergents, hair and hide scraps (Alonge, 2001). These dissolved and suspended substances as well as microbes present, account for the colour, smell, and other physicochemical and microbiological properties of the abattoir effluents (Coker, 2001).

Abattoir effluents whether it reaches the surface water through a point source or non-point source reduce oxygen in water and endanger aquatic life (Cecil, 2005). Leachates of these effluents which have large number of microbes dangerously do pollute shallow and hand dug wells (Meadows, 1995). The organic nutrients added to ground water produce excessive microbial growth causing unpleasant taste and odours of water from this source (Liu, 2002; Odeyemi *et al*, 2014).

Globally efforts have been directed towards nipping in the bud the problems of waste and environmental pollution. In many parts of the world the issue of environmental health is now being taken with utmost importance.

However, in Nigeria, like in many other developing countries, discharge of untreated wastes into the environment is still a problem. Compromised water quality and poor sanitary conditions of abattoirs in the livestock sector have added in no small way to the problem (Adeyemo *et al*, 2002).

Realizing the significance of abattoir wastes on the environment and public health, this work seeks to investigate the effects of run – offs and percolates of abattoir into surface and groundwater to give more insight into the implications of abattoir effluents on the environment and public health.

MATERIALS AND METHODS

Study Location

The study location was Oko – Oba Municipal Abattoir (Lat 6.453^{o}C, Long 3.395^{o}C) located at Agege, Lagos State, Nigeria. It is one of the largest abattoirs in the state as it slaughters about 2000 cattle per week. Blood, dung, stomach contents etc of the cattle slaughtered on slaughter slabs in the abattoir are washed into drainages within the abattoir. From there the effluents run to adjoining drainage in the neighborhood.

Sample Collection Method

Clean, sterilized, wide – mouthed sample bottles with tight screw dust proof stoppers were used. 0.1ml of 18 % Sodium Thiosulphate (a reducing agent) was put into each container before they were used to prevent oxidation of the effluent samples and continuation of bacteria activities during sample transit.

200 mLs abattoir effluent and water samples were aseptically collected as follows:

1. 6 samples of abattoir effluents were taken from the main drainage within the abattoir, 6 samples also from the main drainage outside the abattoir in the neighborhood.
2. 6 samples were taken from the borehole within the abattoir, 6 samples also from the well located just outside the abattoir in the neighborhood.
3. 6 samples of surface water were taken at point A, 6 samples also from point B of the Abesan stream. Point A is the point at which the abattoir effluent enters the stream designated as Upstream and B is a point approximately 50 m from point A, that is, downstream.

Iced cooler was used for the preservation of the samples which were transported to the laboratory immediately for processing within 6 - 12 hours post collection.

Physicochemical Assessment of Water and Wastewater Samples

The physicochemical properties investigated included the pH, turbidity, COD and BOD coefficients, the quantity of nitrate and phosphate ion in the samples. pH was determined using a digital pH meter while Milton Roy(USA) Spectronic 20D meter was used to determine the turbidity of the samples. COD coefficients of the samples were determined using the method recommended by APHA (1998). BOD coefficients of the samples were determined using the Winkler's Titration Method as recommended by APHA (1998). Kjedaldahl Digestion Method was used to determine the quantity of nitrate ion while volumetric analysis was used to determine the quantity of phosphate ion.

Bacteriological Assessment of Water and Wastewater Samples

About 100 mls of the water sample was filtered through a filter that retains bacteria. The filterate was then transferred to Petri dishes containing MacConkey agar and incubated at 37^{0}C for
48hours as described by APHA (1998). The numbers of coliform colonies formed were counted using a microscope and the values were expressed as CFU/ml.

Data analysis

All data were subjected to statistical analysis using SAS 9.1 software to determine the significant difference between the means. Differences were considered at $P<0.05$.

