

PROCEEDINGS
of the
27TH ANNUAL CONFERENCE
BIENNIAL GENERAL MEETING
OF THE FISHERIES SOCIETY OF NIGERIA

HELD AT:
BANQUET HALL GOVERNMENT HOUSE/FACULTY OF LAW,
NIGER DELTA UNIVERSITY BAYELSA STATE
25th-30th NOVEMBER 2012



Tagged
BAYELSA 2012

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EDITORIAL COMMENT

All Glory to the Alpha and Omega, the Mighty God of all creation. The Fisheries Society of Nigeria (FISON) 27th Annual Conference and Biennial General Meeting, tagged "Bayelsa 2012" was a success. All due to selfless contributions of many committed members, participants from far and near, the doggedness of the National and State Executives along with the untiring efforts of the local organising committee under the Chairmanship of Dr. M.E. Allison. It is worthy of note to appreciate the general public and special people who are passionate about the Fisheries profession. We appreciate the Secretary to the Bayelsa State Government Prof. Edmund Allison-Ogunu who is a Fisheries biased Agric.-Economist. The Vice-Chancellors of Niger Delta University and Federal University, Otuoke, The Rector, Federal Polytechnic, Ekowe, The Deans of the Faculty of Agricultural Technology and the Faculty of Law in the Niger Delta University, all these people used their personal and official capacity to support the success of the FISON Conference in Bayelsa State. The Key note address titled "Development of Aquaculture Value Chain: A Veritable Vehicle for Self Sufficiency in Fish production and A Strategic Foreign Exchange Earner" was brilliantly delivered by Dr. O.A. Ayinla. This address dwelt on the Transformation Agenda of the Federal Government emphasizing value chain which is basically getting Agricultural products to consumers in best packaged quality and ensuring it positively impact farmers profit and livelihood.

The papers were presented in 4 sections namely 1. Aquaculture, 2. Capture Fisheries, Gear Technology and Fish Processing Technology, 3. Fish Biology and Pathology and 4. Fisheries Management, Economics, ICT and Marketing. These sections were chaired by experienced eminent Scholars in the field of Fisheries. The various papers presented brought out the enthusiasm to share information by the authors and display of professionalism which has remained the passion towards best practices. Researchers, Farmers and Academia had opportunity to bring out information and current findings for the Development of the fisheries profession. I came to realise the labours of the founding fathers of the society in holding the forth for up coming Fisheries professionals. I pray they reap the fruits of their labours and the Society to continue to grow strong to fulfil its great potentials.

The compilation of the Proceedings was quite an experience with the advancement in information technology many papers were beautifully written and were good publishing materials, I implore authors to go the extra mile in adhering strictly to the instructions for the paper submissions in future conferences because this will go a long way in aiding early production of the proceedings.

God Bless Fisheries Society of Nigeria
God Bless our Dear Country NIGERIA

Dr. (Mrs.) A.O. Adeyemo
Chairman: Conference Editorial Committee

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ACUTE TOXICITY OF 2, 3-DICHLOROVINYL DIMETHYL PHOSPHATE (SNIPER 1000EC) AND RESPONSE OF *Clarias gariepinus* BURCHELL UNDER LABORATORY CONDITIONS

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ABSTRACT

The study investigated the acute toxicity of 2, 3-dichlorovinyl dimethyl phosphate (Sniper 1000EC) on the African mud catfish, *Clarias gariepinus* juveniles (mean weight 19.47±1.05g) using static bioassay method. Sniper 1000EC is an organophosphate pesticide. Each treatment in the acute test was in triplicate with bioassay media concentration of 0, 5, 10, 15 and 20 mg/l. Data on mortalities of fish, water physico-chemical parameters as well as changes in haematological indices were subjected to one way analysis of variance (ANOVA) at 5% probability level. Duncan multiple range test was used to separate differences between the means. The 96hr LC₅₀ estimated by probit analysis during the exposure was found to be 8.20mg/l. Behavioural abnormalities of the exposed fish included erratic and uncoordinated swimming and bleached skin with lesion at the highest concentration (20mg/l). Blood dyscrasias attributable to the toxicant was observed with a significant ($p<0.05$) decrease in haemoglobin, haematocrit, red blood cells, white blood cells, lymphocytes and monocytes. Mean corpuscular volume (MCV), Mean corpuscular haemoglobin (MCH), neutrophils, eosinophil and basophil increased significantly ($p<0.05$) with increasing concentrations of the toxicant. These abnormalities in body and blood parameters as a result of exposure to the toxicant make the study to recommend that the use of Sniper 1000EC by local fishermen be banned to preserve aquatic lives in Nigerian inland water bodies.

