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Effect Of Acute Toxicity of Cypermethrin on Some biochemical Parameters of Juveniles of *Claria Gariepinus*. (Burchell, 1822)

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ABSTRACT: *The experiment was conducted to evaluate the effect acute toxic of cypermethrin, a synthetic pyrethroids on juveniles of Clarias gariepinus. The effect was assessed based on the comparism results of biochemical examinations(Aspartate and alanine transaminase enzymes, glucose, cholesterol, alkaline phosphatase,total glyceride and total protein)in the blood and organs of control and experimental group exposed to five nominal concentration of cypavest, 10EC Pesticide Preparation (active substance 100mg/l) of cypermethrin in a static non- renewal bioassay for 96hours. Fish exhibited progressive loss of balance, respiratory distress, erratic movement and death. Biochemical evaluation showed significant higher values (P < 0.001, 0.01) for Alanine aminotransferase (ALAT), Cholesterol, Triglycerides, and Total Protein Aspartate aminotransferase (ASAT) and glucose showed a significant reduction (P < 0.001) with no significant difference (P > 0.05) in Alkaline phosphatase as compared to the control. thus concluding that cypermethrin is toxic to juveniles of Clarias gariepinus.*

Keywords: *Pyrethroids, Cypermethrin, aspartate and alanine aminotransferase, alkaline Phosphatase, bioassay and nominal concentrations*

I. INTRODUCTION

Water is undoubtedly the most precious natural resource that exists on our planet. It comprises over 70% of the earth surface (Terry, 1996). It is essential for everything on our planet to grow and prosper. Although, we as humans recognize this fact, we disregard it by polluting our rivers, lakes, and oceans. Subsequently we are slowly but surely harming our planet to the point where organisms are dying at a very alarming rate.Cypermethrin is widely used against pests all over the world to increase the production of food grains and other agricultural-products (Usmani& Knowles, 2001) and there is increased risk of food being contaminated with the insecticide, which may harm humans and domesticated animals. Cypermethrin produces drastic effects on both the invertebrates (Gowlan*et al.,* 2002) and vertebrates (Das & Mukherjee, 2003).

Biochemical and physiological biomarkers are frequently used for detectingor diagnosing sublethal effects in fishexposed to different toxic substances(Theodorakis*et al.,* 1992). Sublethal effectsare biochemical in origin as the mosttoxicants exert their effects at basic level ofthe organism by reacting with enzymes ormetabolites and other functional componentsof the cell.Transaminase enzymes play vital role in carbohydrate-protein metabolism infish and other organisms' tissues (Eze 1983). Changes in enzymes activity and otherbiomarkers have been studied as possibletools for aquatic toxicological research(Moore and Simpson 1992; Arellano *et al*,2000 and Abou El-Naga *et al.,* 2001).

The present study aimed to determine the effect of acute toxicity of Cypermethrin on some selected biochemical parametres on juveniles of *Clarias gariepinus*

II. MATERIAL AND METHODS

180 healthy juveniles of *Clarias gariepinus* of the same cohort with average weight (16.62±4.36)g, standard length (12.64±1.03) cm and total length (14.97±8.94) cm were sourced from the hatchery unit of the Federal college of Freshwater Fisheries Technology, Baga Maiduguri, Borno State. They were acclimatized for seven (7) days during which they were fed 5% of their body weight with commercial Coppens (2mm). Feeding was stopped 24hrs prior to the commencement of the toxicity test experiment

III. TOXICITY TEST

A preliminary range finding test was carried out based on the concentration of the active ingredient in the test chemical. The range finding was done using the following concentrations; 0.1mg/l,10mg/l and100mg/l of Cypermethrin for 24hrs in triplicates. The concentration was done using a serial dilution formula $C_1V_1 = C_2V_2$.

The result obtained from the range finding test provided a guide for the definitive test. Following this, the definitive test was carried out using; 0.025mg/l, 0.050mg/l, 0.075mg/l, 0.100mg/l, 0.125mg/l and 0.000mg/l of Cypermethrin. The result obtained was used to determine the median lethal concentration (Lc_{50}) using Probit analysis.

