



The Impact of Egbu Abattoir Wastes on Fungal Concentrates of the Soil Environment

M. I. Nwachukwu^{1*}, C. C. Ike² and I. O. Nwachukwu¹

¹Department of Microbiology, Imo State University, Nigeria.

²Department of Biological Sciences (Microbiology Unit), Rhema University, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/SAJRM/2019/v5i430138

Editor(s):

(1) Dr. Chamari Hettiarachchi, University of Colombo, Sri Lanka.

Reviewers:

(1) Manoj K. Ghosh, Kalinga University, India.

(2) Wafaa Abd El-Ghany Abd El-Ghany, Cairo University, Egypt.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/53353>

Received 20 October 2019

Accepted 24 December 2019

Published 11 April 2020

Original Research Article

ABSTRACT

The impact of Egbu abattoir wastes on fungal concentrates of the soil environment was undertaken. Samples of contaminated soil from the abattoir environment were taken against control and evaluated for fungal concentrates using standard methods. Results obtained showed that total fungal count (TFC) ranged from 3.5×10^5 cfu/g to 4.50×10^5 cfu/g and total hydrocarbon utilizing fungi (THUF) ranged from 1.8×10^5 cfu/g to 3.80×10^5 cfu/g. The percentage occurrence for mould isolates indicated the presence of *Absidia* sp., *Aspergillus* sp., *Fusarium* sp., *Cladosporium* sp., *Penicillium* sp., and *Rhizopus* sp. while yeast isolates were *Candida* sp., *Rhodotorula* sp., *Saccharomyces* sp., and *Torulopsis* sp., for both seasons. Though most of these organisms were indigenous to the soil some invading species were also isolated and were higher in contaminated soil than control soil. Egbu abattoir waste could be behind these observations. The study has revealed the impact of Egbu abattoir wastes on fungal concentrates of the soil environment.

Keywords: Abattoir; fungal concentrate; Egbu; soil environment.

*Corresponding author: Email: drmichaenwachukwu@gmail.com, drmichaelnwachukwu@gmail.com;

1. INTRODUCTION

Abattoir, a place where animals are slaughtered for their meat and skin [1,2], has been recognized as a meat production industry that provides employment [3,4]. It is normally approved and registered by controlling authorities for hygienic slaughtering, inspection, processing, effective preservation and storage of meat products for human consumption [5]. Ubwa et al. [6] noted that the major activities involved in the operations of an abattoir are: receiving and holding of livestock; slaughter and carcass dressing of animals; chilling of carcass products; carcass boning and packaging; freezing of finished carcass and cartoned product; rendering processes; drying of skins; treatment of wastes and transport of processed material. According to Magaji and Chup [7], livestock production is considered a potential food for the world's needy people. The same authors also noted that it, however, becomes a major pollutant of the country site and cities, when the slaughter wastes are not properly managed. Abattoir operations generate organic wastes grouped into solid, liquid and fats. Condensed meat, undigested ingest, hairs, bones and aborted fetuses make up the solid wastes; dissolved solids, blood, guts contents, urine, and water make up the liquid; whereas fats and oil make up the fat wastes [8]. These wastes influence the environment through pollution [9]. The recipient of abattoir form of pollution is soil or water environment, or both at some time.

Animals slaughtered in Egbu abattoir generate these organic wastes grouped into solid, liquid and fats. Egbu abattoir is in Owerri North and it is managed by the local authority. Both soil and water body is the recipients of the inherent pollution of wastes generated from Egbu abattoir. The Otamiri river, one of the major rivers in Owerri, serves a receiving water body to some liquid wastes generated from the abattoir. The soil within the abattoir environment also drains some of the wastes generated within the abattoir. Though the abattoir is controlled by the local

authority, the management of wastes from Egbu abattoir is left in the hands of the abattoir operators and to this end, the wastes generated thereof are handled without consideration of the impacts on the environment.

This study ascertained the fungal concentrates of Egbu abattoir soil environment and will report to the public as the case may be.