Keywords: Sniper 1000EC, *Clarias gariepinus*, toxicity, haematological indices

INTRODUCTION

Fish is becoming increasingly important in the diet of man worldwide because of its availability, palatability and health provision (Fawole *et al.* 2007). Fish flesh is the best source of animal protein due to the low level of connective tissue that makes it more digestible than other animal protein and it is a better source of vitamins and minerals than meat (Al-Jedah *et al.* 1999). Not only this, fish is a heavily traded food commodity and fastest growing agricultural commodity in international markets. Thus, commercially valuable species are now over-fished and even smaller species are being captured daily using obnoxious methods in many instances (Personal communication). In Nigeria, local fishermen use pesticides for catching fishes especially in the inland water bodies. These pesticides contain poisonous substances (toxins) that distort the water quality and impose physiological stress on biotic community (Asanye *et al.* 2007). Pesticides especially the chlorinated non-degradable ones leave residues in various living systems that can pollute the water bodies with grave consequences on both terrestrial and aquatic lives. Sniper 1000EC (2, 3-dichlorovinyl dimethyl phosphate) is a contact acting and fumigant insecticide which is commonly used by some local fishermen in Niger state to catch fish. The effects of toxicants on fish are evaluated by acute and chronic toxicity tests which eventually lead to death (Sprague, 1973). However, some physiological and biochemical processes are affected long before death of an organism results. Haematological indices which have been reported to be a routine procedure in toxicological research and fish health need be assessed to adequately appraise the effect of toxicant on fish (Blaxhall, 1972; Smit *et al.*, 1979). Also, Sampath *et al.* (1993) observed that studies on fish blood could reveal conditions within the body of the fish long before an outward manifestation of disease conditions. Therefore, this study was conducted to investigate the acute toxicity of Sniper 1000EC on *Clarias gariepinus* (a popular species because of the price it commands) under laboratory conditions. This becomes necessary to secure additional information on the use of the pesticide and to appropriately advise the fishers folks in inland fisheries.

MATERIALS AND METHODS

Juveniles of *C. gariepinus* (mean weight 19.47±1.05g) were procured from a reputable fish farm in Minna, Niger State. They were transported to the laboratory in 100L capacity plastic bowl filled with pond water and held in a large water bath of 160L capacity for acclimation for 14 days. They were not fed in the first two days of acclimation after which they were fed 3% of the body weight in subsequent days. The water in the bath was replenished with dechlorinated municipal tap water and uneaten food and faecal matter were siphoned out. A total mortality of 2% was recorded during acclimation. Feeding of fish was stopped 24hrs before exposure to acute toxicity bioassay media. The Sniper 1000EC was obtained from Minna Central Market and used to prepare four concentrations (5, 10, 15 and 20mg/l) and a control of 0mg/l was maintained. The volume of each test fish were put in each aquarium for the acute bioassay test which lasted for 96hrs.

Dechlorinated tap water from storage tank was used and these parameters: temperature, dissolved oxygen, pH and conductivity were monitored in each aquarium with the aid of portable water quality analysis kit. The fish were not fed during the toxicity experiment. Behavioural responses of the fish to the toxicant at different concentrations were monitored daily according to the methods of Ross and Ross (1999). Mortality response was taken to be when the fish became motionless or no opercula movement at the bottom of each aquarium and no response to gentle prodding at time intervals 2, 4, 8, 24, 48, 72 and 96 hours. The lethal concentration that caused 50% mortality (LC_{50}) was estimated by probit analysis as described by Wardlaw (1985). After the expiration of the experiment, blood was collected from three survived fish in triplicate (from exposed and control group) by cardiac puncture with the aid of hypodermic needle and syringe (2ml). The blood was put into EDTA vials and taken to Medical diagnostic laboratory in Minna for analysis using methods described by Blaxhall and Daisley (1973). The haematological parameters analysed were Haemoglobin (Hb), packed cell volume (PCV), red blood cell (RBC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), white blood cells (WBC) and its differential counts. The values of each treatment concentration were subjected to statistical analysis using one way analysis of variance (ANOVA) at 5% level of probability.