IV. EXPERIMENTAL PROCEDURE

A total of eighteen (18) glass aquaria were used for the definitive toxicity test. Ten juveniles of *Clarias gariepinus* were introduced into each aquarium with 20 litres of water with; 0.025mg/l, 0.050mg/l, 0.075mg/l, 0.100mg/l, 0.125mg/l and 0.000mg/l concentration of Cypermethrin at the same time. Each of the toxicant concentration was replicated three times each. The experiment was carried out using a static non-renewal bioassay for 96 hours. Mortality and general behavior of fish were noted 24 hourly

Blood sample collected in the bottle were analyzed for Aspartase Aminotransferase (ASAT), Alanine Aminotransferase (ALAT), Alkaline Phosphatase (ALK. PHOS), Total Protein (T/P), Cholesterol (CHOL) and Triglycerides.

Activities of serum Aspartase,Alanine aminotransferase and total protein was assayed by the methods of Reitman and Frankel (1957).Based on the method of King and Armstrong (1937). Alkaline phosphatise activity was assayedExtract of lipids from serum carried out according to the procedure of Folch*et al*., (1957). Water quality parameter like dissolve oxygen, pH, hardness and temperature will be monitored as contained in standard methods in APHA (1995).

Statistical analysis for results were presented as Mean ± Standard Deviation. Analysis of variance was used to test the variation between the means (Mead and Curnow, 1983).

V. RESULTS

TRANSAMINASES

(A) ASPARTATE AMINOTRANSFERASE (ASAT)

The result on (Table 1 and Fig.1) showed that there was highly significant ($P<0.001$) decrease in Aspartate aminotransferase (ASAT) activities in 0.025mg/l, 0.05mg/l and 0.075mg/l with (196.40± 9.76), (217.60 ± 1.95) and (201.00 ± 6.67) IU/L as the mean value respectively. There was also a significant ($P<0.05$) decrease in the ASAT level at 0.100mg/l as compared with the control. However, there was marked significant ($P>0.001$) increase in ASAT activities in the treatment with 0.125mg/l concentration as compared with the control (242.00 ± 6.71) IU/L.

