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Biochemical Comparison between Cypermethrin and Fenvalerate Harmful Effect on Catfish *Clarias batrachus (Linnaeus*, 1758*)*

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Abstract: ***Effectiveness of Cypermethrin in comparison with Fenvalerate as toxic agent used as insecticides and pesticides were studied on Catfish Clarias batrachus (Linnaeus, 1758). Both agents showed toxicity and intolerance effects which is harmful for fishes. Fishes were exposed to the concentration of pyrethroid insecticide Cypermethrin for 24h as the LC50 value was found to be (1 µg/l) and one fourth of LC50(0.25 µg/l) was selected. The other insecticide Fenvalerate concentration for 24 h was LC50 (250 µg/l) and one tenth of LC50 (25 µg/l) as lethal concentration for acute toxicity studies. Doses followed till 96 h at every time interval of 24 h. Biochemical changes was observed in all three Normal, Cypermethrin and Fenvalerate conditions.***

Keywords: Toxicity, Cypermethrin, Fenvalerate, Catfish *Clarias batrachus* (*Linnaeus, 1758*)

1. Introduction

Fenvalerate and Cypermethrin are types of pyrethroidal group of insecticides which give support for the rise of toxicity in the blood and other body system of either in insects or in other animals, when these are conveyed via the different fruits and vegetables taken as food.

Fenvalerate and Cypermethrin were reported to impair male reproductive function, inducing significant reductions in epididymal sperm count. Fenvalerate was shown to reduce sperm motility [3].

Due to its lipophilicity, Fenvalerate is absorbed at a high rate through the gills of fish. However fishes have a poor ability to metabolise and excrete Fenvalerate and thus are susceptible to even minute concentration of the pesticide [1].

Cypermethrin is also a skin and eye irritant. Slight to severe skin irritation, decreased food consumption, body weight and absolute and relative gonadal weight and absolute and relative gonadal weights have been observed in rabbits treated with Cypermethrin [4].

Cypermethrin is a synthetic pyrethroid insecticide used to control many pests, such as moth pests of cotton, fruit and vegetable crops, including structural pest control, landscape maintenance, for residential and garden use. This has resulted in its discharge into the aquatic environment and consequently several laboratory studies have been performed, which evidenced that Cypermethrin is extremely toxic to fish at very low concentration and to aquatic invertebrates [2].

2. Materials and Methods

Clarias batrachus adultsweighing 400-600 gm and average length of 40-45 cm were collected from a nearby fish market and left to acclimatize in normal environmental condition for 4 days i.e. 96 h in water tank. They were fed with commercial pedigree and wheat flour pellets.

Equal number of fishes were randomly put in two different tanks were exposed to Fenvalerate and Cypermethrin separately.20EC of Cypermethrin and Fenvalerate was used for the preparation of stock solution concentration. The concentration of Cypermethrin was taken as LC50 1/4 for 24h, was found to be 0.25 µg/l and for Fenvalerate as LC50 1/10 for 24 h, was 25 µg/l ,which was continued for 96 h of every 24 h of time interval as lethal concentration for acute toxicity studies.

Fishes were unconscious by the help of anesthetic agent and no sacrifice done on fishes. Blood was withdrawn from fishes and then fishes were put in their respective tanks within normal body phase in consciousness without sacrifice.During this experimental research the biochemical changes were observed and compared with each other in Normal, Fenvalerate and Cypermethrin condition.

3. Result

A great biochemical variation found between the results of Normal, Fenvalerate and Cypermethrin during the blood biochemical examination in *Clarias batrachus* shown in Table-1.

These are following:

- In all biochemical test result which was observed during the research shows that normal condition were under their Estimate Range Unit.
- In the case of Fenvalerate all five biochemical test results were out from their LSL (Lower Standard Limit) and USL (Upper Standard Limit)).That's why all test results shows significant towards toxicity.

