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Original Report

EVALUATION OF WATER QUALITY STANDARDS AND SANITARY CONDITIONS IN MONIYA ABATTOIR, IBADAN, NIGERIA

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Abstract: This work examined the sanitary conditions and water quality standards in Moniya abattoir in Akinyele Local Government area of Oyo State, Nigeria. Samples were collected from the hand-dug well, bore hole and from strategic locations inside the stream that serves as discharge point for all the slurry from the abattoir. The samples were analysed for physico-chemical and biological parameters. The results showed that parameter like temperature 36.4^{0}C was having value outside the WHO limits as a result of microbiological activities since the samples contain high level of BOD. Higher value of iron, 3.99mgL^{-1} is suspected to come from blood washed into the water and leachates to underground water. There is also higher concentration of manganese, 3.73mgL^{-1} but this was traced to the properties of aquifer on which the abattoir is located. From the bacteria assessment, the samples were polluted with pathogenic organisms of faecal origin.

Keywords: Assessment, sanitary conditions, quality standards, abattoir

INTRODUCTION

Most abattoirs aim at optimising the recovery of edible portions from the meat processing for human consumption but significant quantities of secondary wastes materials not suitable for human consumption are however generated. [1] Since water is often used to wash excessive waste solids to drain. The method used in handling, treatment and disposal of abattoir waste should be put into consideration, as waste dumped in the open environment; storm drainage, channels, creeks lagoons and other impoundment points could cause serious environmental pollutions and hazards which in most cases adversely affects the air, water and probably the soil conditions and it also constitutes public nuisance[2]

Though slaughtering of animals results in meat supply and useful by-products like leather and skin, livestock waste spills can introduce enteric pathogens and excess nutrients into surface water and can also contaminates groundwater [3]. Abattoir operations produce a characteristics highly organic waste with relatively high level of suspended solid, liquid and fat. The solid waste includes condemned meat, undigested food, bones, horns, hairs and aborted foetus. The liquid wastes usually comprise of dissolved solid, blood, gut contents, urine and wash water [4]. Water is regarded as polluted when it is unfit for its intended use. The self-purification process of groundwater is a function of the depth of the soil and the concentration of the pollutant in the percolating water [5]. Potable water is defined as the one that does not contain chemical substances or micro-organisms in amounts that could cause hazards to health. Bacteriological examination of water is therefore a powerful tool in order to foreclose the presence of micro-organisms that might constitute health hazards [6]. Micro-organisms that are commonly used as indicators of water quality include: coliforms, *Faecal streptococci, Clostridium perfringes* and *Pseudomonas aeruginosa.* The physico-chemical and microbiological analysis of surface and groundwater are important towards a meaningful impact assessment of domestic and industrial activities on these water bodies [7].

Abattoirs are frequently located near urban centres and enormous amount of waste are produced in relatively small areas, in most abattoirs in Nigeria the waste from abattoir operations is a source of embarrassment as conventional methods for disposal of animal wastes, carcasses and manure as well as slaughter house and other animal industry wastes are now proving inadequate in Nigeria [8]. Most abattoir wastes dumped in watercourses contain high levels of organic matter, which encourages rapid proliferation of oxygen consuming micro-organism to deplete the water of its dissolved oxygen leading to unacceptable odour condition and also lethal for aquatic life [9]. Abattoir waste contamination can also increase the level of nitrates in the ground water which causes methaemoglobinemia or “blue baby syndrome” [10]. The objectives of this work are to assess the quality of water, both surface and underground around Moniya abattoir which are being used by butchers in dressing carcasses and also to know the effects of abattoir wastes on the quality of receiving Oluka stream, a perennial water course which serve as a receiver for all the slurry being generated in the abattoir.

MATERIALS AND METHODS

The abattoir under consideration in this study is located in Akinyele Local Government area of Ibadan, Oyo State. The city is located on geographic grid reference longitude $3^{o}89^{1}$ and latitude $7^{o}38^{1}$ with the average annual rainfall of 1466mm. Animals slaughtered in this abattoir accounts for 30% of the total animals being slaughtered in Ibadan daily [11]. The wastes from the slaughtering and dressing grounds in Moniya abattoir are washed into open drainages (Plate 1) untreated and are carried into a nearby Oluka stream. These wash waters has, as such turned the water inside this stream into slurry and has hampered its flow seriously (Plate 2).

Leachates from the series of decomposition processes of these wastes percolate into the underlying aquifers to contaminate underground water [1] which serves the dual purpose of drinking water for the butchers and others working in the abattoir, and dressing of carcasses to be sold for human consumption. The animal wastes llike intestinal contents are usually dumped in a place and have formed a dunghill which generates a lot of odour within the abattoir (Plate 3).

Plate 1: Intestinal contents being washed into the open channel

Plate 2: The stream that receives all the wash water from the abattoir

Plate 3: A dunghill formed by intestinal contents

Water samples were taken from this pond inside the abattoir (0.00m) and from the pond at 10, 20 and 30 meters away from the abattoir. The samples were labelled as P_0, P_{10}, P_{20} and P_{30} respectively. Also, samples were taken from a hand dug well inside the study site and labelled as HD_1 and another sample was taken from bore hole located inside the abattoir and labelled as BH_1. The samples were taken for physico-chemical and bacteriological analysis at a standard laboratory in Ogun-Osun River Basin Development Authority, Abeokuta, Nigeria. Organoleptic properties such as appearance, odour and taste were also assessed and the results are presented in tables 1 and 2 below.