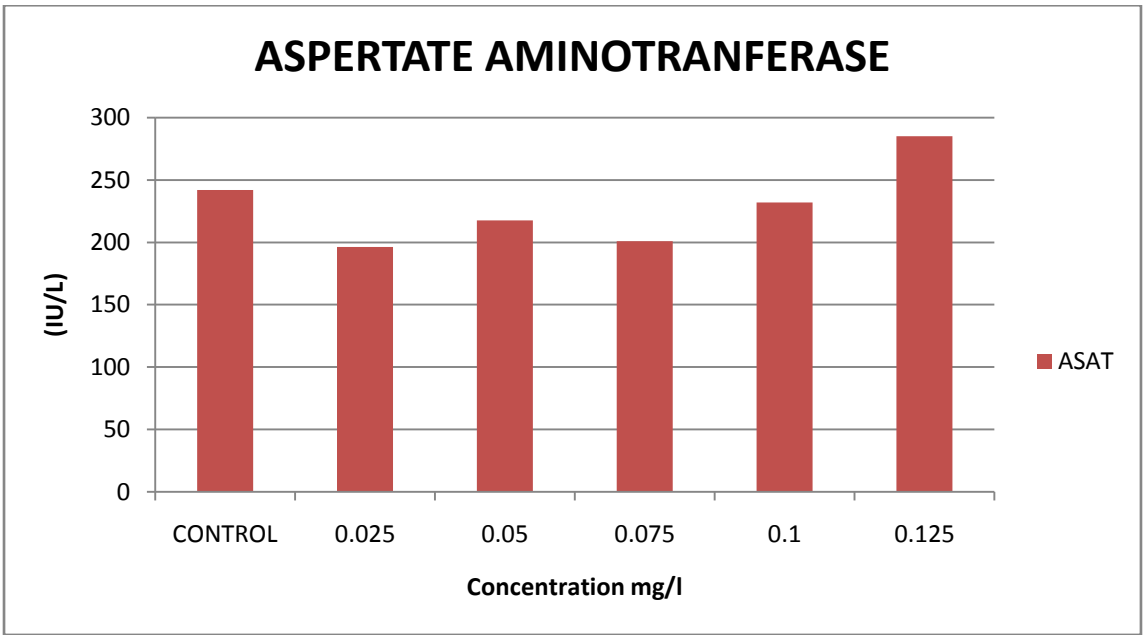

Fig 1: Mean Aspertate Aminotransferase of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

(B) Alanine Aminotransferase (ALAT)

The results of the activities of Alanine aminotransferase (ALAT) in the blood are presented in Table 1 &Fig.2 . The result showed that there was no significant (P>0.05) difference in treatment with concentration of 0.25mg/l and 0.075mg/l of cypermethrin. They had (29.00 ± 1.23) and (26.60 ± 0.89) IU/L as their mean values respectively. There was significant (P<0.001<0.01) increase in the ALAT activities at concentration of 0.050mg/l, 0.100mg/l and 0.125mg/l respectively. The mean values are (30.80 ± 0.84), (42.20 ± 2.59) and (40.60± 2.51) IU/L respectively. The control had (26.40 ±0.89) IU/L.

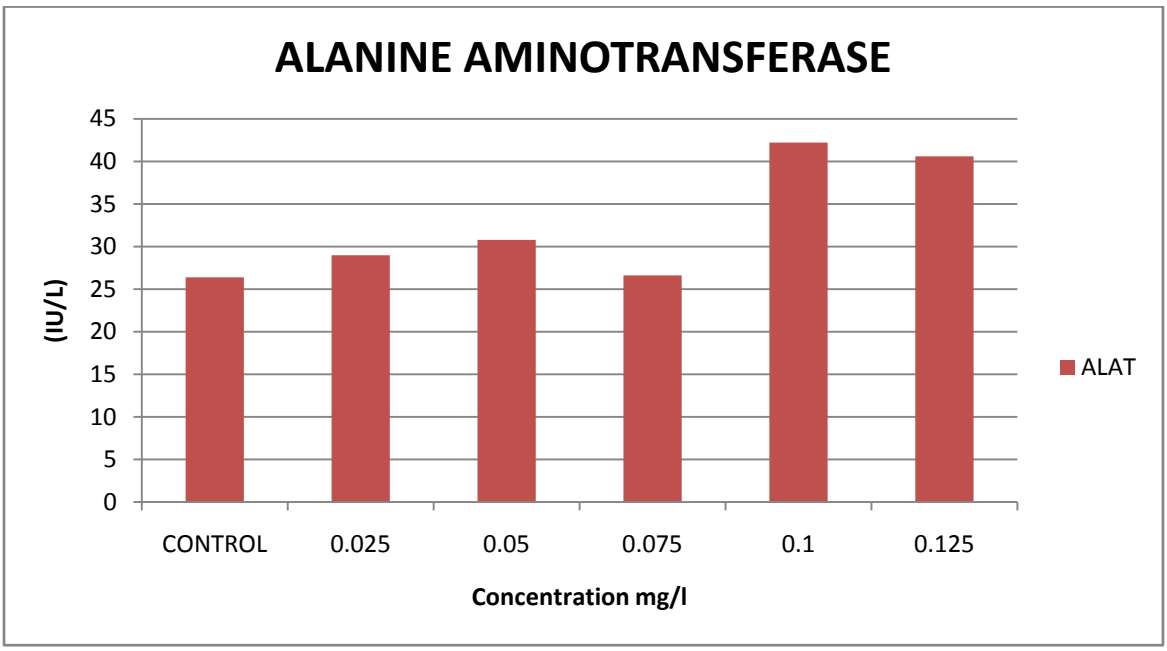

Fig 2: Mean Alanine Aminotransferase of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

