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Full Length Research Paper

Effect of cassava effluent on Okada denizens

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A study was designed to investigate the effect of cassava effluent on Okada environment. Two sets of same five plant species were germinated and watered with cassava effluent for 10 days at alternate days. One part of the effluent had read palm oil in it from processing while a part of it had non. Significant results were obtained from the one without red palm oil. Only *Chlomolaena odorata* survived out of the five plant species. The survival was 5% in 100% effluent concentration, 20% survival in 75% effluent concentration, 35% survival in 50% effluent concentration. While the control had 100% survival. Results from the effluent with red palm oil was not significant. Bad odour was perceived for a mean distance of 90.3 m from the point of discharge of cassava effluent. This is an indication of air pollution. The interview with ethno inhabitants showed that goats, sheep, die when they drink cassava waste water. There was no negative effect in respect of cat, pig, fowl and Turkey. Soil analysis showed that fungi were obliterated. The benefit from mycorrhizal association which enhances plant growth was lost. The study concluded that cassava effluent had negative effect on the Okada environment. Enlightenment campaign, detoxifying cassava effluent in accordance with FEPA standard, appropriate method(s) of disposal of both solid and cassava waste water are recommended for safe and healthy Okada environment.

Key word: Cassava effluent, Okada environment, mycorrhizal association, FEPA standard.

INTRODUCTION

Okada is the headquarter of Ovia North East Local Government Area of Edo State, Nigeria. It is located in the moist tropical forest region in the southern part of Nigeria. *Manihot esculenta* (cassava) belongs to the family Euphorbiaceae. It is native to South America and is extensively cultivated in the tropical and subtropical regions of the world for its edible starchy tuberous root. It is a major source of carbohydrate and it is the third largest source of carbohydrate in the world with Africa being the largest centre of production (Claude and Denis, 1990). Annual cassava production in Africa is about 84 million tones, with Nigeria having the highest- 30 million tones, Tanzania 5.7 million tones, Democratic Republic of Congo 16.8 million tones, Mozambique 5.3 million tones and Madagascar 2.4 million tones (Nweke, 1992). Cassava has diverse uses depending on the community. In Nigeria nearly every community depends on it as source of food. The reliance on cassava as source of food and exposure to goitrogenic effects of thiocyanate has been identified as being responsible for the endemic goiters in Akoko area of South Western Nigeria (Akindahausi et al., 1998).

Waste water from Cassava processing is released into the environment without proper treatment in most rural areas where cassava is processed. This has been identified as a source of pollution. Waste water running freely along surfaces contaminates agricultural surface water, stream, as it percolates into the underground water, and the subsoil, it may have effect on plants, domestic animals, man and fauna and flora. A poisonous substance called cyanide during cassava processing in various concentrations depending on the species, 40 - 70% of the total cyanide appear in the water used to wash the disintegrated cassava and 5 to 10% in fibrous residue used in animal feed (Arguedes and Cooke, 1982). Evaporation of cyanide will occur either during processing or after discharge (Cooke and Maduagwu, 1978). Environmental problems from cyanide include negative effect on young

