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MICROBIOLOGICAL ASSESSMENT OF WASTE-WATER AND SOIL IN IJEBU-IGBO ABATTOIR, SOUTHWEST, NIGERIA

AKINDELE SHERIFAT. T[1] , ABIMBOLA 'WUNMI. A[2] , OLUWABIYI BOLATITO.A[1], JOKOTAGBA. OLORUNTOBI[1]. A., AGBOLADE OLUFEMI .M[2], AND SAM-WOBO SAMMY.O[3]

[1] Science Laboratory Technology Department,
Abraham Adesanya Polytechnic, Ijebu-Igbo, Ogun state.

[2] Plant Science and Applied Zoology Department,
Olabisi Onabanjo University, Ago-Iwoye, Ogun state.

[3] Department of Biological Sciences,
Federal University of Agriculture, Abeokuta, Nigeria

Corresponding Author: Akindele Sherifat Tolulope

zeyn_2005@yahoo.com

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ABSTRACT

The study investigates the microbes associated with waste-water and soil sample in Ijebu-Igbo abattoir. The wastewater and soil samples were collected from the abattoir and standard microbial and biochemical analysis were carried out. After analysis, microorganisms isolated include following bacteria and fungi, *Escherichia coli, Bacillus cereus, Staphylococcus aureus , Salmonella sp. Klebsiella Pneumonia, Seratia liquefasciens, Bacillus sp, Baccilus Plegem, Aspergillus fimigatus, Aspergillus flavus, Trichoderma harziarum, Penicillum camberti, Aspergillus niger and Rhizopus tolonifer.* Total mesophiles aerobic microbial population of waste water shows total heterotrophic count (cfu/ml) ranges from 1.2 x 10^5 to 3.0 x 10^5; suspended solids (g/l) ranges from 0.122 to 0.124; nitrate (g/l) ranges from 0.110 to 0.156; oil and grease ranges from0.38 to 0.420; phosphate (g/l) rages from 7.480 to 7.845 and Coliform count (cfu/ml) 0.3 x 10^5 – 0.6 x 10^5. Total mesophiles aerobic microbial population of soil sample shows total heterotrophic count (cfu/ml) 2.4 x 10^5; suspended solids(g/l) 3.1 x 10^5; nitrate (g/l) 0.122; oil and grease 0.249; phosphate (g/l) 9.48 and Coliform count (cfu/ml) 0.7 x 10^5. The higher rate of contamination of water and soil with these organisms is an indication of deplorable state of poor hygienic and sanitary practices employed right from the abattoir environment. Some microbial diseases and their effect cannot be categorized under a specific mode of transmission. There is tremendous variety of living organisms in the abattoir environment.

KEYWORDS: Abattoir, Analysis, Microbes, Soil sample, Waste Water,

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INTRODUCTION

An abattoir is a slaughter house or a specialized facility approved and registered by the regulatory authority for inspection of animals, hygienic slaughtering, processing and effective preservation and storage of meat products for human consumption [1]. Abattoirs are generally known all over the world to pollute the environment either directly or indirectly from their various processes. The continuous drive to increase meat production to meet the protein needs of the population is usually associated with some pollution problems [2].

In Nigeria, many abattoirs dispose their effluents directly into streams and rivers without any form of treatment and the slaughtered meat is washed by the same water. These abattoirs are usually located near water bodies where access to water for processing is guaranteed. The animal blood is released untreated into the flowing stream while the consumable parts of the slaughtered animal are washed directly into the flowing water [3]. Sangodoyin and Agbawe identified improper management and supervision of abattoir activities as a major source of risk to public health in Nigeria[4].

Recent studies have shown that zoonoses from abattoir wastes are yet to be fully controlled in more than 80% public abattoirs in Nigeria [5]. The risk of epidemics, water contamination and pollution, annihilation of biotic life, global warming and soil degradation by waste materials are real problems confronting developing countries where issues concerning waste management have been grossly neglected [6]. When one thinks of the pollution of water we often think of chemical dumps or spills into water sources. However, the pollution of waters can also be referred to as the presence of humans and other warm-blooded animals. Water pollution can also be refers to as the presence of compounds that promote the growth of microbes. The remediation of polluted water the removal of the potentially harmful organisms or

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the reduction of their numbers to acceptable levels represents the purification of water. Collins *et. al.*, however reported that waste can affect water, land or air qualities if proper practices of management are not followed [7]. It can cause pollution of soil with dung and the atmosphere with methane (a greenhouse gas) from decomposing waste. The aim and objectives of this study is to isolate and identify the microbes in wastewater and soil sample of Ijebu-Igbo abattoir.

