JSIANE : Vol. 1, Issue 3, 2021, Page 15-19 ISSN (Online): 2583-2093

Journal of Science Innovations and Nature of Earth

Journal homepage : www.jsiane.com

ASSESSMENT OF LIVER MARKERS IN *CHANNA PUNCTATUS* UNDER STRESS OF TYPE II PYRETHROID CYPERMETHRIN

Shailendra Pratap Singh[1], Sandhya Pandey[2] and B. B. Biswas[3]

[1,2,3] Department of Zoology, P.P.N.(PG) College, Kanpur 208001

C.S.J.M. University, Kanpur (UP), India

Email: dr.sps72@gmail.com

Abstract

The frighteningly rapid accumulation of xenobiotics, such as insecticides, in aquatic organisms poses a risk to aquatic life because of the associated harm posed by this bioaccumulation. A wide variety of fish species demonstrate uptake and accumulation of numerous contaminants, such as pesticides, which have been discovered to be highly hazardous not just to fish, but also to the organisms that fish eat, posing a threat to the lives of fish. These contaminants include: Because fish are such an essential component of the diets of humans, it is critical that any newly introduced pesticides be tested for their potential to cause illness in fish. For this reason present study is to assess liver markers viz. bilirubin, SGOT, SGPT in freshwater fish *Channa punctatus* under stress of type II pyrethroid cypermethrin.

Keyword : *Channa punctatus*, insecticide, cypermethrin, liver markers

Received 05.08.2021 **Revised 20.08.2021** **Accepted 15.09.2021**

Introduction

As a material absorbed through the skin or consumed orally, cypermethrin has a moderate toxicity level. Skin and eye discomfort are possible side effects. Numbness, tingling, itching, a burning sensation, involuntary urination, clumsiness, convulsions, and even death are all possible outcomes of dermal contact. The central nervous system may be negatively impacted by pyrethroids. In a dermal dosage study, human participants reported tingling and burning sensations in the area around their earlobes. A 10% cypermethrin concentration was used as cooking oil, resulting in the death of one man. After the dinner, the sufferer began to show symptoms of food poisoning, including nausea, vomiting, stomach discomfort, diarrhoea, and eventually convulsions, unconsciousness, and coma. The rest of the family members had less severe reactions and made full recoveries after receiving medical care in a hospital. Although cypermethrin is not an irritant to the skin or the eyes, it can trigger allergic reactions in certain people. If you're exposed to cypermethrin for a long time, your liver can start to change. Studies in rabbits showed that chronic exposure to cypermethrin caused pathological alterations in the thymus, liver, adrenal glands, lungs, and skin.

The Environmental Protection Agency has classed cypermethrin as a "weak potential human carcinogen" due to the fact that there is some evidence that it induced benign lung cancers in only one sex and one species (female mice), and then only at the highest dose studied. Central nervous system toxicity has been linked to pyrethroids. Liver and kidney weights increased and liver tissues were negatively altered in test animals that were fed for extended periods of time. Metabolites of cypermethrin were completely eliminated from the human body 48 hours after the last of 5 daily doses of 1.5 mg. In rats, cypermethrin was found to be almost entirely broken down within hours through a process of hydroxylation and cleavage. Fat stores the remaining 1%. This fraction is removed gradually; the cis-isomer has a half-life of 18 days and the trans-isomer of 3.4 days. The pesticide cypermethrin is particularly poisonous to fish and other aquatic organisms. For rainbow trout, the 96-hour LC_{50} of cypermethrin is 0.82 parts per billion, but for bluegill sunfish, it's 1.78 parts per billion. Daphnia magna, a tiny freshwater crustacean, has an acute LC_{50} of 0.2 ppb. In a flow through investigation, the bioconcentration factor for cypermethrin in rainbow trout was 1200 times. The increased toxicity of cypermethrin in fish may be due to the compound's slower metabolism and elimination in fish compared to mammals and birds. With 96-hour LC_{50} values typically sub 10 ug/l, pyrethroid pesticides are very poisonous to fish. The LD_{50} values for mammals and birds are roughly hundreds to thousands of milligrammes per kilogramme. This suggests that the sluggish metabolism and clearance of pyrethroids in fish may contribute to their sensitivity to these chemicals. Several pyrethroids have elimination half-lives in trout that are more than 48 hours, whereas the corresponding values for birds and mammals are 6-12 hours. Cypermethrin is highly adsorbable to soil particles and is not water soluble. Therefore, it is quite improbable that groundwater would become contaminated.

