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The Growth Response in Fingerlings Of *Oreochromis niloticus* in Chronic Toxicity Test to Galex (Methoxychlor)

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ABSTRACT

Toxicity test of *Oreochromis niloticus* fingerlings of mean weight 5.50g at temperature of 24- 26˚ C was carried out to evaluate effects of galex on growth of the test organisms. Some of the fingerlings having undergone acute toxicity test which gave a LC_{50} of 9.30mg/L and 95% confidence limit of 1.04 and sublethal toxicity being subjected to Toxicant concentrations of 0.00 (control), 0.39mg/L, 0.89mg/L and 1.57mg/L. Fish were fed to satiation once daily and test water constantly changed for health of fish. Water parameters were monitored constantly too. The control fish showed a significant increase in size ($P < 0.05$) which ranged from 6.75g at onset of test and 10.07± 0.30 at the 8th week while fish exposed to different toxicant concentrations showed an insignificant growth pattern.

Keywords: *Growth, O.niloticus, Galex,Acute toxicity,Sublethal toxicity.*

1. INTRODUCTION

It is apparent that growth is a reflection of food availability, consumption and utilization efficiency in an organism's stage of development and maturation, as well as its size, is a critical aspect of an organism's existence and, more significantly, of a population persistence[1] . There are many difficulties that face usage of weight as index of toxicity. These include temporary delay in growth early on in the exposure period but equal size attainment by the end of test [2,3] and example of cyanide . Other difficulties come from chemical- induced growth stimulation and influence of density on the fish surviving the exposure.

Growth, along with its survival, behavioral and physiological changes and tainting of fish were used as quantiable effects in early laboratory toxicity tests with fish. A Maximum Acceptable Toxicant Concentration (MATC) was then developed using their laboratory fish production index as an integrated measure of effect as early as 1960. Some scientists emphasized the necessity of conducts bioassays with the most susceptible life stages of the test organisms. In the course of conducting full and practical life cycle tests with several species and a variety of chemicals, the early developmental stages (such as embryo, larvae and early juvenile) had consistently shown equal or greater sensitivity than the adult life stages (Woltering, 1984)[1].

The objective of this paper is to evaluate the growth response of *O. niloticus* to sublethal toxicity test to galex.

Table 1: Physico-Chemical Parameters of Test Water

	Range	Mean
Temperature (˚ C)	25-26	24 ± 0.77
Dissolved Oxygen (mg/L)	5.8-6.5	5.7 ± 0.42
	5.0- 5.5	4.5 ± 0.83
Conductivity µm/hos/cm	4.0-6.5 × 10^2	5.25 ± 0.83
Hardness (mg/L)	13.0- 16.0	14 ± 1.66
Alkalinity (mg/L)	7.0 – 8.0	7.5 ± 0.77
pH		

2. MATERIALS AND METHODS

Four replicated tanks with appropriate galex concentration of 0.39, 0.89 and 1.57mg/L were set up separately including the control. Ten fish of mean weight of 6.7g ± 0.7 were assigned to each tank randomly. Fish were fed to satiation once daily. A 12/12h photo period was maintained in the laboratory during the test period. Water parameters were monitored weekly and

changing of test solutions was done bi-weekly throughout the test period. Weighing of test organisms was done once in two weeks for a period of 8weeks.
Wet weight gained and percentage cumulative weight gain was worked out at the end of the test.
The artificial diet used for this study consisted of a mixture of groundnut cake, corn meal, fish meal and vitamin premix in the proportion shown in table 2 according to Standard Method. Ingredients were ground finely and mixed together with water. Binder was added and all cooked at low heat for 20minutes. Paste was then spread in the trays and pelletized and dried in the sun. Proximate composition is shown in tables 2 and 3.

Table 2: Proximate composition and mineral concentration of the diet fed to *O. niloticus* in galex test water

Components	Range	%Dry weight
Protein	25.58 – 26.16	25.87 ± 0.47
Lipid	28.8 – 28.9	28.85 ± 0.11
Carbohydrate	38.91 – 40.20	39.56 ± 0.91
Potassium	0.67 – 0.69	0.68 ± 0.04
Sodium	0.21 – 0.23	0.22 ± 0.01

Table 3: Percentage composition by weight of the formulated Diet fed to *O. niloticus* exposed to galex

Constituents	Concentration %
Corn	69
Fish meal	15
Groundnut cake	15
Vitamin Premix	1
Total	100
*Vitamin Premix	
Vitamin A (Retinol)	8000 I .U
Vitamin E (51-Locophenol)	60 I .U
Vitamin D2 (Calciferol)	1000 U. I
Vitamin K (Menadione)	
Thiamine hydrochloride (B2)	4mg
Riboflavin (B2)	8mg
Panto themic acid	12mg
Nictinic acid (niacin)	50mg
Folic acid (Folacin)	10mg
Pyridoxine hydrochloride (B6)	6mg
Choline Chloride	200mg
Cobalamin (B12)	12mg

Vitamin premix was prepared by Lebsure, RHM, Agriculture (South Ltd; Poolo, Dorset, BH 15 111L (Registered office) England

Table 4: Weight gained and % Cumulative weight gain in *O. niloticus* during Sub-lethal exposure to paraquat concentrations for a period of 8weeks

