

Growth effects and erythrocyte nuclear abnormalities in juvenile *Oreochromis niloticus* experimentally exposed to crude oil

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Crude oil contains genotoxic and carcinogenic substances that can bring about hazardous effects on organisms at different levels. The objectives of the present study were to investigate long term effects on growth of juvenile *Oreochromis niloticus* fish exposed to crude oil under laboratory conditions, and to test whether the exposure to crude oil educe any signs of genotoxicity in the fish, using erythrocyte nuclear abnormalities (ENA) as biomarkers. Three experimental groups in triplicate were maintained over 90 day period as freshwater control (N), 5ppm crude oil (T1) in water (V/V%), and 25ppm crude oil (T2) in water, with addition of 35 live fish into each tank under semi-static exposure conditions. Fish were sampled (n=20 per tank) at 18 day intervals for growth estimation. Giemsa-stained smears of peripheral blood and cephalic kidney from each fish (n=6 per group) were prepared on completion of 90 days, and occurrence of abnormal cells under four different categories (micronuclei, nuclear buds, fragmented apoptotic nuclei and altered nuclei) was examined. The results revealed that growth rates in weight and length, and specific growth rates over 90 day period were significantly lower in both crude oil exposed groups than in the control group ($p < 0.05$), indicating a significant growth retardation upon exposure to crude oil. When compared with control group, there was a significant increase in the frequency (per 1000 cells) of erythrocyte nuclear abnormalities in fish exposed to 5 ppm (T1) and 25 ppm (T2) of crude oil. There was a significantly higher frequency of all ENA types in T2 group compared to T1 group as well. The comparison of the different ENA types between the peripheral blood and cephalic kidney within each experimental group showed significantly higher induction of all ENA types except altered nuclei (AN) in the cephalic kidney in the crude oil exposed groups. In conclusion, exposure to crude oil caused significant growth retardation and higher induction of ENA in juvenile *O. niloticus*.

Key words: crude oil exposure, Erythrocyte nuclear abnormalities, growth impairment

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