The liver is an important organ found in vertebrates and other animals. Detoxification, protein synthesis, and the creation of

digestive biochemicals are only a few of its many roles. Liver dialysis can be used temporarily, but the liver is essential to living, and there is presently no means to replace liver function permanently.

Material and Methods

For this investigation, we collected live *Channa punctatus*, often known as soli, from ponds and the Agra fish market in the city's immediate area. The experimental fish *Channa punctatus* was chosen due to its accessibility, its resilience in the face of proposed pollutant treatments, and its potential to serve as a useful indicator of the persistence of toxic effects in soft tissues. Fish also has a high monetary value as a food source. In order to reliably compare the effects of different pesticide treatments, researchers utilised fish that were essentially of the same size and weight. Fish with cutaneous infections were rinsed in a 0.1% KMnO4 solution. After that, they were rinsed with tap water and glued to aquariums. Synthetic pyrethroid pesticide cypermethrin25%EC is effective against a wide range of pests.

For each concentration tested, a duplicate was also run as a control. On the other hand, the cypermethrin concentration was kept constant by replacing the water every other day. To eliminate the potential for excretory materials to alter the toxicity of the chemical, the fish were fasted for 24 hours before to the testing. The LC50 value was used to determine the sub-lethal concentrations. One tenth of the LC50 was chosen for short-term (4-day) administration, one twentieth was chosen for sub-lethal (20-day) administration, and one-quarter was chosen for long-term (45-day) administration. In addition, 45-day recovery studies were conducted.

Results and Discussion

Acute (4 days), sub-acute (20 days), and chronic (45 days) treatment with doses of 8.124, 1.624, and 0.722g/l of cypermethrin resulted in a considerable increase in bilirubin in Channa punctatus, according to the current study. Treatment of Channapunctatus with 8.124, 1.624, and 0.722 g/l of cypermethrin for 4 days, 20 days, and 45 days, respectively, resulted in a substantial rise in SGOT and SGPT. Myocardial injury frequently causes a dramatic elevation in SGOT (Varley, 1976). Changes in SGOT levels reflect cypermethrin's effect on the experimental fish's metabolism, which may have been disrupted by liver malfunction or cellular damage in various organs. Results obtained here are consistent with those obtained by Goel and Maya (1986) in Clarias batrachus exposed to roger as a pesticide. Similar SGOT elevation patterns were also found in Verma *et al.* (1981) in Mystusvittatus following pesticide treatment.

Maximum levels of serum glutamic oxaloacetic transaminase (SGOT) are found in the heart, followed by the liver, the skeletal muscles, and the kidneys. Myocardial infarction, liver illness (such cirrhosis or viral hepatitis or liver necrosis), and skeletal muscle disease all result in elevated SGOT levels. Mathur *et al*. (1965) cite a similar trend, stating that pesticides harm fish livers. Tissue injury and an increase in SGOT activity could result from the former (Verma *et al.* 1981). In S. mossambicus, Revathi *et al*. (2003) found an increase in SGOT expression after tissue injury caused by pesticidal stress. Arsta *et al*. have shown that alterations in SGOT activity can be used to detect tissue injury in fish (1996). The present results are more in line with those of Sulodia and Singh (2004), Wieser and Hinterleitner (1980), Sastry and Gupta (1978), and Garg *et al.* (1990) in several species of fish.

Serum glutamic pyruvic transaminase activity rises as a result of cypermethrin stress on the liver. These results are supported by those of Agarwal *et al.* (1982), who found that achlor exposure raised transaminase levels in Clarias batrachus. Verma *et al.* (1981) found similar outcomes after exposing Mystusvittatus to dichlorvos. Liver and kidney stores of SGPT are respectively the greatest and second highest. A rise in serum enzyme levels indicates that these organs have been harmed by pesticide exposure. Liver illnesses include infective hepatitis, liver cirrhosis, cholestatic jaundice, and skeletal muscle injury are all associated with an increased SGPT level. It was also noted by Sulodia and Singh (2004) that Channa punctatus had elevated serum transaminase (SGPT) levels. Similar findings were reported by Revathi *et al.* (2008) for the fish Satherodonmossambicus after exposure to the organoplosphorous insecticide tempos; they used variations in the activity of SGPT and SGOT to illustrate tissue damage in the fish. Similar changes in transaminases have been documented in the fish Barbusticto by Arsta *et al*. (1996) and Magare (1997). The results of the present study are consistent with those shown by Nemcsik *et al*. (1987) in Cyprinuscarpio following exposure to the organophosphate pesticide methidation, wherein elevated levels of transaminase enzymes were observed as a result of subsequent liver injury. Clarias batrachus under roger stress was also studied by Goel and Maya (1986), who found similar results.

