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EFFECTS OF PESTICIDE (CHLORPYRIFOS ETHYL) ON THE FINGERLINGS OF CATFISH (*CLARIAS GARIEPINUS*)

G. N. WOKE AND I. P. ALELEYE-WOKOMA

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ABSTRACT

Acute toxicity bioassay of the organophosphate pesticide chlorpyrifos ethyl on the fingerlings of *Clarias gariepinus* was evaluated to determine its effect on the survival, body morphology and the lethal concentration (LC_{50}). Following a preliminary bioassay in mg/l concentration which showed 100% mortality, fish were exposed to three replicate serial concentrations of 0.5, 1.0, 2.0 and 4.0 μg/l for 96 h. As soon as fish were transferred to the toxicant there was corresponding abnormal behaviour, characterized by restlessness uncoordinated swimming, loss of equilibrium, increase in opercula beats and air gulping, indicating respiratory stress. The effect of the toxicant is concentration and time dependent. The lethal concentrations (LC_{50}) of chlorpyrifos ethyl on the fingerlings of Clarias gariepinus for 24,72 and 96 hr were 2.0,1.0 and 0.5 μ/l respectively. Toxicant exposed fish also showed pinkish coloration at the caudal peduncle (tail region) and the operculum indicating of haemorrhage or damage to the tissue, resulting from respiratory stress. In conclusion, fish farmers are advised to take adequate precaution to prevent excessive use of organic pesticides such as chlorpyri for ethyl because of the possible loss to fish production.

KEYWORDS: presticides, Chlorpyrifos ethyl acute toxicity bioasscuy. *Clarias*. *gariepinus*, LC_{50},

INTRODUCTION

Chlorpyrifos ethyl is an organophosphate insecticide which is very toxic to freshwater fish as well as estuarine and marine organisms (Caroline, 1995). Chlorpyrifos ethyl is known to the directly toxic to the nervous system and it is transformed inside animals to chlorpyrifos-oxon and 3,5,6- trichloro 2pyridinol (TCP), both of which are more toxic to the nervous system than chlorpyrifos ethyl itself (Chambers *et al,* 1989). Aquatic pollution of pesticides results from atmospheric deposit and or run off from agricultural land during rainfall. Some pesticides are employed to kill pests and insect vectors.

The mode of action of chlorpyrifos ethyl and their metabolites is the inhibition of the enzyme acetyl cholinesterase (AchE). Chlorip ethyl is more persistent than other organophorous pesticides because of its lipophilic character (Chambers *et al,* 1993).

The active site of the enzyme reacts with acetyl-chlorine and hence chlorpyrifos ethyl pholphorylates the enzyme.

Fish occupies a tertiary position in aquatic ecosystem. Therefore it is important in food chain on which humans are also dependent. Chlorpyrifos ethyl impacted fish therefore poses danger to human health (Essiet, 1980). The purpose of this study was to the determine the toxic concentration of Chlorpyrifos ethyl in an aquatic ecosystem on the fingerling of C. gariepinus which would endanger human life.

MATERIALS AND METHODS

Two hundred fingerlings of *Clarias gariepinus* were obtained in plastic containers containing water at 27^{O}C from a local farm near the University of Port Harcourt. They were taken to the laboratory and acclimated in trough (62x37x14) cm containing 4 liters of water at 27±0.5^{O}C and aerated with an air pump (RV 1600). The pH was standardized with a pH meter (Jenway 3015 model) by placing it into a beaker containing distilled water and with stirring using two buffer solutions (pH 7and 9) before the electrode was immersed in the test sample. Thus pH was recorded as pH of the sample feeding was stopped two days before the experiment.

Pesticide Used:

Chlorpyrifos-ethyl was bought form Betram Agrochemicals, Port Harcourt. It is a product of chimac Agriphar B-402 Ougree-Belgium (EC 400). *Four hundred. This sentence is incomplete gram of chlorpyrifos per litre* was pipetted and 1ml liquor was added to a beaker containing 399ml of distilled water to contain 1gm/1 solution A. further dilution was made to get 1000 μ g/1 as solution B.

Following a preliminary bioassay in mg/1 which showed 100% mortality, three replicate serial bioassays were made in a volume of 2litres in 0.5, 1.0, 2.0, and 4.0 μ/1 and control with no toxicant. A total of 10 fingerlings were transferred into each experimental dish and covered with a net to prevent fish form jumping out. The experiment was left at room temperature for 96 hrs. observation and recording of results were made during this period. Fish were considered dead if they failed to respond to light producing and were immediately removed.

RESULTS

As soon as fish were transferred into the solution of toxicant there was an immediate abnormal behaviour, characterized by restlessness, muscle spasm

G. N. Woke, Department of Animal and Environmental Biology, University of Port Harcourt, Port-Harcourt, Nigeria
I. P. Aleleye-Wokoma, Department of Animal and Environmental Biology, University of Port Harcourt, Port-Harcourt, Nigeria

and body torsion, coughing with bubbles coming out of their mouth, followed by increase in the opercula beats with correlated with the concentration of toxicant.

The experimental bowls containing 2.0 and 4.0 μ/1 turned pinkish indicating haemorrhage from skin and gill damages.

The Lethal Concentration (LC_{50}) of chlorpyrifos ethyl on the fingerlings of *Clarais*. *gariepinus* for 24,72 and 96 hr were 2.0 μ/1 1.0 1 μ g/1 and 0.5 μ g/1 respectively.

This showed that the acute toxicity is concentration and time dependent. A lower concentration but with prolonged exposure resulted in similar toxic effect as the higher concentration.

DISCUSSION

This study provides the evidence that exposure of *clarias gariepinus* to chlorpyrifos ethyl results in a sharp mortality rate after a series of abnormal behaviour such as extreme restlessness and increase in opercula beats. The pattern of toxicity as shown by Chlorpyrifos ethyl had been noted by previous investigators (Chambers *et al,.* 1993), Caroline, 1995, Ogueji *et al,* 2007).

It had been shown that gill damage is one of the adverse effects of toxicity of pesticides to fishes (Avoagi *et al* 1997). However, the toxicant may even react with the oxygen in the water, thus depleting the oxygen content and producing hypoxia which could result in excessive opercula beat. Also, in natural habitats of fishes where pesticides are discharged, dilution may reduce the concentration of the effluent, depending on the amount of the effluent that is routinely discharged and the volume of the receiving water body. This implies that toxicity of pesticides concentration in nature could be less than what is obtainable in the laboratory (Hudson *et a.,* 1984).

Form this study the LC_{50} showed that if a greater time interval were considered, the lethal concentration (LC_{50}) would decrease. It also shown that the longer the time, the less the $LC_{50.}$ It was shown that the safe level of chlorpyrifos ethyl (organophosporus) is high, as compared to organochlorine which destroys the life of aquatic organisms in contact because of its extreme toxicity, high persistence and bioaccumulation power. Whereas, organphosphorus is less persistent, its concentration is moderately toxic and in a more diluted form when is use (Wildish *et al,* 1991).

Exposure of *Clarias gariepinus* to chlorpyrifos ethyl chronically leads to the death of the fishes. (Bayers *at al.,* 1996)

The study also revealed that pesticides are environmentally active, therefore users should exercise restraint especially, in croplands or where intensive irrigation is practised. Hence it is recommended that the level of these toxicants should not exceed 10% of their 96 hours $LC_{50.}$ This 10% corresponds to the maximum allowable toxicant concentration (APHA, 1998). This is very necessary because active and chronic exposure not only affects fecundity of fishes, but also their growth as well as palatability.

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