MATERIALS AND METHODS

Study Area

The study was conducted at Ijebu-Igbo Abattoir in Ijebu-North Local Government Area (6^o 57'N and 4^o 0'E) of Ogun State. It is located on the tropical rainforest belt with hot and humid climatic condition. Ijebu-Igbo indigenes are mainly Yorubas with a very low number of non-indigenous people.

SAMPLE COLLECTION

Wastewater and soil samples were collected from Ijebu-Igbo Abattoir Ogun State during the peak activities at about 8:00am in the morning; samples were taking in butchering section, rinsing section and the stream. Water samples were taken from the source (i.e. where water is mainly fetched in the abattoir), and from the contaminated area. Twenty grams (20g) of soil samples were also collected from the contaminated area and the uncontaminated area (to serve as control) according to the method described by Adesemoye et al.,[8]. All samples were transported to the laboratory foe analyses immediately after collection. The Biochemical and Microbial analysis were carried out at the institute of Agricultural Research and Training (IAR & T) Moor Plantation, Ibadan, Oyo State, Nigeria.

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MICROBIOLOGICAL ANALYSIS OF THE WASTE WATER AND SOIL SAMPLES

The microbiological analysis of the water and soil sample were carried out according to the methods of Cappuccino and Sherman, [9]; Collins et. al.,([7]and Wesby,[10]. The bacterial isolates were identified and characterized using standard biochemical (Buchanam and Gibbons,[11] and(Cheesebrough,[12]. The tests conducted includes: colonial, morphological characterization, gram stain, catalase, methyl red, voges-proskauer, indole production, urease activity, H_2S, production, citrate utilization, glucose, sucrose and lactose utilization test.

The fungual isolates were identified according to Oyeleke and Okusanmi[13] based on the colour of hypha, substrate mycelium, arrangement of hyphae, conidial arrangement as well as morphology.

DETERMINATION OF SUSPENDED SOLIDS IN WASTE WATER SAMPLES.

Suspended solids are made up of inorganic materials. A glass fiber filter paper is dried, 5.5 cm in diameter, to constant weight at 103-105^{O}C in oven, it was cooled to room temperature in a desiccators. Weight was noted, Gooch funnel was prepared (about the diameter of a glass fiber) and rubber adapter, and then fixed to filtering flask. The glasses fiber was placed in the Gooch funnel carefully with the aid of pair of tongues. The water samples were mixed thoroughly and 100-250 ml was pipette. It was filtered using the filter apparatus. A pair of tongue was used to remove the glass fiber carefully from the Gooch and was dried to constant weight at 103-105^{o}C. 11g were weighed and the weight of filter paper was subtracted from the weight of suspended solids.

DETERMINATION OF NITRATE IN SOIL

The determination of nitrate in soil usually follows an extraction in 0.5 M K_2SO_4. 10 g of fresh soil was shaken in 20 ml of extractant for 30 minutes at 60 rpm. The sample was then centrifuged and nitrate was determined in clear solution.

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DETERMINATION OF OIL AND GREASE USING SOXHLET EXTRACTION

Waste water was collected in a wide mouth bottle and acidifies to pH 1.0 using concentrated HCL. A filter is prepared which consist of muslin cloth disc on which the whatman filter is laid, the edges of the paper was proceed down, then the muslin and the paper was wetted.

The soxhlet apparatus was connected to the vacuum pump, with the aid of the pump; 100 ml filter aid suspension was passed through the prepared filter paper. It was washed with one liter distilled water; a vacuum was applied until no water passes the filter. The acidified sample was filtered using the vacuum pump. A dry clear wash glass was obtained using a pair of forceps, the filter paper was taken and place on the watch glass the filter paper was rolled carefully and place on extraction thimble. The filter paper and the thimble were dried for 30 minutes in a hot oven operating for 103^{o}C. the extract flask was weighed, and the grease was extracted by the soxhlet apparatus using trichloro-trifluoro –ethane at the rate of 20 cycles per hour for four hours taken the time for the first cycle under reflex the solvent was distill from the extraction flask at 85^{o}C with heat supplied from the electric heating mantle. The flask was dried by replacing a steam both and drawing air through the flask by means of vacuum applied for 15 minute. The desiccators was cooled for 30 minutes and weighed.

RESULTS

A total number of 29 Microorganisms were observed 28 bacteria and 6 fungi. The probable organisms are listed in the tables below.