TABLE- 1: Serum bilirubin (mg/dl) in *Channa punctatus* after 4, 20 and 45 days treatment of cypermethrin

S.No.	Experimental Set	Dose (µg/l)	No. of fishes	Range	Mean±S.Em.	Significance level
1.	Control	-	5	0.47-0.67	0.56±0.08	-
2.	Acute (4 days)	8.124	5	0.65-0.87	0.74±0.11	P>0.05
3.	Sub-acute (20 days)	1.624	5	0.55-1.08	0.86±0.21	P<0.05
4.	Chronic (45 days)	0.722	5	0.78-0.92	0.88±0.09	P<0.05

Fig.- 1: Serum bilirubin (mg/dl) in *Channapunctatus* after 4, 20 and 45 days treatment of cypermethrin

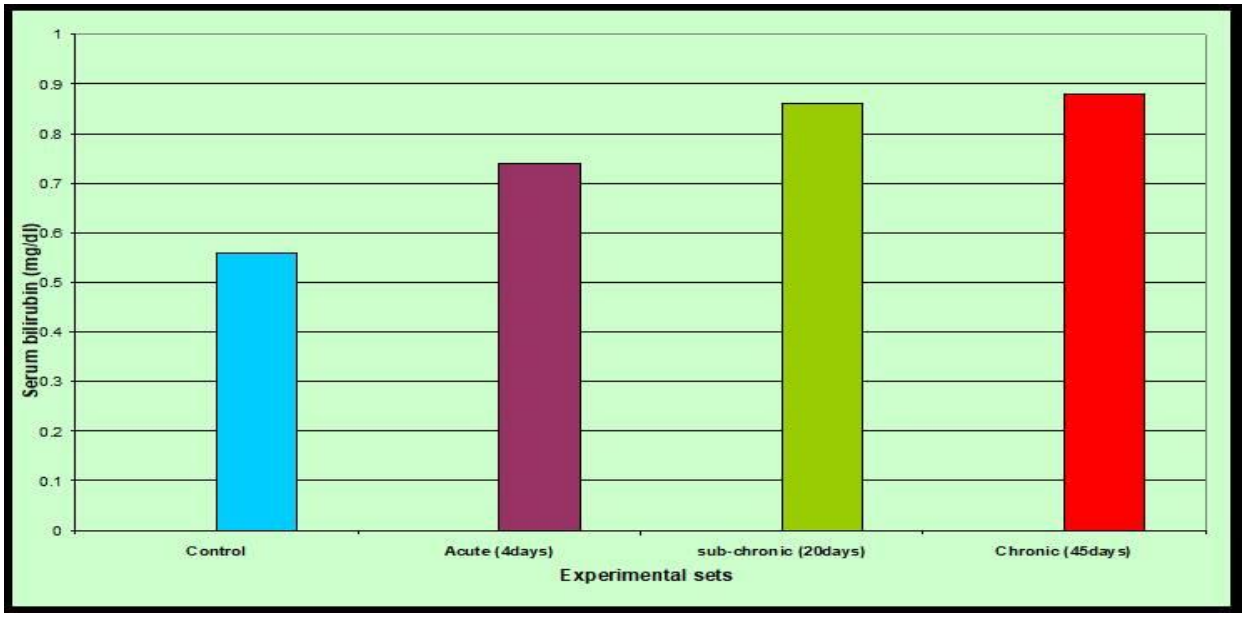


TABLE- 2: SGOT (U/L) in *Channapunctatus* after 4, 20 and 45 days treatment of cypermethrin

S.No.	Experimental Set	Dose (µg/l)	No. of fishes	Range	Mean±S.Em.	Significance level
1.	Control	-	5	79.20-93.50	88.52±1.10	-
2.	Acute (4 days)	8.124	5	99.00-112.0	104.10±0.95	P>0.05
3.	Sub-acute (20 days)	1.624	5	108.0-122.3	112.50±0.83	P<0.05
4.	Chronic (45 days)	0.722	5	110.0-121.9	116.30±0.85	P<0.01

Fig.- 2: SGOT (U/L) in *Channapunctatus* after 4, 20 and 45 days treatment of cypermethrin

