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ACUTE TOXICITY OF ORIZO-PLUS TO THE WATER FLEA, MOINA SP

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ABSTRACT

A test was carried out to determine the acute toxicity of Orizo-plus to Moina exposed for 48 hours in concentrations of 0.0mg/l, 0.25mg/l, 0.56mg/l, 0.84mg/l, 1.40mg/l, and 1.68mg/l. The 48-hour LC_{50} determined was $3.11x10^{3}$mg/l with upper and lower confident limits $5.01x10^{3}$mg/l and $1.93x10^{3}$mg/l respectively. Mortality of Moina was directly proportional to increase in concentration of Orizo-plus. There was no mortality in the control. The abnormal behaviours observed were agitation, erratic swimming, loss of equilibrium and death. There were significant differences ($p<0.05$) in water quality parameters.

Key Words: Acute toxicity; Orizo-plus; *Moina*.

INTRODUCTION

The increase in the use of agriculture chemicals has resulted to increase in the discharge of a variety of toxic compounds to receiving water bodies and has caused undesirable effects on the different components of the aquatic environment and on fisheries (Manson,1993). Herbicides and pesticides are routinely utilized in farming to protect crops from weeds, insects and disease. Agricultural activities such as fertilizer, insecticide, herbicide, and pesticide applications have introduced pollutants in rivers and drainage systems causing problems to aquatic life (Khallaf, *et al* 1998). Weeds often compete with plants for nutrients water, and space. They are of concern to the society due to their toxicity to non-target organisms (Akhtar, 1988). In toxicity, the lethal concentration, $LC_{50,}$ is the concentration required to kill half the members of a tested population after a specified test duration. The LC_{50} figures are used as a general indicator of a substance acute toxicity (Walum, 1998.). *Moina* occur in high concentrations in pools, lakes, ponds, ditches, slow moving streams and swamps where organic material is decomposing. It has the ability to survive in waters containing low oxygen; resistant to changes in the oxygen concentrations and often reproduce in large water quantities in water bodies strongly polluted with sewage. Moina is a very important live food in aquaculture; it has higher protein content than daphnia and is ideally suited for feeding fresh water fish fry (Rottman, 2000).

Orizo-plus is a selective broad-spectrum herbicide for weed control, mostly in rice farm. It acts by both contact and systemic action. It is a mixture 360g of propanil (3,3 dichloropionilide) and 200g of 2,4-D amine (2,4-D-dichlorophynoxy acetic acid) to control broad leaved *Phyllantus niruri, Jussiaca linifoli, Cassia tora* etc. The concentrations at which most herbicides and pesticides are detected in the aquatic system are rarely high enough to bring about acute toxicity. The sub-lethal concentrations that prevail in such water bodies cause adverse biological effect manifesting physiological, biochemical, anatomical or behavioural changes in the exposed organisms (target and non-target). Therefore, for environmental and ecological management, knowledge of the harmful effect associated with various concentrations of a variety of herbicides and chemical substance is very important (Poulsen, *et al* 1982). Due to increase in

the use of Orizo-plus on farms, there is need to have information on its effects on aquatic life. This work was carried out to determine the acute toxicity of Orizo-plus to moina.

MATERIALS AND METHODS

The herbicide, Orizo-plus. was obtained from a retail shop, while the test organisms (*Moina sp*) were obtained in a fish pond from the fish farm at Federal University of Agriculture, Makurdi. The test organisms were acclimatized for 24 hours without feeding. The test system consisted of five (5) different concentrations of the herbicideT_0 (control), T_1 (0.28mg/l), T_2 (0.56mg/l), T_3 (0.84mg/l), T_4 (1.40mg/l) and T_5 (1.68mg/l), all with replicates. Twenty (20) Moina were introduced into test beakers containing 400ml of water in a static exposure for 48hours without water change. The test parameters were mortality and behavioural change. The herbicide was then introduced into the beakers already containing the test organism and the experiment lasted for 24 hours. Some of the water quality parameters monitored include; temperature, dissolved oxygen (DO_2), conductivity, $_p$H, Total dissolved solids (TDS) and water hardness using a multiparameter water checker. Data was analyzed using a one-way analysis of variance (ANOVA) with the aid of computer software. GenStat Discovery Edition and Ministate 14 was used for descriptive statistics.

RESULTS

The 48 hr (LC_{50}) after exposure was determined to be $3.11x10^3$mg/l with upper and lower confident limits $5.01x10^3$mg/l and $1.93x10^3$mg/l respectively. Mortality increased with increase in concentrations of the herbicide. No mortality was observed in the control (Table 1). Other observed responses were erratic swimming, clustering at water surface, resting at the bottom of beaker and, ultimately, death. There was significant difference ($p<0.05$) in the physico-chemical water parameters of the exposures based on herbicide concentrations (Table 2).