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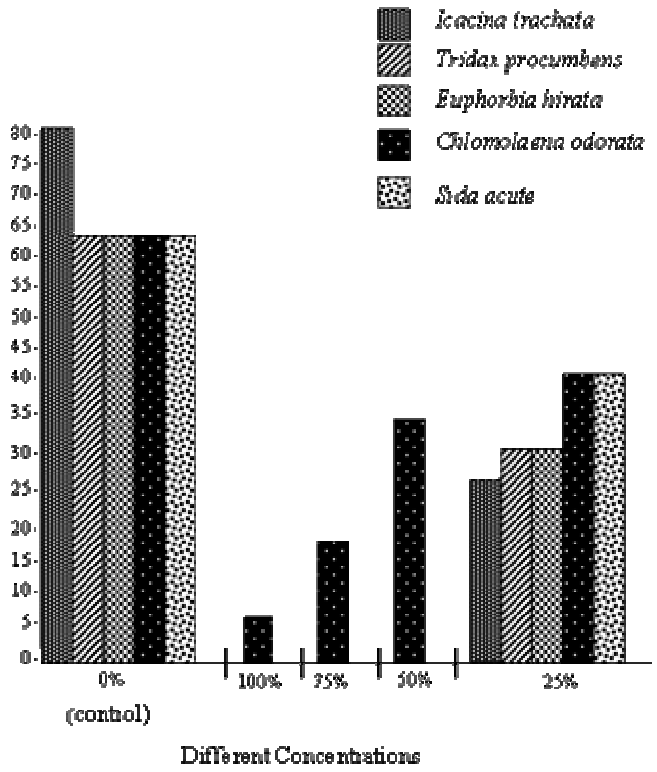

Figure 1a. Effect of different concentrations of cassava effluent (no red palm oil) on five species of plants.

stage of rice and vegetables (Bengtsson and Trient, 1994).

The choice of Okada for the study stemmed from the observation that every 5 days a lot of people with commercial vehicles come to Okada, Edo State, Nigeria looking for cassava and cassava products to purchase. This is an indication that Okada is an area that processes a lot of cassava. Consequent upon the processing there is a lot of cassava effluent discharged on the environ-ment. Further more, the recent Nigerian govern-ment's encouragement to grow and process more cassava for domestic and international needs resulted in corresponding increase in production and processing thus increased amount of cassava effluent discharged on the environment. The matters of health and environment stand perpetually pregnant with disaster and it is important to dissect the constituents of African water and air that make them so deadly (Oladele, 2007). The purpose of this study was to investigate the effect of cassava effluent on the Okada denizens (human, soil, animals and plants) of the processing area.

MATERIALS AND METHOD

Three different areas of cassava processing were identified and labelled A B C (effluent areas). Three other different areas 10 m from A B C were also labelled D E F (control) without cassava effluent.

Soil analysis (Physical and chemical)

Eighty grams of soil from A B C each was obtained and mixed thoroughly together and kept in a large poly bag. The same was done for DEF but kept in a separate poly bag. Both samples were taken to Edo State Environmental Laboratory, behind the secretariat in Benin City for analysis using standard laboratory methods.

Toxicity effect of cassava effluent

Information was gathered from the local inhabitants using direct interview to assess toxicity of cassava effluent on the environment. Response was recorded as percentages. The inhabitants indicated that cassava effluent has different effects from their experience. This depended on the type of method used in processing. Two methods were noted and used in the study. The one to which red palm oil was added and the one with out red palm oil. Samples of effluent from the two different methods were collected into separate containers duly labeled. The choice of direct interview was to by pass a large number of unreturned questionnaires for the fact that most of the respondents are not educated. Various concentrations of the two types of effluents were prepared namely 0, 25, 50, 75 and 100% going by the method described by (Ogundola and Laiasu, 2007).

The five most occurred species in the effluent sites were identified by a Botanist in the Department of Biological Sciences, Igbinedion University Okada. The seeds were broadcast on a nursery bed watered every alternate day for 14 days. Five seedlings at two leaf stage of each of the species were transplanted into big poly pots filled with topsoil only. They were replicated three times. The pots were arranged in random block design. The pots were subjected to wetting as necessary every other day, bag 1 was wetted with 0% concentration of cassava effluent, bag 2 was wetted with 25% concentration of cassava effluent, bag 3 was wetted with 75% concentration of cassava effluent and bag 4 was wetted with 100% concentration of cassava effluent. This first set of experiment was wetted with cassava effluent without red palm oil while the second set of experiment was set up like the first but was wetted with the effluent that had red palm oil in it. Effect of the two types of cassava effluent was evaluated at 10 weeks after transplanting that is, in terms of percentage survival in each concentration. The five identified plant species were, *Sida acuta*, *Icacina trachanta*, *Euphorbia hirata*, *Tridax procumbens and Chromelaena odorata*. The native use these plants for various ethno medicine. Number of survival and dead seedlings were directly counted in each treatment and mean values were recorded. The distance at which cassava effluent odour could be perceived was determined by taking the mean distance at which three individuals can perceive the odour. This was to know if there was air pollution. The Results were statistically analysed where necessary for test of significance.