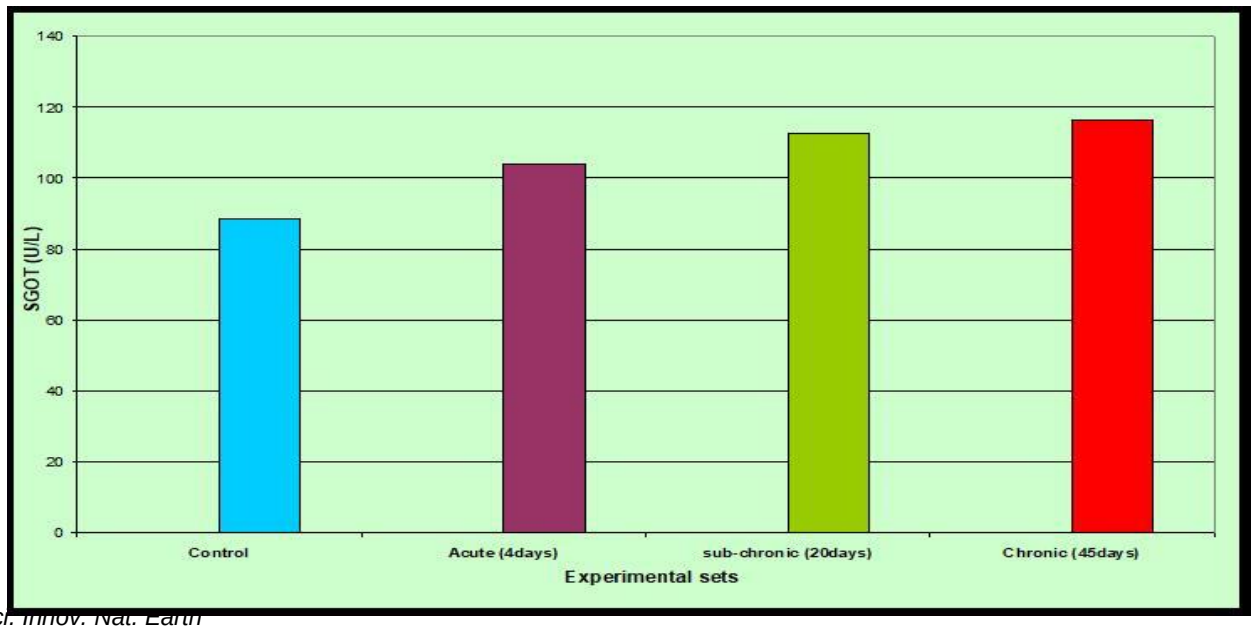
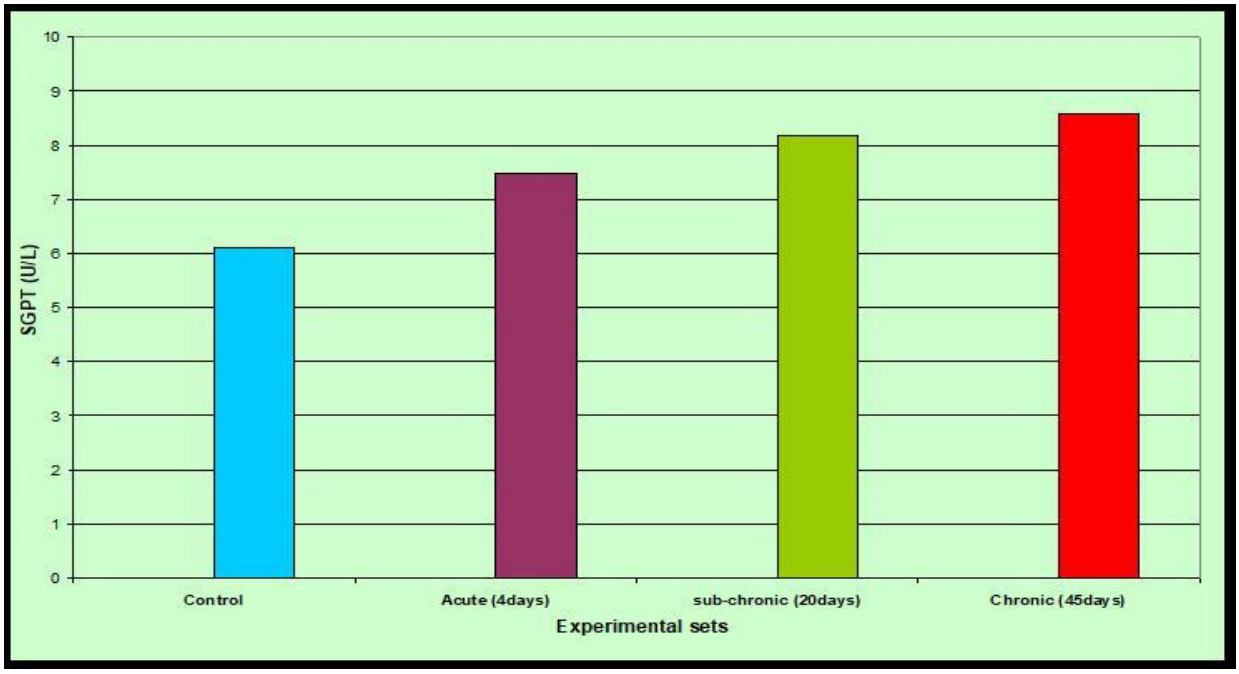