2. MATERIALS AND METHODS

Study area: Egbu abattoir is located within coordinates of longitude 05°28.432'-05°29.802'N and latitude 007°03.200'-007°04.215'E. The climate of Egbu falls within the tropical climate with average relative humidity about 80%. The inhabitants of the area are mainly farmers, civil servants, petty traders and casual workers. The wet and dry seasons are the two distinct seasons of the area under study, with 70% of the annual rainfall between April and August; September to November tend to have about 22% of the rainfall while December to March is the driest months in the area under study. Wastes from Egbu abattoir through soil erosion and surface runoff are washed into Otamiri River as the recipient water body, which is located 100 meters away from the abattoir.

Identification of sampling points and sample collection: A total of four sampling points were considered in this study. The sampling stations, sampling point's codes, sampling points coordinates and types of samples collected are presented in Table 1.

Surface soil samples were collected from four different sampling points coded A, B, C, and D from a depth of 0-15 cm using a soil auger. About 500 g of bulked composite soil samples from soil samples collected from points A, B, and C was prepared using the method of Ekundayo and Obuekwe [10]. A soil sample from point D, which is about 200 m from Egbu abattoir served as a control sample. The samples were collected by augering the good hole; this was achieved by

Table 1. Identification of sampling points and sample collection

Sampling stations	Sampling points	Sampling co-ordinates	Sampling co-ordinates	Types of samples collected
		Northing (N)	Easting (E)	
Egbu Abattoir	A	05° 28.432'	007° 03.200'	Soil (test sample)
	B	05° 28.441'	007° 03.209'	Soil (test sample)
	C	05° 28.582'	007° 03.312'	Soil (test sample)
	D	05° 28.559'	007° 04.231'	Soil (control)

rotating the handle of the auger in a clockwise direction by applying steady and firm downward pressure on the handle. When the bucket was full, the auger was lifted out of the hole and inverted so that the collected sample slipped out of the open end of the bucket into sterile polyethylene bags. Immediately after collection, the sample was labelled and transported to the laboratory in a cooler packed with ice blocks for analysis.

Microbiological analysis: Total fungal count (TFC) was determined using the methods of Prescott et al. [11]. The method of Mills and Colwell [12] was used for total hydrocarbon utilizing fungal counts (THUF). Fungi and yeast representatives' isolates were identified following the methods of Barnett and Hunter [13].

3. RESULTS

The results as presented in Tables 2, 3 and 4 show Fungal counts of soil samples contaminated by Egbu abattoir wastes for the seasons; percentage occurrence of mould isolates from soil samples contaminated by Egbu

abattoir wastes for the seasons; and percentage occurrence of yeast isolates from soil samples contaminated by Egbu abattoir wastes for the seasons respectively.

Table 2 showed that total fungal count (TFC) ranged from 3.5×10^5 - 4.50×10^5 cfu/g, while total hydrocarbon utilizing fungal counts ranged from 1.8×10^5 - 3.80×10^5 cfu/g.

Percentage occurrence of mould isolates from soil samples contaminated by Egbu abattoir wastes for the seasons revealed that *Absidia sp.* ranged from 8.00-13.33%, *Aspergillus sp.* ranged from 16.00 -16.67%, *Fusarium sp.* ranged from 0.00-16.00%, *Cladosporium sp.* ranged from 13.33-20.00%, *Penicillium sp.* ranged from 16.00-20.83%, and *Rhizopus sp.* ranged from 24.00-40.00%.

Table 4 showed the percentage occurrence of yeast isolated such as *Candida sp.* (40.00-42.86%), *Rhodotorula sp.* (0-40.00%), *Saccharomyces sp.* (20.00-57.14%), and *Torulopsis sp.* was noted detected in any of the samples.

