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EFFEECT OF CRUDE OIL POLUTION ON TILAPIA LIVE PERFORMANCE

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ABSTRACT

This study was conducted using Nile tilapia (Oreochromis niloticus L.). Weekly feed intake, mortality and haematological parameters were taken and recorded. All data generated were analysed using SPSS. Results indicated significant (P<0.05) differences in feed intake, mortality and haematology. The control treatment had more deleterious effect on the fish as almost all the fish (adult, juveniles and fingerlings) died within the study period. The adult fish in all the treatments were mostly affected by crude oil than the juveniles and the fingerlings. This study indicates that non-oil induced pollution is more detrimental to tilapia survival over a short pollution period than oil pollution over time. It also indicates that oil pollution is beneficial to tilapia at certain pollution levels.

Keywords: Crude oil, Pollution, Fingerlings, Juvenile, Adult, live performance.

INTRODUCTION

Oil pollution is one of the environmental constrains that produces aqua-toxicological effects, which are deleterious to aquatic life [1-2]. A variety of pollutants including crude oil and its products are known to induce stress conditions, which impair the health of fish [3]. Oil pollution impact negatively on fishery resources [4]. [5-6] observed that eggs and young fingerlings of fishes are especially vulnerable to the toxic effects of crude oil and its refined products. Ekweozor [7] reported that frequent spillages of crude oil and its products in creeks and rivers may have resulted in a marked reduction in the number of both freshwater and marine creatures.

The use of haematological studies as noted by [8-9] in fisheries is growing in importance for toxicological research, environmental monitoring and fish health conditions. Several authors [10-11] have reported deleterious effects of sublethal concentrations of crude oil and its derivatives on physiology of exposed fish. [12] reported similar observation in juvenile pink salmon (*Oncorhynchus gorbuscha*). Sublethal concentrations may not necessarily lead to outright mortality but may have significant effects which can lead to physiological stress and dysfunctions in animals [9]. Haematological techniques have been used to determine sublethal effects of these pollutants during the clinic diagnosis of fish physiology [13]. Previous studies have shown that erythrocytes and white blood cells are the most important indicators in examining physiologic changes [14].Significant decrease in leucocytes in exposed fish is an indication of reduced chances of survival in the face of bacteria invasion [15].

The toxicity of crude oil effluent on *Tilapia guinensis* and mangrove swamp had One hundred percent mortality in the *Tilapia sp* exposed to 60% concentration of produce water within 24 hours. Mortality ranged between 50% and 80% when the same organism was exposed to 40% concentration for 96 hours. No mortality was observed below 30% concentration during 96 hours. Since total hydrocarbon levels in produce water were low with

indicated value of ±2.19 part per million (ppm), observed mortalities were attributed to the presence of toxins other than the oil, [16].

Nile tilapia, *Oreochromis niloticus* L. species are native to Egypt and are worldwide distributed [17]. Fingerlings of the Nile tilapia exposed to varying concentrations of water soluble fractions (WSFs) of the Bonny light crude oil had no mortality in the exposed fish throughout the exposure period, but the results obtained showed that growth and feed utilization were significantly reduced [18].

Damage done by pollution to the environment is irreversible, [18-19]. For this reason, awareness of the harm caused by several pollutants to the natural environment has led political and legislative authorities of the industrially developed countries to introduce or enhance regulations to protect the environment. This is because Oil leaks and spills do not just affect marine life - they have a direct impact on humans, too long after the initial media frenzy has died down [20].

MATERIALS AND DATA

A study was conducted using adult fish, juveniles and fingerlings of Nile tilapia (*Oreochromis niloticus* L.). The fish were separated into three groups of 30 fish each replicated three times. Each replicate pen had 10 fish contained in a transparent white container with 12 litres of clean tap water of P^H 6.8 and varying levels of crude oil. The control had no crude oil (0.0ml) while the other treatments had varying levels of 0.6ml, 0.8ml, 1.2 ml, and $2.4ml^{-1}$ of water. Measured quantities of feed were given to each group over a period of 12weeks. Mortalities were taken and recorded on daily basis. At the end of the trial period survived fish in the different replicate pens were taken to the laboratory for haematology using the method [21].

All data generated were analysed [22].

RESULTS

Table I. Effect of crude oil pollution on haematological parameters of tilapia fish

Parameter	*0.0ml*	*0.6ml*	*0.8ml*	*1.2ml*	*2.4ml*	*± SEM*
Hb (g)	33b	33b	28a	27.1a	25.3b	1.8037
RBC (x 10^6)	1.3a	1.0a	1.3a	0.9b	0.73c	0.3409
WBC (x 10^3)	2.60a	2.03a	1.43b	1.26b	1.02b	0.4305
MCV (μm^3)	80b	87.5a	56.7c	50.7d	56.4c	2.7133
MCH (Pg)	46.5a	46.1a	44.8b	44.7b	43.4b	2.2386
MCHC (%)	37.9a	37.3a	37.3a	35.4b	34.9b	2.0155

All means along the rows without letters are not significantly (P>0.05) different.

Table II. Effect of crude oil pollution on live performance of tilapia fish

Parameter	*0.0ml*	*0.6ml*	*0.8ml*	*1.2ml*	*2.4ml*	*± SEM*
Feed intake	49.2b	47.8c	50.1	50.9a	50.6a	2.3504
Initial weight	53.1a	40.2	41.5	41	40.3	2.1271
Final weight	53.1a	54.8a	49.6c	50.9 b	51.4b	5.3728
Mortality	28.4a	12.5c	26.3b	27.0a	28.0a	1.6479

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All means along the rows without letters are not significantly (P>0.05) different.

DISCUSSION

From table I above, all haematological parameters studied were significantly (P<0.05) different. This agrees with works of [10-11] and which reported deleterious effects of sub lethal concentrations of crude oil and its derivatives on the physiology of exposed fish. However, the haematological effects of $0.6ml^{-1}$ of water had similar effects with the control. This similarity could be attributed to other pollutants other than crude oil which gave similar results as $0.6ml^{-1}$ pollution effect in the control.

From table II above, all parameters studied were significantly (P<0.05) different except initial live weight. This implies that Crude oil has effect on the live performance of tilapia fish. This could be attributed to its effect on haematological parameters. However, mortality was highest in the control. This could be attributed to water pollution outside crude oil as it was without crude oil. This pollution could be dust and bacteria load form decaying feed. This agrees with the work [17] which attributed mortalities to the presence of toxins other than the oil. It appears $0.6ml^{-1}$ of water crude oil treatment was least affected by crude oil pollution. This is evident in the haematology result and in mortality.

CONCLUSION

In as much as this study agrees with works of [10-11] on haematological results and on the work of [9], which reported that sub lethal concentrations may not necessarily lead to outright mortality but may have significant effects which can lead to physiological stress and dysfunctions in animals [9], the study indicates that crude oil pollution could be beneficial to tilapia fish at certain sub lethal doses. Hence, stress due to sub lethal pollution could enhance the fish defense mechanism. Young tilapia fish such as fingerlings and juveniles were stronger in withstanding crude oil pollution at the levels studied than the adults.

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