TABLE- 3: SGPT (U/L) in *Channapunctatus* after 4, 20 and 45 days treatment of cypermethrin

S.No.	Experimental Set	Dose (µg/l)	No. of fishes	Range	Mean±S.Em.	Significance level
1.	Control	-	5	5.60-6.50	6.10±0.07	-
2.	Acute (4 days)	8.124	5	7.22-8.33	7.48±0.05	P>0.05
3.	Sub-acute (20 days)	1.624	5	7.80-8.19	8.18±0.06	P>0.05
4.	Chronic (45 days)	0.722	5	8.42-8.68	8.59±0.06	P<0.05

Fig.- 3: SGPT (U/L) in *Channapunctatus* after 4, 20 and 45 days treatment of cypermethrin



References

Agarwal, V. P., M. L. Sharma, S. Wadhwa, K. Gupta and B. P. Mishra. (1982). Lithium induced haematological and biochemical changes in Heteropneustesfossilis. Proc. Symp. Environ.,Van. Sp. 27 31.

Arsta, T., V.S. Bais and P.T. Thakur (1996). Effect of Nuvan on some biochemical parameters of Indian catfish. Mystusvittatus, J. Environ. Biol., 17 (2): 167 – 169.

Garg, V.K., D.V. Singh, S.KGarg and S.K. Tyagi., (1990). Haematological alteration in lead exposed fish Clariasbatrachus. Ad. Bios., 79 – 84.

Goel, K.A. and Maya, (1986). Haematological anomalies in Clariasbatrachus under the stress of rogor. Ad. Bios.,5: 187 – 192.

Guyton A.C. and J.E.Hall, (1996). Textbook of medical physiology (9th Ed.). Prism books Pvt.Ltd.,Bangalore , India.

Magare, S.R., (1997). Enzymatic changes caused by the pesticide in a fish, Barbusticto. Proc. 84thIndian Sci. Cong. 105.

Mathur, D.S. (1965). Histopathological changes in the liver of certain fishes induced by dieldrin. Sci. and Cult.,31: 258 259.

Nemcsik, J., I. Benedeczky, L. Boross, B. Asztalos, and Orban (1987). Sub-cellular localization of transaminase enzymes in fishes and their significance in the detection of water pollution. Acta. Biol. Szeged. 27: 9-15.

Reitman, S. and Frankel (1957). A colorimetric method for aspartate and alanine aminotransferase in serum. J. Clin. Pathol.,28: 56-58.

Revathi, K. and M. D. Bindhuja. (2008). Biochemical changes in Macrobrachiummalcolmsoniiexposed to organophosphate profenofos. J Exp. Zool. India, 11(1): 57 61.

Sastry, K.V. and Gupta, P.K. (1978). Histopathological and enzymological studies on the effects of chronic lead nitrate intoxication in the digestive system of a fresh water teleost; Channapunctatus (Bloch.). Environ. Res.,17: 472-479.

Sulodia, S. and S. Singh, (2004). Assessment of total lipid of Channapunctatus (Bloch) with special references to intoxication folidol. Indian J. Environ. And Ecoplan.,8(3): 631-633.

Varley, H. (1976). Practical clinical biochemistry, 4th Edn. Heinemann, Indian Pauls Press, New Delhi.

Verma, S.R., V. Kumar and R.C. Dalela, (1981). Acute toxicity of three newly formulated pesticides to fish Mystusvittatus. Ind. J. Environ. Hlth.,23: 215 – 221.

Wieser, W. and S. Hinterleitner, (1980). Serum enzymes in rainbow trout as tools in the diagnosis of water quality. Bull. Enivorn. Contom. Toxicol.25: 188-193.