Title: Behavioural and Some Physiological Assessment of Glyphosate and Paraquat Toxicity to Juveniles of African Catfish, Clarias gariepinus
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Byline: Ayanda Opeyemi Isaac, Oniye Sonnie Joshua and Auta Jehu ABSTRACT The impact of acute exposure of Clarias gariepinus juveniles to commonly used herbicides, glyphosate and paraquat was evaluated through changes in fish behaviour and mortality. Juveniles of the African catfish were exposed to varying acute concentrations of glyphosate and paraquat. The fishes responded, exhibiting different behavioural abnormalities like hyperactivity, abnormal swimming, restlessness, loss of equilibrum and haemorrhage. Observation of opercular ventilation count (OVC), tail fin movemant rate (TMR) and air gulping index (AGI) showed a marked difference between control and exposed fishes, indicating that the herbicides negatively impact on these parameters. These behavioural and morphological anomalies became more pronounced with increasing concentrations of the herbicides. Mortality was also observed to be concentration dependent. After 96 h of exposure, the 96hr LC50 for paraquat was found to be 0.07mg/L while that of glyphosate was found to be 0.530mg/L. The result revealed that glyphosate and paraquat have the ability to induce unusual behaviours in fish and can therefore serve as reliable indicators of toxicity in environmental impact assessment programmes. Key words Glyphosate, Paraquat, OVC, TMR, AGI. INTRODUCTION Freshwater contamination with a wide range of pollutants has become a matter of urgent concern over the last few decades (Al-Weher, 2008). There is increasing awareness of the potential hazards that exist due to the contamination of freshwater, especially toxic chemicals associated with mining, industrial and agricultural practices (Corbett, 1977; Du Preez et al., 2003). Run-off of herbicides from agricultural lands into natural water bodies have become a worldwide phenomenon. Due to the different pollutants entering the aquatic ecosystems, the organisms there are subjected to environmental stresses which may be deleterious to them, to a population or to a community and eventually causing an alteration in the structure of natural ecosystems (Imoobe and Adeyinka, 2010). The quality of fish food is inexorably linked to the health of fish which itself is dependent on the level of pollutants in the aquatic environment (Verma et al., 1981). Glyphosate is a non-selective post-emergence herbicide that is commonly applied in agriculture and forestry for the control or destruction of herbaceous plants in fish-ponds, lakes, canals, slow running water, etc. This herbicide due to the changes of metabolic, oxidative and haematological parameters, may alter the ecological balance causing damage to non-target organisms (Neskovic et al., 1996). Paraquat (1,1-dimethyl-4,4-bipyridininum ion) is one of the most common contact and non-selective herbicide for exterminating vegetative pests, is used for controlling terrestrial weeds and aquatic plants in different countries and its presence is reported in many water sources of the world (Filizadeh, 2002; Ye et al., 2002; Gao et al., 2010; Ismail et al., 2011). Indices for measuring stressed conditions in fish include physiological, morphological, behavioural, serum parameters, histopathology, genotoxicity, cytotoxicity among others. Behavioural responses are very important indicators in the natural and/or external environment of animals. It is first visible sign of stress noticed in an organism. It is a promising tool in ecotoxicology. Behavioural and morphological changes in fish have been...

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