Table 2. Fungal counts (cfu/g) of soil samples contaminated by Egbu abattoir wastes for the seasons

Groups	Dry season		Rainy season	
	Test sample	Control	Test sample	Control
TFC	3.5×10^5	3.0×10^5	4.50×10^5	4.00×10^5
THUF	1.8×10^5	1.0×10^5	3.80×10^5	2.50×10^5

Table 3. Percentage occurrence (%) of mould isolates from soil samples contaminated by Egbu abattoir wastes for the seasons

Isolates	Dry season		Rainy season	
	Test sample	Control	Test sample	Control
<i>Absidia sp.</i>	8.00	8.33	13.33	10.71
<i>Aspergillus sp.</i>	16.00	25.00	16.67	25.0
<i>Fusarium sp.</i>	16.00	16.67	-	7.14
<i>Cladosporium sp.</i>	20.00	8.33	13.33	17.86
<i>Penicillium sp.</i>	16.00	20.83	16.67	17.86
<i>Rhizopus sp.</i>	24.00	20.83	40.00	21.43
Total	100.00	99.99	100.0	100.0

Table 4. Percentage occurrence (%) of yeast isolates from soil samples contaminated by Egbu abattoir wastes for the seasons

Isolates	Dry season		Rainy season	
	Test sample	Control	Test sample	Control
<i>Candida sp.</i>	40.00	37.50	42.86	30.76
<i>Rhodotorula sp.</i>	40.00	50.00	-	15.38
<i>Saccharomyces sp.</i>	20.00	12.50	57.14	38.46
<i>Torulopsis sp.</i>	-	-	-	15.38
Total	100.00	100.00	100.00	99.98

4. DISCUSSION

The observed fungal organisms of the present study showed the diversity of the organisms in the abattoir soil for the seasons than the control. Total fungal count (TFC) of soil contaminated by abattoir waste was 3.5×10^5 cfu/g in the dry season, which increased to 4.50×10^5 cfu/g in the rainy season. Total hydrocarbon utilizing fungi (THUF) was between 1.8×10^5 cfu/g in the dry season to 3.80×10^5 cfu/g in the rainy season. The observed values were higher than their respective control.

The observed total fungal counts for the seasons were higher than their respective control (Table 1). The mould and yeasts isolated indicate organisms that were indigenous to the soil. However, other invading fungal species were also isolated.

Among the mould isolates were *Absidia sp.*, *Aspergillus sp.*, *Fusarium sp.*, *Cladosporium sp.*, *Penicillium sp.*, and *Rhizopus sp.* Rabah et al. [4] reported the presence of *Absidia sp.*, *Aspergillus sp.*, *Fusarium sp.*, and *Penicillium sp.*, in soil contaminated with abattoir effluents in Sokoto metropolis. The percentage occurrence of *Absidia sp.*, *Aspergillus sp.*, *Penicillium sp.*, and *Rhizopus sp.*, were higher in rainy season than dry season while *Fusarium sp.*, and *Cladosporium sp.*, were higher in the dry season than rainy season. Egbu abattoir effluents may have encouraged the growth of *Absidia sp.* and *Rhizopus sp.* than other mould isolates.

The yeast isolates were *Candida sp.*, *Rhodotorula sp.*, *Saccharomyces sp.*, and *Torulopsis sp.*, for both seasons. Percentage occurrence of yeast isolates such as *Candida sp.*, and *Saccharomyces sp.*, were higher in the rainy season, and against their respective control. Percentage occurrence *Rhodotorula sp.*, isolates were lower than their respective control for the seasons. *Torulopsis sp.* was not detected in all the samples. Egbu abattoir waste could be behind the distribution of fungal organisms observed in the present study.

5. CONCLUSION

The total fungal count (TFC) and total hydrocarbon utilizing fungi as observed in this study were higher in the rainy season than the dry season. Their values were higher than their respective control. Apart from *Rhodotorula sp.*, yeast isolate and *Torulopsis sp.*, that was

detected, all other mould and yeast organism that was isolated from the contaminated soil was higher than the control sample. The studied abattoir waste could be behind these observations. The study has revealed the impact of Egbu abattoir wastes on fungal concentrates of the soil environment.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/53353>