Exposure level (mg/L)	Duration (weeks) 2	4	6	8
0.00	1.75	2.04	4.74	5.07
%	35	40.8	94.8	101.4
0.39	0.24	0.98	1.13	1.31
%	4.8	19.6	22.6	26.2
0 89	0 47	0 9	0 2	-09
%	9.60	17.31	4.0	1.7
1.57	0.66	1.52	1.36	1.55
%	22	50.66	45.33	51.66

The initial mean wet weight of the test fish were 5.0 ± 0.1 (for the control) and 5.0 ± 0.3, 5.2± 0.6 and 5.1 ± 1.3 for the fish exposed to 0.39mg/l, 0.89mg/l and 1.57mg/l of galex in water respectively. Growth was estimated from the sum of the individual wet weight of the fish at 2, 4, 6 and 8 weeks of exposure to the toxicant and expressed as percentage cumulative wet weight gain.

The result showed that the cumulative percentage wet weight gain in the control group increased from 35% to 101.4% at week 8 (Table 4). The growth of fish that were exposed to 0.39, 0.89 and 1.57mg/l increased from 4.8%, 9.0%, and 22% at week 1 to 26.2 %, 1.7% and 51.66 % at week 8 respectively. A statistical difference in growth rate of the treated and control was observed (P< 0.05).

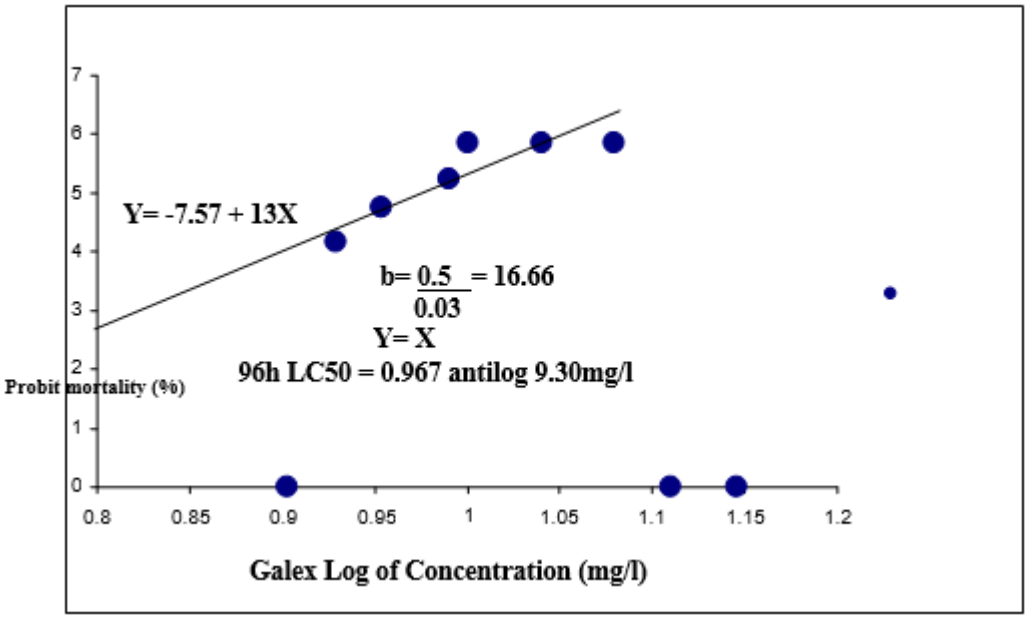

Fig.1 Linear Relationship between Probit Mortality (%) and Log_{10} Concentration (mg/l) of *O. niloticus* Exposed to Various Acute Concentrations of Galex.

3. DISCUSSION

The water quality records for the various treatments and replicates fell within the limits of good water quality for aquaculture as recommended by Boyd and Lichtkoppler [4] and Madu *et. al*.[5]. In this bioassay, cumulative wet weight gain showed that growth rate was reduced with increasing time of exposure and concentration of galex significantly ($P<0.05$) probably due to the reduction of feeding rate at high concentration of galex. There was an abnormal decrease in growth at concentration of 0.89mg/l at weeks 6 and 8 which was not observed in other toxicant concentrations and control.. There was a sudden increase in environmental temperature at those weeks and a fish kill was observed in the toxicant concentration of 0.89mg/l unlike others, showing that temperature is a great factor in toxicant test.
Nwabueze and Agbogidi[6] recorded reduction in weight of *Heterobranchus bidorsalis* with increasing time of exposure and concentration of water soluble fraction of crude oil (WSFS). Ofojekwu and Onah[7] reported that fish are known to increase their metabolic rates to metabolize and excrete aromatic hydrocarbon and consequently allocate more energy to homeostatic maintenance than storage, hence a reduction in growth rate. Similar report in weight depression was made by Ogundele *et. al*.[8] in sub-lethal bioassay of effect of alkyl detergent (LAS) on *Clarias gariepinus* fingerlings.Babatunde *et al*. [9] in the sublethal benzene sulphonate bioassay of growth response of fingerlings *O.niloticus* to paraquat explained that growth was response was significantly reduced due to low feeding rate at high toxicant concentrations as shown by the large quantity of food left in the aquaria. was further explained that the food could probably be odious to the fish since adsorption of the toxicant on food pellets could have taken place.*O.niloticus* fingerlings exposed to metoxychlor recorded low rate of growth in all test toxicants throughout the test period except in the control fish which recorded high growth rate[10]

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