RESULTS AND DISCUSSION

Table 1 showed the bacteriological and physicochemical properties of effluents from drainages within and outside the Oko-Oba abattoir. From the table TDS, BOD, Nitrate and Turbidity were significantly ($p<0.05$) higher in drainage within abattoir than drainage outside abattoir while other parameters like TSS, phosphate and coliform were significantly ($p<0.05$) higher in drainage outside than within abattoir. The pH of both were however similar ($p>0.05$) statistically. The high values of TDS, BOD and Turbidity obtained for drainage within the abattoir implies high dissolution of waste materials in the water used for processing while the high values of TSS, phosphate and

Table 1. Bacteriological and physicochemical properties of effluents from drainages within and outside the Oko-Oba abattoir

Parameters	Drainage within abattoir	Drainage outside abattoir
TDS (mg/l)	6000.00±66.00[a]	4500.00±50.00[b]
TSS (mg/l)	55.00±3.50[b]	145.50±6.35[a]
BOD (mg/l)	181.00±5.60[a]	103.71±4.52[b]
pH	6.60±0.43	7.00±0.55
Nitrate (mg/l)	308.64±2.50[a]	183.05±3.66[b]
Phosphate (mg/l)	31.94±2.13[b]	38.92±1.68[a]
Turbidity (NTU)	1525.00±28.69[a]	873.00±12.50[b]
Coliform(CFUx10^7/ml)	2.70±0.72[b]	669.00±8.50[a]

[ab]means with different superscripts along the same rows are significantly ($p<0.05$) different.

Table 2. Bacteriological and physicochemical properties of groundwater within the abattoir and around the oko oba abattoir neighborhood

Parameters	Borehole within abattoir	Well outside abattoir
TDS (mg/l)	2900.00±56.00[b]	3000.00±40.00[a]
TSS (mg/l)	8.60±0.83	7.79±0.65
BOD (mg/l)	62.00±0.50[a]	56.15±2.40[b]
pH	5.90±0.38	5.65±0.40
Nitrate (mg/l)	60.92±1.40[a]	41.72±3.00[b]
Phosphate (mg/l)	0.00±0.00[b]	3.19±0.30[a]
Turbidity (NTU)	2.20±0.20[b]	9.27±0.67[a]
Coliform(CFUx10^7/ml)	12.50±2.10[b]	1567.00±23.00[a]

[ab]means with different superscripts along the same rows are significantly ($p<0.05$) different

coliform implies that there is possibility of additional pollutants from humans operating within and around the abattoir thus the drainage outside the abattoir is more polluted than that within the abattoir. This result corroborates Coker et al (2001) that abattoir wastewater is heavily polluted regardless of the point from which it is taken from.

Table 2 showed the bacteriological and physicochemical properties of groundwater within and outside the Oko-Oba abattoir. From the table TDS, Phosphate, Turbidity and TC were significantly ($p<0.05$) higher in water sample from well outside the abattoir while other parameters like BOD and Nitrate were significantly ($p<0.05$) higher in water sample from the borehole within abattoir. The TSS and pH of both were however similar ($p>0.05$) statistically. The high values of TDS, phosphate, Turbidity and TC obtained for water sample from the well outside the abattoir implies high presence of impurities in the water while the high values of TSS, BOD and Nitrate implies that there is possibility of very small quantity of the abattoir leachates getting into the water of the borehole within the abattoir thus the water sample from the well outside the abattoir is heavily polluted and that from the borehole within the abattoir is sparingly polluted. This result agrees with the work done by Adeyemo et al., (2002).

Table 3 dealt with the bacteriological and physiological properties of water sample from up and down Abesan stream (surface water). From the table TDS and BOD were significantly ($p<0.05$) higher in water from upstream than water from downstream while other parameters like TSS, nitrate, turbidity and coliform were significantly ($p<0.05$) higher in water from downstream. The pH and phosphate were however similar ($p>0.05$). High values of TDS and BOD of the upstream water is due to the fact that it is at this point that the abattoir effluent enters the stream and also microbial activities requiring available oxygen are higher This agrees with the work done by Osibanjo et al (2007) . However high values of the TSS, nitrate and turbidity in the downstream water implies high dissolution of abattoir effluents and other particulate matters in this part of the Abesan stream which corroborates Iwara et al (2012) and Chukwu et al (2008) and while high TC of the downstream may mean that humans may be defaecating in the stream as its water moves from upstream to

Table 3. Bacteriological and physicochemical properties of water samples from Up and down the Abesan stream into which oko oba abattoir effluents is Discharged