RESULTS AND DISCUSSION

The acute toxicity test showed that all fish in control medium survived while mortalities were observed in all other treatments. The mean mortality rates increased with duration of exposure as shown in Table 1 which ranged between 100% in 20mg/l and the 10% in 5mg/l treatment. The probit mortality curve shown in Figure 1 was subjected to linear regression given an equation $Y = 7.582x - 1.929$ to yield the 96hr LC_{50} value of Sniper 1000EC as 8.20mg/l. The mortality increased with increasing concentration of the toxicant in water showed a dose-response relation which has been reported by many authors including Musa and Omoregie (1999), Omoniyi *et al.* (2002), and Omoregie *et al.* (2009). The safe level of 0.82g/l was however higher than the reported safe level by Omoregie *et al.* (1990). This implies that Sniper 1000EC is highly lethal to fish. Mucus was observed on the gills of the moribund fish which might be responsible for the mortality recorded in this study. Konar (1970) reported that accumulation of mucus on gills reduces respiratory activity because of the inability of gill surfaces to actively carry out gaseous exchange, thus the recorded mortalities. The result of water quality of the media were within the optimal range recorded by Omoniyi *et al.* (2002) as requirements for *C. gariepinus* culture which implied that the parameters did not seem to influence the toxicity of the pesticide to the test fish. Mortality of 2% during acclimation must have been due to stress at handling and transportation. The fish exhibited stressful behaviours such as calmness, air gulping, erratic and spiral movement and opercula ventilation in the bioassay media. The frequency of jumping and other behavioural changes were noticed to be high as the concentration of toxicant increased (Table 2). There was a gradual decrease with time until a state of calmness, which was subsequently followed by death. A similar pattern of behaviour was reported by Fafioye *et al.* (2001) on *C. gariepinus* and Rahman *et al.* (2002) on *C. punctatus*. These observed restlessness and uncoordinated jumping and swimming in bioassay media might be due to the effect of trichlorfon which is a stimulant in the pesticide. This observation might be attributed to trichlorfon which could bind on to acetylcholine receptors in the nervous system thus causing the excitation and the resultant jumping and restlessness. Bleached body with lesions in high concentration was the only external changes observed in the test fish. The lesions were indicative of damage caused by the toxicant. Balathakur and Bais (2000) reported that skin abnormalities such as lesions could expose the fish flesh to various other diseases. Fafioye *et al.* (2001) made a similar observation. Table 3 presents blood dyscrasias attributable to Sniper 1000EC poisoning in *C. gariepinus* on 96hrs exposure. The results indicated a consistent reduction in the values of Hb, PCV, RBC, WBC, lymphocytes and monocytes while the values of MCV, MCH, neutrophils, eosinophils and basophils increased significantly ($p < 0.05$) as the toxicant concentration increased. There was no significant ($p > 0.05$) difference in the values of MCHC. The reduction in these blood parameters was an indication of anaemia caused by this toxicant as the concentration increased. The anaemic exposure could be as a result of destruction of RBC or inhibition of RBC production (Wintrobe, 1978) or haemodilution as reported by Sampath *et al.* (1993). Joshi *et al.* (2002) made a similar observation on blood parameters of *C. batrachus* exposed to Lindane and Malathion which are pesticides. The increased mean corpuscular volumes and changes in neutrophils, eosinophils and basophils indicated stress condition in the fish and similar reports have been made by several authors including Johansson-Sjöbeck *et al.* (1978) and Anyanwu *et al.* (2007).

CONCLUSION

The mortalities, abnormalities in behaviour and haematological parameters of *C. gariepinus* as a result of exposure to the pesticide under laboratory conditions make the study to recommend that the use of Sniper 1000EC by local fishers folks be banned to preserve aquatic lives in Nigerian inland water bodies. This pesticide is highly poisonous to fish and its public awareness should be enhanced in the country.

Table 1. Mean of mortalities of *Clarias gariepinus* exposed to different concentrations of Sniper 1000EC for 96 hours.

Conc.(mg/L)	Mean mortality%				Total mean mortality	Percentage mortality
	24	48	72	96		
0.0	0 ^a	0 ^a	0 ^a	0 ^a	0 ^a	00
3.0	0 ^a	0 ^a	1.0 ^b	0 ^a	1.0 ^b	10
10.0	2.0 ^b	2.0 ^b	2.0 ^b	0 ^a	6.0 ^b	60
15.0	1.0 ^b	1.0 ^b	1.0 ^b	1.0 ^b	9.0 ^b	90
20.0	1.0 ^b	1.0 ^b	2.0 ^b	2.0 ^b	10.0 ^b	100

Values with the same superscript along the column are not significantly ($p>0.05$) different.

