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Comparison of Induced Effect of Pyrethroid (Cypermethrin) with Organophosphate (Malathion) on GOT and GPT in Liver, Kidney and Brain of *Calotes versicolor* Daudin (Agamidae: Reptilia)

Muhammad Zaheer Khan and Farina Fatima
Department of Zoology (Wildlife and Fisheries), University of Karachi, Karachi-75270, Pakistan

Abstract: Experiments were carried out to find the induced effect of pyrethroid (cypermethrin) and organophosphate (malathion) was observed on GOT and GPT of *Calotes versicolor* Daudin. Two different concentrations 0.1 and 1% were used. In the surviving lizards GOT and GPT activities were estimated, in liver, kidney and brain. These activities were decrease of GOT upto 33 and 37% in liver, 23 and 66% in kidney and 38 and 61% in brain under the effect of cypermethrin. In the case of malathion the decrease of GOT activity was found as 26 and 33% in liver, 30 and 44% in kidney and 28 and 46% in brain. Under the effect of cypermethrin an average decrease in GPT upto 23 and 31% in liver, 26 and 42% in kidney and 2.47 and 11% in brain, while under the treatment of malathion the decrease of GPT activity was found as 21 and 23% in liver, 25 and 27% in kidney and 11 and 20% in brain, respectively.

Key words: Induced effect, organophosphate, pyrethroid, *Calotes versicolor*

Introduction

The lizards perform a service consuming significant amounts of small insects. Internationally approximately 25% of reptiles are listed as threatened (Hilton-Taylor, 2000) as a result of human activities including use of pesticides. There are more than 300 species belonging to family Agamidae found in the world (Rogner, 1997). Over 177 species of reptiles are known in Pakistan: 14 turtles, 1 crocodile, 90 lizards and 65 species of snakes (Ghalib *et al.*, 1979; Rehman and Iffat, 1997). Pesticides reduced the availability of plants and insects that serve as habitat and food for lizards and other wild animals. The organophosphate and carbamate widely used and have a variety of lethal and sublethal effects on non-target wildlife (Parsons *et al.*, 2000). Approximately 40 pesticides used in USA are known to be highly toxic to wildlife species of birds. Pesticides affect all members of an ecosystem, from the basis of the smallest invertebrate to birds, reptiles and other fauna. In California, the annual application of more than 100, 000, 000 pounds of the most toxic pesticides in both urban and agricultural settings is responsible for the deaths of wildlife fauna (Kegley *et al.*,1999). Nominal works has been reported on effects of pesticides on birds cholinesterase levels and the subsequent effects of enzymatic inhibition. These studies are of e.g., Grue *et al.* (1983); Henny *et al.* (1987); Hill (1989); Clark *et al.* (1995); Mineau (1993); George *et al.* (1995); Burn and Leighton (1996); Kegley *et al.* (1999); O'Hara *et al.* (1999); Bishop *et al.* (2000); Richards *et al.*(2000) and Khan *et al.* (2002) reported effect of pesticides on different non-target species of wildlife. In this study the induced effect of cypermethrin and malathion on liver, kidney and brain, GOT (glutamate oxaloaceate transaminase) and GPT (glutamate pyruvate transaminase) activities were studied.

Material and Methods

The experiment was carried on adults Agama lizard *Calotes versicolor* (during the 1999-2001). Lizards were collected from Karachi University campus and kept in glass-fronted wooden vivarium. Two different concentrations of cypermethrin and malathion 0.1 and 1% were used. At 24 h of post treatment animals were dissected, thereafter, liver, kidney and brain were taken out for GOT and GPT estimation. GOT and GPT activities were estimated by Randox Kit No. 146. This method is based on Reitman and Frankel (1957).

Results

The cypermethrin and malathion were applied against *C. versicolor* employing one μl of 0.1 and 1% concentrations per lizard. The GOT and GPT activities were estimated in liver, kidney and brain at 24 h of post treatment. A batch of untreated (control) was also kept for comparison. These activities were decrease of GOT upto 33 and 37% in liver, 23 and 66% in kidney and 38 and 61% in brain under the effect of cypermethrin (Table 1). In the case of malathion the decrease of GOT activity was found as 26 and 33% in liver, 30 and 44% in kidney and 28 and 46% in brain (Table 2). Under the effect of cypermethrin an average decrease in GPT upto 23 and 31% in liver, 26 and 42% in kidney and 2.47 and 11% in brain (Table 3), while under the treatment of malathion the decrease of GPT activity was found as 21 and 23% in liver, 25 and 27% in kidney and 11 and 20% in brain (Table 4), respectively.

Discussion

The great majority of pesticides there is no information reported on hazards to lizards. Induced effects of cypermethrin and malathion on *C. versicolor* are not yet available nor any information is reported in Pakistan. In this study it was observed that the activities of GOT and GPT of liver, kidney and brain decreased after cypermethrin and malathion treatment. All pesticides reduced enzymatic activity in wildlife species so far reported. Parson *et al.* (2000) observed the effect of pesticides on non-target wildlife species. These pesticides inhibited enzymatic activity. Azmi (1992) indicated that DDT, malathion and cyfluthrin (solfac) significantly effected the GOT and GPT enzymes activity in the subject animal. DDT, malathion and solfac inhibited the enzyme activity and present results confirm the results of earlier reports. In this study these activities were decrease upto 33 and 37% in liver, 23 and 66% in kidney and 38 and 61% in brain of GOT under the effect of cypermethrin. In the case of malathion the decrease of GOT activity was found as 26 and 33% in liver, 30 and 44% in kidney and 28 and 46% in brain. Under the effect of cypermethrin an average decrease in GPT upto 23 and 31% in liver, 26 and 42% in kidney and 2.47 and 11% in brain, while under the treatment of malathion the decrease of GPT activity was found as 21 and 23% in liver, 25 and 27% in kidney and 11 and 20% in brain, respectively. Azmi *et al.* (1999) studies the effect of neem fraction and inhibition was found to be 44.84% for GOT. Khan *et al.* (1999) reported that cypermethrin reduced the GOT and GPT activities. Khan *et al.* (2002) studied the induced effect of Biosal on Agamid lizard and reported the reduction in GOT was found as 13.06 and 18% in kidney and 39.53 and 52.61% in liver and inhibition of GPT was as 25 and 37% in kidney and 28.17 and 33% in liver under the effect of Biosal. These results are in agreement with present work. This Study indicated that cypermethrin and malathion are significantly effected and decrease the activities of GOT and GPT in *C. versicolor*. On the basis of the