RESULTS/DISCUSSION

Figures 1a and b show the effect of different concentrations of cassava effluent on the denizens of Okada – cassava processing areas. Significant results were observed across the various concentrations of cassava effluent used. *C. odorata* had 5% survival in 100% concentration, 20% survival in 75% concentration, 35% survival in 50% concentration respectively. However, the result obtained from the control and the 25% concentration of cassava effluent was not significant. All the species survived in the control and in the treatment of

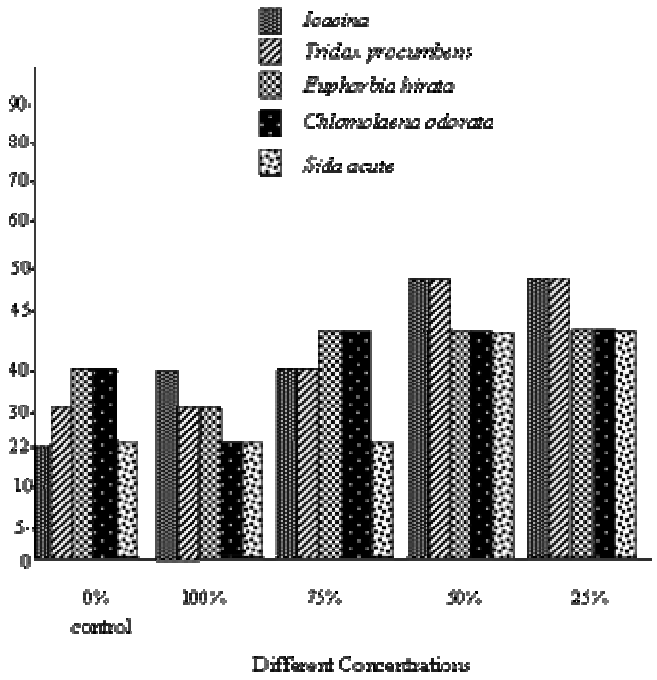

Figure 1b. Effect of different concentrations cassava effluent to which red palm oil was added on five species of plants.

25% concentration of cassava effluent although at various degrees of survival Figure 1a. There was no significant difference observed from the effect of cassava effluent to which red palm oil was added. Almost uniformity of growth pattern was observed from control and treatment Figure 1b, the implication of this observation is that probably the red palm oil may have reduced the toxic effect of cyanide content of the cassava effluent.

Effect of cassava effluent on air quality

This is shown in Tables 1 and 2 and Figures 1 and 2. From the point of disposal of the cassava effluent the odour could be perceived for a mean distance of 90.3 M (Table 1). This is an indication of air pollution.

From the respondent interviewed, it became clear that goats and sheep are very vulnerable to the in take of cassava effluents. All respondents agree that goats and sheep die when they drink cassava effluent but that they did not die when red palm oil was added to the effluent. There was no evidence of death in the case of pig, fowl and Turkey (Table 2).

Soil

Microbial analysis result (Table 4) showed that fungi were obliterated. The economic advantage of Mycorrhizal association with plant communities where cassava effluent was deposited was thus lost. These advantages include enhanced nutrient absorption capacity, protection from the attack of root pathogens and damaging nematodes, vigorous plant growth and resistance against insect attack and diseases. Thus there is negative effect of cassava effluent on the microbial component part of the Okada environment.