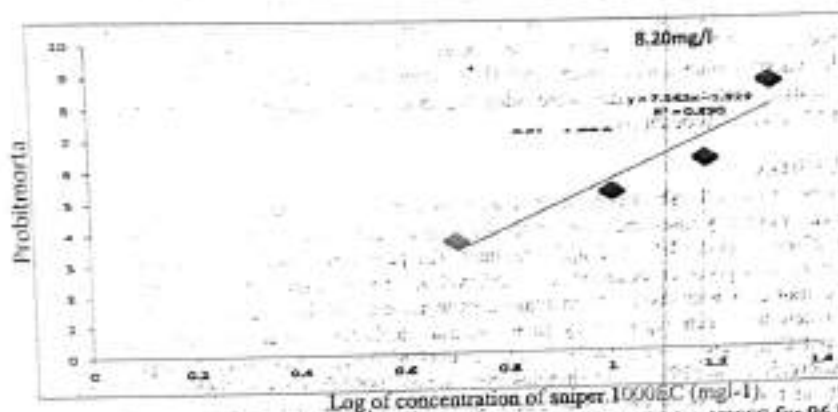


Figure 1. Probit mortality curve of *Clarias gariepinus* exposed to different concentrations of Sniper 1000EC for 96 hours.

Table 2. Behavioural changes of *Clarias gariepinus* exposed to Sniper 1000EC at different concentrations (mg/L) level.

Conc	Cal	Exc	Ag-S	L-Eq	G-air	Operculum Vent. Fast	Static	SL	Tail fin movt. Fast	Static	SL	Death
20.00mg	-	+	+	+	+	+	-	-	+	+	-	10
15.00mg	-	+	+	+	+	+	-	-	+	+	-	9
10.00mg	-	+	+	+	+	+	-	-	+	+	-	6
5.00mg	-	+	+	+	+	+	-	-	+	+	-	1
Control	-	-	-	-	-	-	-	-	-	-	-	0

Cal - Calmness; Exc - Excitement; Ag-S - Agitated Swimming; L-Eq - Loss of Equilibrium; G-air - Gulping of air; SL - Slow; Sta - Static; Death - Presence; - - Absence.

Table 3. Haematological Parameters of *Clarias gariepinus* exposed to acute concentrations of sniper 1000EC (mean $\pm$ SD).

Concentration(mg/L)	Control	5.00	10.00	15.00
Hb(g/dL)	15.1($\pm$ 0.67) ^a	14.9($\pm$ 0.62) ^a	14.5($\pm$ 0.30) ^a	12.9($\pm$ 0.56) ^b
PCV (%)	45.2($\pm$ 2.06) ^a	44.0($\pm$ 1.85) ^a	44.0($\pm$ 1.88) ^a	38.7($\pm$ 0.12) ^b
RBC($\times 10^{12}/L$)	5.7($\pm$ 0.22) ^a	5.4($\pm$ 0.14) ^a	5.2($\pm$ 0.14) ^a	4.1($\pm$ 0.01) ^b
MCV(fL)	81.3($\pm$ 2.94) ^a	83.0($\pm$ 2.20) ^a	84.0($\pm$ 1.41) ^a	94.0($\pm$ 0.31) ^b
MCH(pg)	27.1($\pm$ 0.99) ^a	27.6($\pm$ 0.73) ^a	28.3($\pm$ 0.91) ^a	32.0($\pm$ 0.61) ^b
MCHC(g/dL)	33.4($\pm$ 0.02) ^a	33.3($\pm$ 0.03) ^a	33.34($\pm$ 0.03) ^a	33.29($\pm$ 0.00) ^a
WBC($\times 10^9/L$)	5668($\pm$ 10.20) ^a	5412($\pm$ 15.09) ^a	5012($\pm$ 6.68) ^a	5000($\pm$ 5.00) ^a
Neutrophils (%)	68.0($\pm$ 1.41) ^a	70.0($\pm$ 1.28) ^a	72.0($\pm$ 2.16) ^a	73.0($\pm$ 1.13) ^a
Lymphocytes (%)	26.0($\pm$ 1.37) ^a	24.0($\pm$ 1.35) ^a	22.0($\pm$ 0.82) ^a	21.0($\pm$ 0.43) ^a
Monocytes (%)	6.0($\pm$ 1.25) ^a	5.0($\pm$ 1.42) ^a	4.0($\pm$ 0.79) ^a	2.0($\pm$ 1.34) ^b
Eosinophils (%)	0.0($\pm$ 0.00) ^a	1.0($\pm$ 0.01) ^a	2.0($\pm$ 2.16) ^a	3.0($\pm$ 0.00) ^a
Basophils (%)	0.0($\pm$ 0.00) ^a	0.0($\pm$ 0.00) ^a	0.0($\pm$ 0.01) ^a	1.0($\pm$ 0.00) ^a

Values of parameters with the same superscripts along the rows are not significantly different at ($p>0.05$).

Hb - Haemoglobin; PCV - Packed cell volume; RBC - Red Blood Cell count; MCV - Mean Corpuscular Volume; MCH - Mean Corpuscular Haemoglobin; MCHC - Mean Corpuscular Haemoglobin Concentration; WBC - White Blood Cell count.

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