Table 1: *Biochemical Results*

Test Level	Range	Normal	Fenvalerate	Cypermethrin
Bilirubin (Total Serum)	0.08-1.02 mg/l	0.11 **(+)**	0.05 **(-)**	0.06 **(-)**
ESR	20- 34 mm	22 **(+)**	10 **(-)**	22 **(+)**
SGOT (AST)	155.0-162.72 u/L	161.5 **(+)**	72.4 **(-)**	261.0 **(-)**
SGPT (ALT)	40.17-54.01 u/L	45.3 **(+)**	31.3 **(-)**	48.7 **(+)**
Post Prandial Plasma Glucose (After Meal)	109.8-184.5 mg/dl	151.6 **(+)**	71.4 **(-)**	271.9 **(-)**

Legends: (+): Significant towards Non-toxicity
(-): Significant towards toxicity

- Different test results show different types of fluctuation in comparison with their Range Unit. The changes shown as per as-

In Fenvalerate
- Bilirubin (Total Serum), ESR, SGOT(AST), SGPT(ALT), Post Prandial Plasma Glucose (After Meal) all are below their LSL range unit and shows more significant towards the toxicity of Fenvalerate.

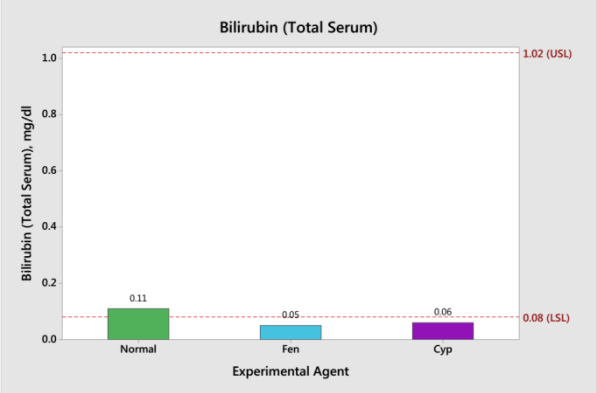
In Cypermethrin
- Bilirubin (Total Serum) below from its LSL range.
- Whereas, in ESR and SGPT (ALT)are under the normal range and are non-significant towards toxicity.
- In SGOT (AST) and Post Prandial Plasma Glucose (After Meal) both shows their harmful effects and are far away from their USL range. It shows that in both condition Cypermethrin dominating its toxicity and is significant to misbalancing the SGOT (ALT) and Post Prandial Plasma Glucose (After Meal) in the body of test fish.

4. Discussion

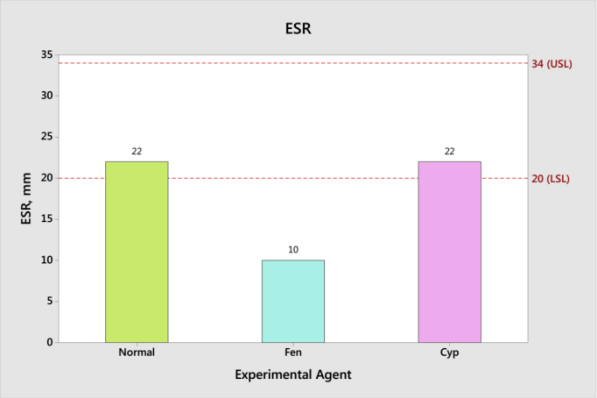
The variation shows about the toxicity of Fenvalerate and Cypermethrin on the catfish that how much and how long level they can shows their harmful effects and disturbs their body balance especially in biochemical ranges. Their fluctuations in results observed during and after the experimental research are shown in graph 1-5.

- Comparing both Cypermethrin and Fenvalerate results in all five biochemical tests found that Fenvalerate is more toxic in its all test phases than Cypermethrin.
- Whereas, in Cypermethrin all five biochemical test shows different results in which, Bilirubin (Total Serum), Post Prandial Plasma Glucose (After Meal) and SGOT (AST) are significant towards toxicity and destroy these three levels of biochemical tests very badly.
- In other condition of ESR and SGPT (ALT) both shows friendly nature and proved that Cypermethrin doesn't significant for their toxicity on these two biochemical test levels in comparison of Bilirubin (Total Serum), Post Prandial Plasma Glucose (After Meal) and SGOT (AST).