Corresponding Author: Muhammad Zaheer Khan, Department of Zoology (Wildlife and Fisheries), University of Karachi, Karachi-75270, Pakistan

Table 1: Activity of glutamate oxaloacetate transaminase (GOT) in liver, kidney and brain of agama lizard *Calotes versicolor*, treated with cypermethrin

Conc. of cypermethrin	O.D. x 100	Mean (U/l)	S.D. (±)	S. E. (±)	Range at 95% confidence limit	% Inhibition
Liver						
Control	4700					
	4100	4300	346.410	200.005	3908-4692.009	00
	4100					
0.1%	2300					
	2700	2866	665.832	384.87	2111.65-754.34	33
	3600					
1%	2300					
	2700	2700	400.00	231.21	453.17-2478.03	37
	3100					
Kidney						
Control	2700					
	2700	3000	519.615	300.00	2412-3588	00
	3600					
0.1%	1900					
	2300	2300	400.00	231.21	453.17-1846.82	23
	2700					
1%	700					
	1000	1000	300.00	173.41	660.11-1339.88	66
	1300					
Brain						
Control	3100					
	2700	3133	450.92	260.65	2622.16-3643.87	00
	3600					
0.1%	1900					
	1600	1933	351.18	202.99	1535.13-2330.86	38
	2300					
1%	700					
	1300	1200	458.25	264.88	680.83-1719.16	61
	1600					

Table 2: Activity of glutamate oxaloacetate transaminase (GOT) in liver, kidney and brain of agama lizard *Calotes versicolor*, treated with malathion (time 24 h)

Treatments	Mean	S.D.(±)	S.E.(±)	Range	% Inhibition
Liver					
Untreated	393.33	280.0910	161.9023	76.01-710.65	00
Treated (0.1%)	330.00	244.2334	141.1754	54.00-606.69	26
Treated (1%)	300.00	218.4032	126.2446	275.57-547.43	33
Kidney					
Untreated	566.66	403.6632	233.3313	108.68-1023.3	00
Treated (0.1%)	393.33	280.0910	161.9023	76.01-710.65	30
Treated (1%)	313.33	226.1068	130.6976	106.20-569.49	44
Brain					
Untreated	503.33	357.5485	206.6754	98.26-908.40	00
Treated (0.1%)	360.00	236.0084	136.4210	92.62-627.38	28
Treated (1%)	270.00	195.0640	112.7538	49.003-498.997	46

Table 3: Activity of glutamate pyruvate transaminase (GPT) in liver, kidney and brain of agama lizard *Calotes versicolor*, treated with cypermethrin (time 24 h)

Conc. of cypermethrin	O.D. x 100	Mean (U/l)	S.D. (±)	S.E. (±)	Range at 95% confidence limit	% Inhibition
Liver						
Control	9400					
	9400	9200	346.410	200.23	8807.54-9592.45	00
	8800					
0.1%	9400					
	9400	7033	7033.33	4065.51	935.39-15001.39	23
	8800					
1%	9400					
	9400	6333	2655.811	1535.151	3324.10-9341.89	31
	8800					
Kidney						
Control	7200	6700	500.00	289.01	6133.54-7266.45	00
	6200					
	6700					

Table 3: Continue

0.1%	4800					
	4800	4933	4933	2851.44	655.82-1051.82	26
	5200					
1%	3400					
	3900	3866	450.92	260.65	3355.12-4376.87	42
	4300					
Brain						
Control	5200					
	5700	5366	288.67	222.05	4930.78-5801.21	00
	5200					
0.1%	5200					
	5700	5233	950.438	549.386	4156.21-630.97	2.47
	5200					
1%	5200					
	5700	4766	450.924	260.650	6133.54-7266.45	11
	5200					

Table 4: Activity of glutamate pyruvate transaminase (GPT) in liver kidney and brain of agama lizard *Calotes versicolor*, treated with malathion

	Mean	S.D.	S.E.	Range	% Inhibition
Liver					
untreated	900.00	637.3382	368.4035	177.94-1622.06	00
Treated (0.1%)	703.33	498.1735	287.9610	138.929-1267.731	21
Treated (1%)	686.66	486.4134	281.1638	135.59-1237.73	23
Kidney					
untreated	703.33	464.6793	268.6007	176.88-1227.78	00
Treated (0.1%)	670.00	476.3926	275.3715	130.28-1209.72	25
Treated (1%)	653.33	462.8821	267.5619	128.91-1177.75	27
Brain					
untreated	736.66	521.7106	296.4265	155.67-1317.65	00
Treated (0.1%)	636.66	451.1253	260.7660	125.571-1147.749	11
Treated (1%)	570.00	367.6955	212.5407	153.43-986.578	20%

present studies it is concluded that cypermethrin (pyrethroid) and malathion (organophosphate) are toxic to lizards and reduces the enzymatic activities.

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