Table .1 Changes in Some Serum Biochemical Parameter of *Clarias Gariepinus* Exposed To Acute Concentration of Cypermethrin

DOSE (Mg/l)	ASAT(IU/L)	ALAT (IU/L)	ALK. PHOS. (IU/L)	CHOL (mmol/L)	TGC (mmol/L)	T/P(g/l)	GLUC (mmol/L)
0.025	196.40±9.76***	29.00±1.23	19.60±1.34	1.06±0.15*	1.22±0.08	26.20±0.84	1.90±0.12***
0.050	217.60±1.95***	30.80±0.84**	20.00±0.71	2.18±0.15***	1.32±0.11	31.40±0.89***	1.26±0.17***
0.075	201.00±6.67***	26.60±0.89	12.60±0.55	1.60±0.14**	1.28±0.11	22.80±1.79***	1.68±0.13***
0.10	232.00±2.74*	42.20±2.59***	18.00±0.71	1.54±0.17**	1.38±0.11	31.60±1.67***	1.82±0.08***
0.125	285.20±2.86***	40.60±2.51***	33.00±1.41	1.62±0.08**	1.52±0.08**	36.20±1.10***	2.02±0.11***
Control	242.00±6.71	26.40±0.89	15.40±0.89	1.24±0.09	1.24±0.06	27.60±1.34	2.40±0.10

Mean ±SD, n =5.
*P<0.05 Significance increase or decrease compared to control
**P<0.01 moderately Significance increase compared to control
***P<0.001 Highly Significance compared to control

The results of alkaline phosphatase were also presented in Table 1. and Fig.3 . The result showed no significant (P>0.05) difference in all the treatment as compared with control.

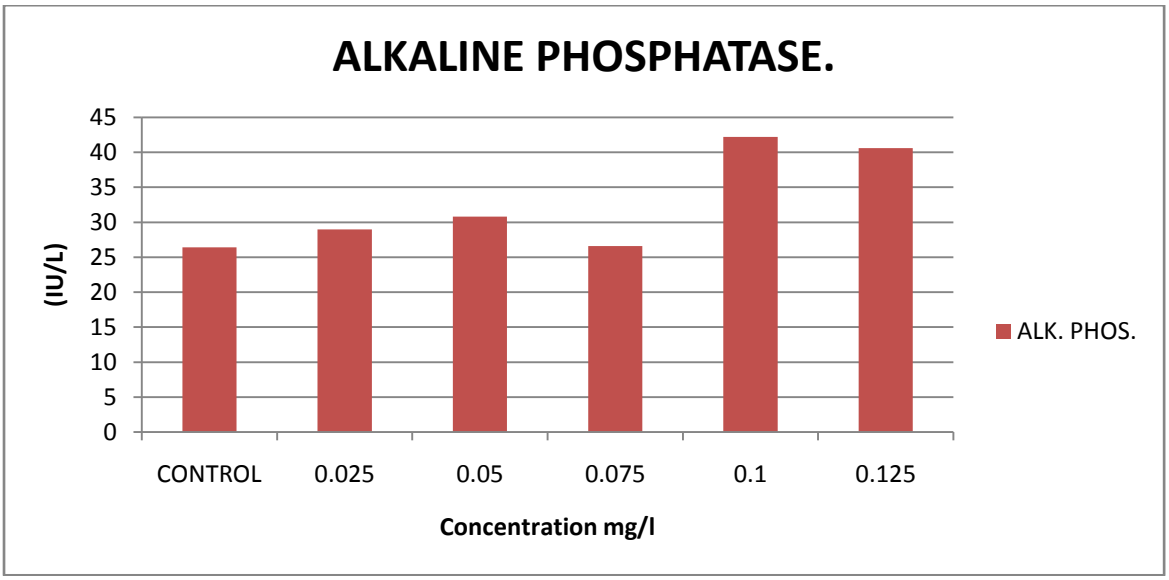

Fig 3: Alkaline Phosphatase of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

The result of cholesterol variation in the blood of the exposed fish is presented in Table 1 and Fig. 4. It shows that there was significant (P< 0.01) increase as the concentration of cypermethrin increases. The result obtained for total glyceride showed no significant (P>0.05) difference in all the treatment concentration except in the highest concentration (0.125mg/l), that showed significant (P<0.01) increase in the cholesterol value (1.52± 0.08)IU/L as compared with control (1.24 ± 0.06)IU/L.