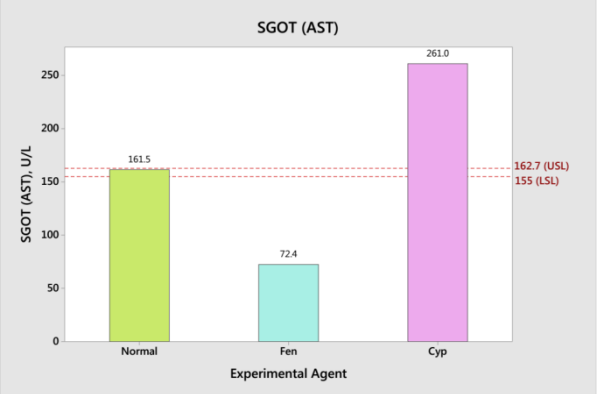
Graph 1: *Comparison of Bilirubin levels*



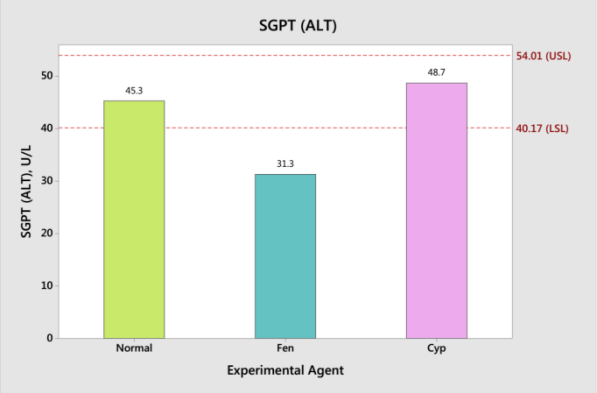
Graph 2: *Comparison of ESR levels*



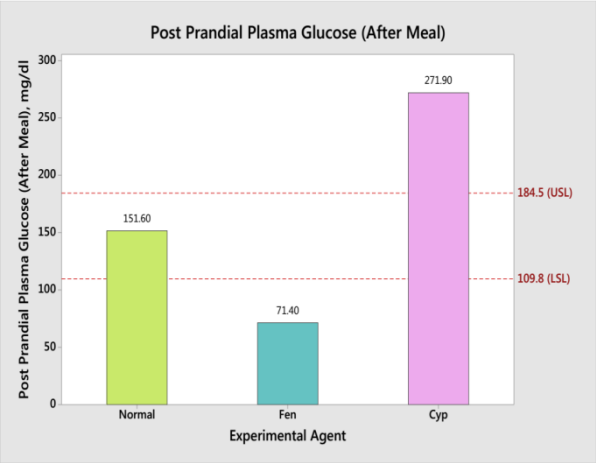
Graph 3: *Comparison of SGOT(AST) levels*



Graph 4: *Comparison of SGPT(ALT) levels*



Graph 5: *Comparison of Post Prandial Plasma Glucose (After Meal) levels*



5. Conclusion

Thus, the whole experiment shows Fenvalerate and Cypermethrin both are toxic and also are very dangerous for either for fishes and also used as pesticides and insecticides at the dose of one tenth of LC50 (25 µg/l) in Fenvalerate and one fourth of LC50 (0.25 µg/l) in Cypermethrin. After comparing both toxic agents Fenvalerate shows more toxicity in all five biochemical tests condition; but Cypermethrin toxicity only affects Bilirubin (Total Serum), Post Prandial Plasma Glucose (After Meal) and SGOT (AST) and are non – significant as toxicity in the ESR and SGPT (ALT) test levels.

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Author Profile

Priya Kumar completed her Post-graduate degree in Zoology with the Special Paper "Fish and Fisheries" from Patna Science College, Patna University, Biharin 2010.She performed her field work in "Survey of different fish and their toxicological identification in different fish markets of Patna, Bihar". She qualified the Doctoral Entrance Test (DET) according to the Ordinance-18, act of United Grand Commission (UGC). Now, she is registered as a Research Scholar in the field of Toxicology in Devi Ahilya Vishwavidyalaya (DAVV), Indore, Madhya Pradesh, India.

Dr. Narendra Kumar Dhakadis appointed as 25th Vice Chancellor of Devi Ahilya Vishwavidyalaya (DAVV) Indore, Madhya Pradesh that was established in 1964. A retired professor of Zoology, he had served as a Principal for about 25 years at many Government Colleges including Holkar Science College, Bhind College, Mhow College and Dewas College. He represented Principal Secretary (Higher Education) in the DAVV's executive council for six years. He worked for about six years as Additional Director at local office of Department of Higher Education and retired in July 2015.