The tentative isolates (Table 5) are usually associated with cassava effluent for fermentation. Significant differences where observed in treatment and control. Cyanide which is a major chemical in cassava effluent was present in source but absent in control. Other parameters were also higher than what was obtained in control. However there was no significant difference observed in the pH from the source and control (Table 3). The outcome of the physio-chemical analysis is indicative of possible negative impact of cassava effluent on the Okada environment in terms of plants, animals, soil micro organisms, aquatic life etc. The tentative isolates indicated the organisms associated with cassava effluent fermentation.

The plants in this study can be controlled by 100 and

Table 1. Mean distance (m) covered by bad odour of cassava effluent.

Individual	Perception distance (M) of bad odour from cassava effluent	Mean distance (M)
A	90.5 M	A+B+C / 3
B	90.0 M	90.3
C	90.5 M	

Table 2. Effect of cassava effluent on domestic animals and birds.

Animals	Cassava effluent	
	No red palm oil added	Red palm oil added
Cat	-	-
Goat	+	-
Sheep	+	-
Pig	-	-
Birds		
Fowl	-	-
Turkey	-	-

+: Dead
-: No effect

Table 3. Soil physico – chemical analysis result.

Parameters	Source	Midpoint	Control
pH	5.37	6.62	6.04
Cyanide (PPM)	25.60	18.40	0.00
Acidity (PPM)	1420	520	260
Alkalinity (PPM)	180	260	250

Table 4. Soil microbial analysis result.

Samples	Total Aerobic count (cfu/g)	Total Coliform count (cfu/g)	Total staphylococcal count (cfu/g)	Total Fungal count (cfu/g)
Control	$4x10^6$	$1x10^6$	Nil	$21x10^6$
Source	$19x10^6$	$18x10^6$	$13x10^6$	Nil
Midpoint	$16x10^6$	$6x10^6$	$8x10^6$	Nil

Table 5. Tentative Isolates.

Tentative bacterial isolates	Tentative fungal isolates
Bacillus sp.	*Mucor* sp.
Micrococcus luteus	*Aspergillus niger*
Staphylococcus aureus	*Saccharonigces cerevisal*
Staphylococcus epidermidis	*Penicillum notatum*
Enterobacter aerogens	*Penicillum oxalicum*
Flavobacterium sp.	

75% cassava effluent concentration respectively. Cassava effluent had selective herbicidal effect on the plants as evidenced from the result of this study Figure 1a. The herbicidal effect of 100 and 75% concentrations of cassava effluent from this study agrees with the findings of Ogundola and Laiasu (2007). However, they differ with respect to 50% concentration. That cassava effluent had negative effect on plants has been established in this study. This agrees with the findings of Bengtesson and Trient (1994). They reported that cassava effluent had negative effect on growing stages of rice and vegetables. Cassava though widely used as food has the disadvantage of containing toxic cyanogenic compounds (Cock, 1985; Rossling, 1988). The toxic effect of the cyanogenic glucosides on human being and livestock is well known (Nestel, 1973). These agree with the finding of this study as animals and plants were affected. Further more a visit to the cassava processing area revealed that the cassava effluent released during processing may have toxic effect on the fauna and flora. This was confirmed in this study when fungi were wiped out as shown in soil analysis. Vegetation is hardly noticed on such areas (Ogundola and Laiasu, 2007). The fact that Cyanide hydrolyses to hydrogen cyanide which volatilizes without leaving any residue is an indication that cassava effluent can be effective as a non persistent herbicide.

Conclusion and Recommendation

The study concluded that cassava effluent had negative effect on the Okada environment. This is obvious from the results of the various parameters investigated-effect of cassava effluent on plants, air, domestic animals, soil and water. Negative values higher than the FEPA standards were obtained. This is the basis for the conclusion.

The cassava farmers and those involved in the processing of cassava are mostly illiterates. They do not understand the implication of the hazards posed by cassava effluent. Enlightment campaign by Agricultural extension workers, detoxifying cassava effluent in accordance with FEPA standard, appropriate methods of disposal of both solid and cassava waste water are recommended for save and healthy Okada environment.

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