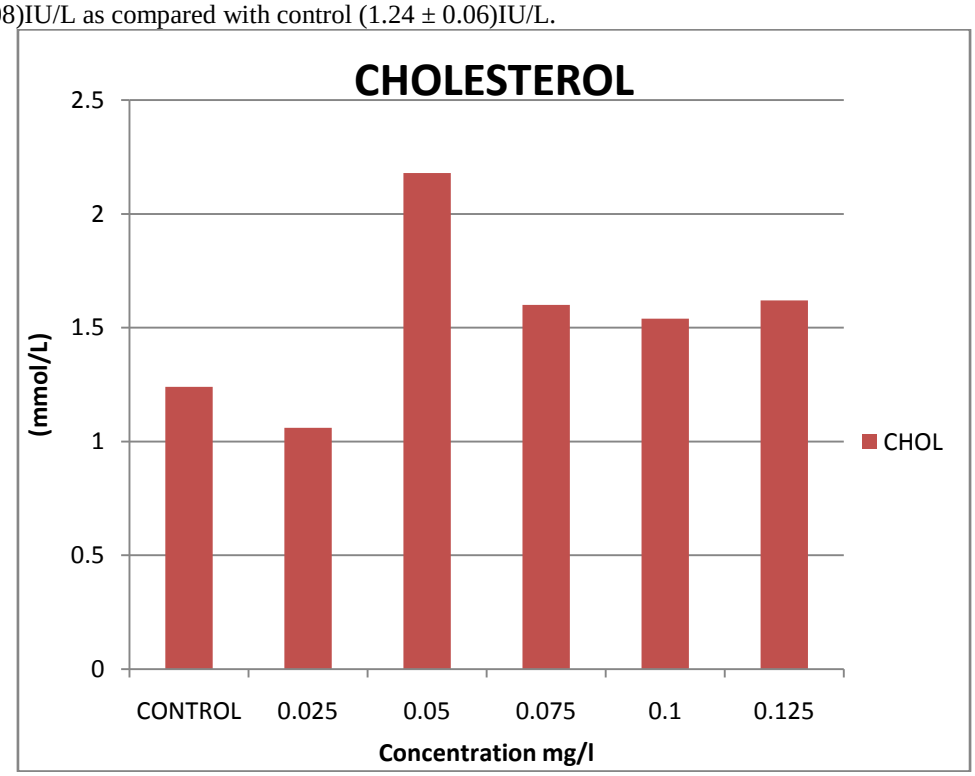

Fig 4: Mean Cholesterol of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

Results on total protein showed that treatment with the least concentration (0.025mg/l) showed no significant (P>0.05) difference in total protein as compared with control. However, there was marked significant (P<0.001) increase in total protein at increasing concentration of cypermethrin toxicant. Though, there was highly significant (P<0.001) decrease in total protein value at 0.075mg/l with (22.80±1.79)IU/L as the mean value compared with control.