Table 1: Mortality of Moina against concentration of Orizo plus for 48hrs

Treatment and replicates	Concentrations (mg/l)	Total mortality	Mortality (%)
1	0.0007	7/40	17.5
2	0.0014	13/40	32.5
3	0.0021	14/40	35.0
4	0.0035	20/40	50.0
5	0.0042	25/40	62.5

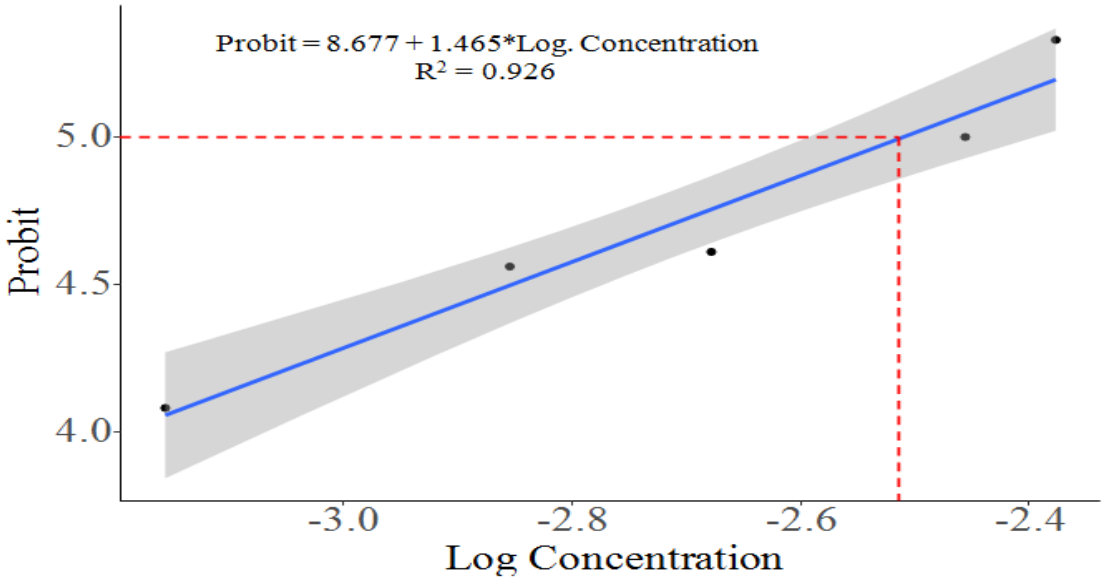

Figure 1: Probit curve of mortality of Moina exposed to acute concentrations of Orizo-plus

Table 2: Mean Water Quality Parameter of the Exposure Water.

Treatments	Temperature (^{O}C)	DO (mg/l)	Conductivity	P^{H}	Total dissolved solids (TDS)	Water hardness (mg/l)
1	24.95±0.05	5.55±0.05	86.00±0.0^{d}	6.30±0.00^{c}	45.80±0.00	45.40±0.00^{c}
2	24.95±0.05	5.55±0.05	86.25±0.2^{d}	6.30±0.00^{c}	46.00±0.00	45.40±0.00^{C}
3	24.95±0.05	5.10±0.10	88.00±0.0^{c}	6.65±0.15^{b}	46.50±0.00	46.00±0.00^{b}
4	24.80±0.02	5.00±0.00	88.75±0.2^{b}	7.00±0.00^{a}	46.50±000	46.25±0.25^{ab}
5	24.80±002	5.20±0.40	89.50±0.0^{a}	7.50±0.00^{a}	46.80±0.00	46.50±0.00^{a}

Table 2: Means in the same column with different superscript differ significantly (p<0.05)

DISCUSSION

The rapid movement of Moina exposed to Orizo-plus at the initial stage could be as a result of its sensitivity to the herbicide. The absence of mortality in the control indicates that the experimental water was good enough for the test organisms. The level of mortality distributed among the treatments indicates increasing mortality at increased concentrations of the herbicide. This is in agreement with the works of Rajendra and Venugopolan (1989) and Umar, (2010) who also reported that herbicides have an adverse effect on *Moina* and mortality increase was directly proportional to increase in concentration of the herbicide

CONCLUSION

Result obtained indicates that the herbicide orizo-plus was harmful to moina with 48 hr (LC_{50}) of $3.11x10^{3}$mg/l. Understanding and managing aquatic live food for fisheries and aquaculture effectively requires effective collaboration and communication across disciplines and research projects. Regulations should be made or re-enforced to guard against indiscriminate discharge of herbicides that would lead to the destruction of live food in the aquatic environment or render them unfit for consumption by other organisms.

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