

TOXICITY OF OIL – BASED DRILLING MUD (OBM) ON THE SURVIVAL OF THE FINGERLINGS OF NIGER DELTA MUDSKIPPER, PERIOPHTHALMUS PAPILIO (BOCH AND SCHNEIDER, 1801).

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ABSTRACT

The toxicity of oil – based drilling mud on the survival of the fingerlings of Niger Delta mudskipper, *Periophthalmus papilio* were studied using static plastic tanks. The exposure period lasted for 96 hours. Lethal concentration (LC₅₀) and lethal time (LT₅₀) were determined. The control tanks contained no oil – based drilling mud. Results revealed increased in mortality values of the fish to all lethal concentrations. There was no mortality observed in the control tank. The oil – based drilling mud were toxic on *P.papilio*.

Keywords: Drilling fluid, Mortality, Lethal concentration (LC₅₀), Bioassay

INTRODUCTION

The toxic effect of oil – based drilling mud has been highlighted by Hart *et al.*, (2007) when they worked on the effects of lethal concentrations of oil – based drilling fluid on *Callinectes amnicola*. Vincent and Sikoki (2006) had observed both the survival and gill morphology of *Oreochromis niloticus* exposed to synthetic drilling fluid. The toxicity of *Periophthalmus barbarus* has been investigated by Nwakanma (2012). The oil – based drilling mud had been reported by Hart *et al.*, (2008) to be toxic on *Tympanotanus fuscatus* due to increase in mortality and tissue damage to target tissues. Mudskipper fish is an important traditional delicacy for the Niger Delta Egun, Ijaje and Ijaw tribemen in Nigeria, and as the cost of beef increases daily, the consumption of this species increases. These fish species are drastically reducing in the shores of the Niger Delta wetland to pollution discharges and literature on this effect is poor. The aspects of the biology and ecology of *P.papilio* were described by Etim *et al.*, (2002), King and Udo (1996), Udo (2000). The toxic effects of the lethal concentrations of oil – based drilling mud on the survival of the fingerlings of Niger Delta mudskipper, *P. papilio* have been studied in this work.

MATERIALS AND METHODS

The fingerlings of *P.papilio* weighing less than 9g were collected from the mangrove shores of Rumuche River in Emohua Local Government Area, in Port – Harcourt, in the Niger Delta. The mudskippers were collected by trap nets at low tide and transported in the late hours of the day to the Hydrobiology/Fisheries Biology laboratory, University of Port – Harcourt in air buckets. They were acclimated for 7 days in plastic tanks. The amphipods fish species were fed with feed meal obtained from the African Regional Aquacultural Centre, ARAC. The oil – based drilling mud used was obtained from Onne, Port – Harcourt and prepared according to standard method (Reish and Oshida, 1996). Lethal concentration of 0% (control), 2%, 4%, 8% and 10% were prepared (i. e . 1% OBM = 100ml/L) and the bioassays lasted for 96 hours. The temperature, pH, dissolved oxygen, salinity, alkalinity and conductivity were monitored throughout the duration of the experiment following the methods described by APHA (1998). The analysis of variance (ANOVA) method was used in Statistical tests (at P > 0.05).

RESULTS AND DISCUSSION

The summarized data on physico– chemical parameters obtained for *P.papilio* exposed to OBM treated tanks are presented in Table 1. The levels of physico – chemical parameters during the experiment as determined according to EIFAC (1983) at the various concentrations did vary significantly (P < 0.05) from those of the control of the *P. papilio* specie. The effects of the different concentrations of OBM on *P.papilio* with regards to percent mortality increased significantly (P < 0.05) with increase in the OBM concentrations and time of exposure. The probit plot of mortality against concentration is shown in (Fig. 1). The LC₅₀ for 24, 48, 72 and 96 hours were 11.1%, 10.3%, 55 and 4.1% respectively. The results showed that as the concentration and time increased, the LC₅₀ reduced. The probit plot of mortality against log of time is shown in (Fig. 2). LT₅₀ of 124.50hours, 96.58hours, 74hours, and 70 hours for 2%, 4%,8% and 10% respectively were obtained. The variation in the water quality observed between control and treated tanks suggested that the drilling fluid did not adversely alter the water quality integrity. They were in conformity with the findings of authors (Omoregie *et al.*, 1990, Wade *et al.*, 2002). The plume that formed at the sediment caused behavioural reactions such as irritation and escape activities. This indicates that suspended particles in drilling fluids may contribute substantially to their toxicity. The results of the investigation on fish mortality was in agreement with findings from authors such as (Hart *et al.*, 2007;2008,Vincent and Sikoki, 2006). Mortality increased progressively with increase in concentration of oil – based mud over time of exposure, which was in line with previous findings (OGP, 2004).

CONCLUSION

In conclusion, coupled with absence of mortality of fish in the controls indicate that the drilling fluid was responsible for the mortality of fish in respective tanks. The result from these studies showed that the drilling fluid (OBM) cannot be described as having 'low toxicity and being environmentally friendly' as suggested by the producers.

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Table 1. Mean and Standard Deviation of physico-chemical parameters of the test media for *Periophthalmus papilio*.