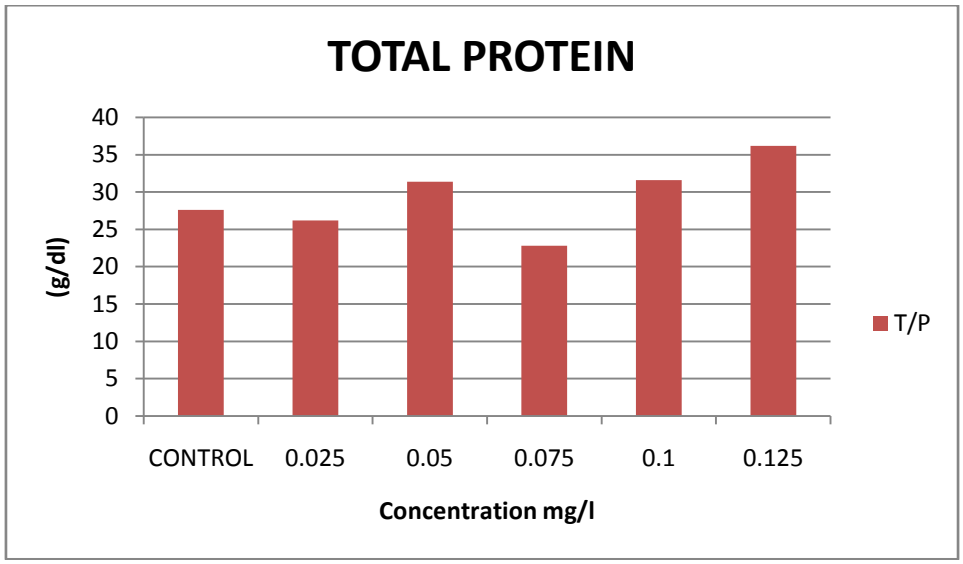

Fig 5: Mean Total Protein of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

Glucose level (Table 1andFig.6) in all the treatments concentration showed marked significant (P<0.001) decrease as compared with control with their mean values as (1.90± 0.12) , (1.26 ± 0.17) (1.68 ± 0.13) (1.83 ± 0.08) and (2.02 ± 0.11)mmol/L as the mean values for 0.025mg/l, 0.050mg/l, 0.075mg/l, 0.100mg/l and 0.125mg/l respectively.