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TABLE 1: MICROBIAL ISOLATES FROM ABATTOIR WASTEWATER SAMPLES

Organism	
Bacteria	*Acinetobacter mallei, Alcaligenes faecalis, Bacillus subtilis, Bacillus cereus* *Proteus pennerii, Micrococcus luteus, Klebsiella liquefasciens, Microcus roseus, Staphylococcus auras, klebsiella sp, Bacillus megaterium, Corynebacerium pilosum, salmonella sp, Bacillus licheniformis, Bacillus polymyxa, Proteus mirabilis, Staphylococcus albus, Escherichia coli, Micrcoccus kristinae, Enterobacter aerogenes*
Fungi	*Aspergillus flavus, Aspergillus niger, Rhizopus stolenifer, Trichoderma hariziamum, Aspergillus fumigatus, Penicillium camemberti*

TABLE 2: MICROBIAL ISOLATES FROM THE ABATTOIR SOIL SAMPLE

Organism	Contaminated soil	Uncontaminated soil
Bacteria	*Mircorcoccus leteus, Mircorcoccus leteus, Klebsiella pneumoniae, citrobacter freundii, Bacillus cereus*	*Proteus sp, Serriatia liquefascient, Chromabacterium violaceum, Bacillus lichenformis, Bacillus coagulans*

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TABLE 3: TOTAL MESOPHILES AEROBIC MICROBIAL POPULATION OF WASTE WATER

Sample codes	Total Heterotrophic count (cfu/ml)	Suspended solids (g/L)	Nitrate (g/L)	Oil and Grease (g/L)	Phosphate (g/L)	Coliform counts (cfu/ml)
A	1.2×10^5	0.124	0.110	0.420	7.845	0.6×10^5
B	1.9×10^5	0.122	0.142	0.380	7.480	0.4×10^5
C	3.0×10^5	0.120	0.156	0.380	7.560	0.3×10^5

TABLE 4: TOTAL MESOPHILES AEROBIC MICROBIAL POPULATION OF SOIL SAMPLE

Sample codes	Total Heterotrophic count (cfu/ml)	Suspended solids (g/L)	Nitrate (g/L)	Oil and Grease (g/L)	Phosphate (g/L)	Coliform counts (cfu/ml)
A	2.0×10^5	3.1×10^5	0.122	0.230	9.24	0.7×10^5
B	2.4×10^5	3.0×10^5	0.120	0.249	9.48	0.7×10^5

DISCUSION

Tables 3 and 4 describes the microbial population of the waste water and soil sample where the total heterotrophic counts ranges from $1.2x10^5$ to $3.0x10^5$ cfu/ml; the suspended solids were from 0.122 to $3.0x10^5$g/l; the nitrate are 0.110 to 0.156g/l; oil and grease ranges from 0.249 to0.420 g/l; phosphate are from 7.480 to 0.48g/l and the coliform counts ranges from $0.3x10^5$ to $0.7x 10^5$ cfu/ml.

The high level of contamination of Ijebu-Igbo Abattoir waste water and its contaminated soil as obtained in this study confirm the dangers associated with discharging untreated waste water to the soil and river, thus the need for adequate treatment to ensure decontamination. The higher rate of contamination of water and soil with these organisms is an indication of deplorable state

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of poor hygienic and sanitary practices employed right from the abattoir environment. Some microbial diseases and their effect cannot be categorized under a specific mode of transmission. However, similar to previous study, there is tremendous variety of living organisms in the abattoir environment (Table1 and 2). According to a research article, Bacteriological Quality of Abattoir Effluents Discharged into water Bodies in Abuja, Nigeria, Observed that untreated abattoir waste water discharged into water bodies in Abuja, Nigeria contains bacterial counts above the recommended level for discharged into water bodies in Nigeria. Receiving water bodies were contaminated with bacteria pathogens that could impact on public health, especially the streams and rivers still serves as major sources of water supply in developing countries like Nigeria [14].

RECOMMENDATION

It is recommended that better inspection of abattoir and strict enforcement of law should be made to be able to reduce environment contamination and related diseases. Attempts should also be made to control the hygiene of slaughter house using visual assessment of premises and animals. Government agencies and other stake holders should develop methods of waste treatment for reasons of public health and conversion which results in the destruction of pathogens, such methods can include anaerobic waste water treatment using granular sludge reaction. Finally, solid waste from slaughtered animals can be fermented in terms to produce compost and biogas. Biogas can be used as additional energy for the production of industrial and household gas and thus, encouraging sustainable agriculture.

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