Parameters	Water from upstream	Water from down stream
TDS (mg/l)	6000.00±87.50[a]	2450.00±40.00[b]
TSS (mg/l)	5.00±0.50[b]	32.00±2.21[a]
BOD (mg/l)	151.00±6.60[a]	66.10±0.80[b]
pH	6.50±0.30	7.00±0.40
Nitrate (mg/l)	75.10±3.00[b]	90.40±0.10[a]
Phosphate (mg/l)	0.20±0.80	0.20±0.70
Turbidity (NTU)	11.60±1.10[b]	23.40±1.50[a]
Coliform(CFUx10^7/ml)	89.00±2.40[b]	710.00±8.30[a]

[ab]means with different superscripts along the same rows are significantly ($p<0.05$) different

downstream because this value deviates from that of Omole and Longe (2008).

CONCLUSION AND RECOMMENDATION

From the result above, abattoir wastewater is heavily polluted. This level of pollution must be taken care of because the effluents will eventually end up in either available surface water or shallow groundwater, in view of this retention point where the treatment and biodigestion of effluents should be created. This will allow some level of purification before releasing it to the environment.

Also there is close to complete natural purification of the wastewater that seeps through the soil before it reaches the water table from which the borehole water is drawn unlike the wells which are shallow and thus receives the abattoir effluent leachates with little or no natural purification as it passes through the soil layers therefore borehole water is recommended for processing in this abattoir but the borehole should be sited far away from the waste discharge points so as to prevent the abattoir effluents leachates from getting to the water table.

This work inundates the fact that untreated abattoir effluents generated at the oko oba abattoir constitute serious environmental problem to the abattoir neighborhood and health problem to people using the Abesan stream for domestic purposes, hence there should enforcement of strict environmental management

REFERENCES

Adeyemo OK, Ayodeji IO, Aiki-raji CO (2002). The water quality and sanitary conditions in a major abattoir (Bodija) in Ibadan, Nigerian, Afr. J. Biomedical Res. (2002); Vol5; pp51-55.

Alonge DO (1998). Textbook of meat hygiene in the tropics, Farmcoe press, Ibadan; pp 58. American Public Health Association (APHA) (1998). Standard methods for examination of water and wastewater ,American Public Health Association, American Water Works Association and Water Pollution Control Federation 20th Edition, Washington D.C USA, pp 5-17.

Cecil H (2005). Animal waste and the environment Http//www.animalwaste and the environment.html.

Chukwu O, Mustapha HI, Abdul GHB (2008). The Effect of Minna Abattoir Waste on Surface Water Quality, Environmental Research Journal 2(6):334-338.

Coker AO, Olugasa BO, Adeyemi AO (2001). Abattoir wastewater quality in Southwestern, Nigeria In Scott R. (Edited) People and Systems published by Water Engineering and Development Centre(WEDC), Loughborough University, UnitedKingdom, pp 329-331.

Iwara AI, Njar GN, Deekor TN, Ita AE (2012). Effect of Adiabo Abattoir on the Water Quality Status of Calabar River in Odukpani, Cross River State, Nigeria. Continental J.Environmental Sciences, 6(2): 36 – 43.

Liu Y, Xu H, Show K, Tay J (2002). Anaerobic granulation technology-free wastewater treatment, World Journal Microbiol. Biotechnol.18; 99-113

Meadows R (1995). Livestock Legacy in Environmental Health Perspectives 103{12}; pp 1096-1100.

Odeyemi AT, Dada AC, Akinjogunla OJ, Agunbiade OR (2011). Bacteriological, Physicochemical and Mineral Analysis of Water Used in Abattoirs in Ado-Ekiti, Southwest, Nigeria.

Omole DO, Longe EO (2008). An Assessment of the Impact of Abattoir Effluents on River Illo, Ota, Nigeria, Journal of Environmental Science and Technology 1(2): 56-64

Osibanjo O, Adie GU (2007). Impact of Effluent from Bodija Abattoir on the Physicochemical Parameters of Osunkeye Stream in Ibadan City, Nigeria, African J. Biotechnol., 6(15): 1806-1811

World Health Organization (WHO) (1993). Draft definition developed at WHO Consultation meeting in Sofia, Bulgaria