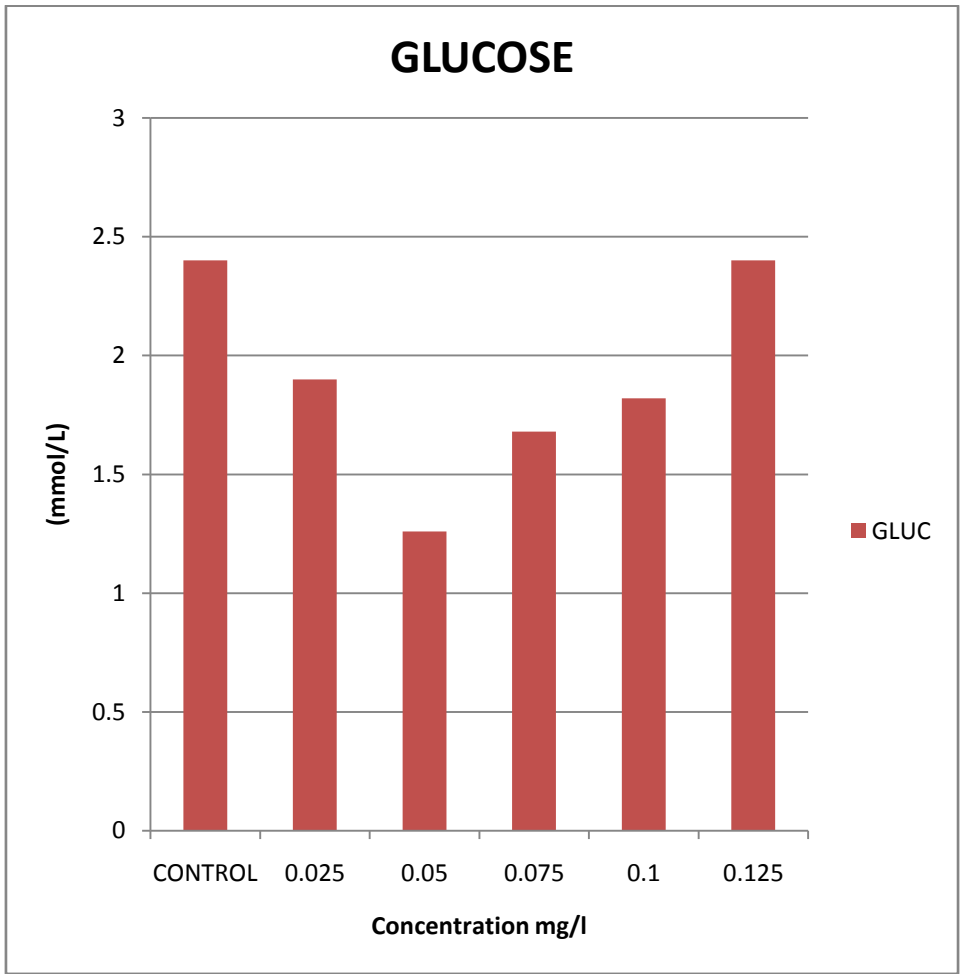

Fig 6: Mean Glucose of *Clarias gariepinus* juveniles exposed to different concentration of Cypermethrin for 96hrs

VI. DISCUSSIONS

Biochemical parameters are sensitive index to change due to pesticide toxicity and can constitute important tools in toxicological studies (Siddiqui, 2004).Hence, the purpose of this work is to evaluate the effect of cypermethrin a synthetic pyrethroid on some selected biochemical parameters. Result showed that total protein (TP) and cholesterol (CHOL) increased significantly ($P<0.001$) as the concentration of the toxicant increases. The increase in total protein and cholesterol could be attributed to necrosis of the liver by the toxicant which leads to the impairment in the metabolism of this parameter thus resulting in significant increase in the concentration of the parameter. Similar result was recorded by Yaji*et al.,* (2011).The authors discovered a significant increase in total protein and cholesterol level in the blood of *Oreochromisniloticus* exposed to cypermethrin insecticide. This result was also corroborated by the findings of Faisal, (2003).

The activities of enzymes in the blood plasma can also be used as a relevant stress indicator. The activities of transaminases, alanine aminotransferase (ALAT) and aspartate aminotransferase (ASAT) increased sigificantly ($P>0.001$) at higher concentration. This indicated stressed based tissue impairment (Svoboda, 2001). Increased activities of both transaminases indicated amplified transamination processes. An increase in transamination occurs due to amino acid input into the TCA cycle, in order to cope with the energy crisis during pyrethroid-based stress (Philip *et al.*, 1995). Increase in transaminase activities was also reported by Wegwu*et al.,* (2010).It was discovered *Clarias gariepinus* exposed to aqueous extract of Nigeria crude oil experienced increased transaminase activities of both ASAT and ALAT in the blood plasma as compared with control fish.
Triglyceride (TG) level in the blood plasma of the exposed *Clarias gariepinus* juveniles showed no significant ($P>0.05$) difference as compared to the result obtained to the control, though a significant ($P<0.01$) increase was noticed in the highest concentration of cypermethrin (0.125mg/l). Triglyceride level is normally used to evaluate lipid metabolism. High concentration may occur as a result of nephritic syndrome or glycogen storage disease (Bernet*et al.*, 2001). Similar result was obtained by Jen-lee and Hon- chen (2003).It was discovered that there was a significant variation in triglyceride level of common carp (*Cyprinuscarpio*) exposed to acute gallium for 96 hours as compared to the control. On the other hand, serum glucose level was discovered to significantly ($P<0.001$) decrease compared to the control. The reduction in serum glucose level was mainly due to rapid utilization by the organism as a consequence of metabolic stress. Associated finding was reported by Singh *et al.,* (2010).The authors studied the effect of Phorate on serum biochemical parameter of snake head fish (*Channapunctatus*), it was discovered that serum glucose decreased significantly ($P<0.001$) as compared to the control.

VII. CONCLUSION

Cypermethrin is an important insecticide in agriculture, its toxicity to aquatic fish has been ascertain as a result of flow from agricultural land near aquatic rivers or lake because of irrigational farming. The evidence of effect on some biochemical parameter in the blood and organs of the fish should make us reduce it incidences into aquatic bodies.

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