Conc. (%)	pH	DO(mg/L)	Temp (°c)	Salinity(mg/L)	Alkalinity(mg/L)	Conductivity(μohms)
Control	6.99±7.06E-02	5.38 ± 0.10	28.17± 0.37	16.74 ± 0.16	99.84 ± 0.67	25897± 507
2%	6.97±6.62E-02	5.22 ±0.17	27.72± 0.29	16.66 ± 0.14	99.13 ± 1.46	25317 ± 908
4%	6.89±6.80E-02	5.14 ± 0.18	27.54± 0.34	16.58 ± 0.13	98.86 ± 1.87	24283 ± 918
8%	6.82±8.35E-02	4.73 ± 0.41	27.27± 0.24	16.43 ± 0.14	97.92 ± 2.33	23915± 1195
10%	6.78±8.26E-02	4.37 ± 0.38	27.11± 0.18	16.03 ± 0.29	96.50 ± 2.28	23425 ± 1410

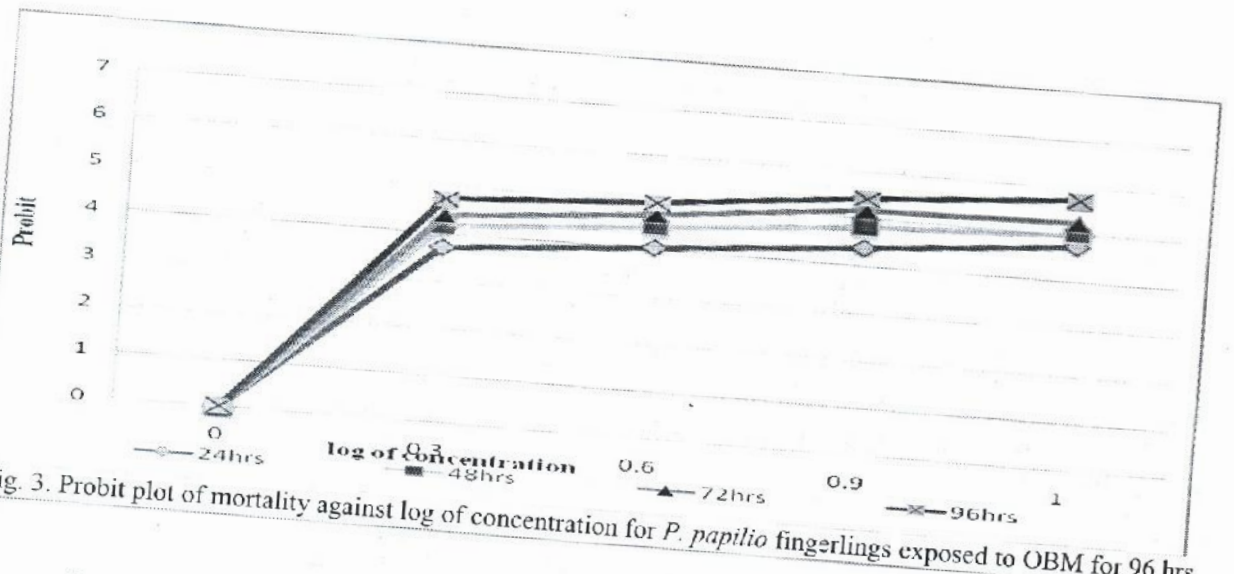


Fig. 3. Probit plot of mortality against log of concentration for *P. papilio* fingerlings exposed to OBM for 96 hrs.

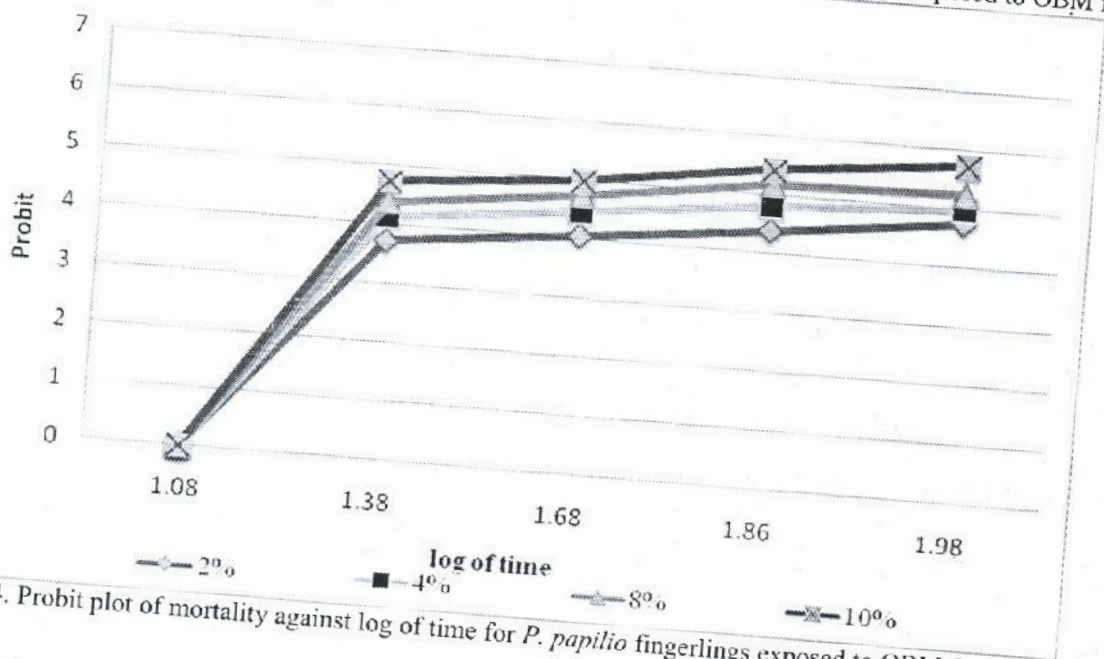


Fig. 4. Probit plot of mortality against log of time for *P. papilio* fingerlings exposed to OBM for 96 hrs.