RESULTS AND DISCUSSION

The physico-chemical analysis results are presented in table 1 and the results of bacteriological examination of the water samples are presented in table 2.

Table 1: Physico-chemical Values of the Water Samples

Physico- chemical parameters	P_0	P_{10}	P_{20}	P_{30}	HD_1	BH_1	(WHO, 2006)
pH	6.57	6.50	6.75	7.2	8.0	8.30	6.5-8.5
Temperature ^0C	36.4	33.9	26.2	26.3	27.0	27.51	-
Sodium ($mg.L^{-1}$)	43.0	33.0	48.1	47.2	51.0	30.53	-
Calcium ($mg.L^{-1}$)	140.9	70.3	131.15	136.0	150.9	221.12	75-200
Potassium ($mg.L^{-1}$)	125.0	74.8	74.88	75.00	74.88	31.12	-
Zinc ($mg.L^{-1}$)	0.05	0.02	0.12	0.99	0.67	16.71	5-15
Iron ($mg.L^{-1}$)	3.99	2.74	1.36	2.46	2.72	2.68	0.10-1.00
Copper ($mg.L^{-1}$)	0.31	0.63	0.11	0.14	0.33	0.43	0.05-0.50
Manganese($mg.L^{-1}$)	0.45	2.11	2.63	2.90	3.31	3.73	0.05-0.50
Total Solids($mg.L^{-1}$)	2080.0	1680.0	750.0	600.0	430.0	302.1	500-1500
Total Chloride (mgL^{-1})	250.17	141.75	102.44	104.2	99.3	115.4	200-250
Total Hardness ($mg.L^{-1}$)	361.3	135.89	162.9	166.4	179.0	175.0	100-500

Table2: Results of Bacteriological Assessment of the Water Samples

Bacteriological parameters	P_0	P_{10}	P_{20}	P_{30}	HD_1	BH_1
Feacal Coliform ($cfu.mL^{-1}$)	189.2	120.0	86.4	89.9	12.0	Nil
Streptococcus feacalis ($cfu.mL^{-1}$)	120.4	89.2	83.4	60.3	11.4	Nil
Echerichia coli ($cfu.mL^{-1}$)	127.0	78.6	50.5	43.5	13.3	Nil
Total Plate Count ($cfu.mL^{-1}$)	170.7	145.9	68.1	72.4	1.56	0.91
Biochemical Oxygen Demand ($mg.L^{-1}$)	250.3	221.4	158.0	111.0	23.0	2.5
Dissolved Oxygen ($mg.L^{-1}$)	2.9	2.9	2.4	2.6	3.1	3.5

It can be deduced from organoleptic examination that the water samples from the hand dug well and bore holes were clear, odourless and tasteless. However, water samples from the pond at P_0 and P_{10} were very rough due to high level of both suspended and dissolved solids. As the water flows further, it is becoming increasingly clearer due to sedimentation and the filtration activities of the white sand that constituted the bed materials. The pH for all the water samples ranges from 6.5 to 8.3 which is still within the [12] allowable limits. Temperature range was

between 26.0 and 36.4 ^{0}C. The relatively high values of temperature at P_0 and P_{10} (36.4^{0}C and 33.9^{0}C) can be traced to microbiological activities going on in the samples as the water samples contain higher level of BOD (table 2). All other physical compositions of the water samples are within the WHO allowable limits. However, calcium level at BH_1 went outside the range, this can only be attributed to the properties of the underlying aquifer as the sample satisfies all organoleptic parameters. The relatively higher value of iron than [12] recommendation is suspected to have come from animal blood that are washed into the water and also the leachates from this water that contain high blood content could have led to higher value of iron at HD_1 and BH_1. High total solids at P_0 and P_{10} are certainly from abattoir wastes like, bones, tissues, intestinal contents and wools. The high level of manganese in all the samples can not be attributed to any wastes from the abattoir. However it could have come from underground pollution from high concentration of mineral salts due to geological nature of the bedrock in which the aquifer is situated. Its high level at BH_1 can be from inadequate seals and wrong choice of casing which may lead to corrosion and hence pollution of the water supplies [13].

From the bacteriological assessment, all the water samples except at BH_1 were heavily polluted with pathogenic organisms of faecal origin and the abattoir workers should be discouraged from using this water to clean or dress carcasses meant for human consumption. Also the high level of BOD at P_0, P_{10} and P_{20} will lead to high odour generation which will in turn affect the life of abattoir workers. It is advisable that this pond is opened up and allowed to pass freely. Government can also provide a covered channel that will convey this abattoir wastewater to a safe place without creating any nuisance.

CONCLUSION

The workers should be strictly advised to use only the bore hole water for drinking and carcass dressing since it is the only one free from harmful pathogenic organisms according to this study. There is also the need for Government to provide much more potable water for this very important abattoir since its operations require much water.

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