Advance Research in Agriculture and Veterinary Science
Adv. Res. Agri. Vet. Sci. Vol. 1, No. 1, 2014: 31-34
Academy for Environment and Life Sciences, India
Available at www.aravs.org

ORIGINAL ARTICLE

STUDY OF BIOCHEMICAL TOXICITY OF NUVAN IN CHANNA *PUNCTATUS* (BLOCH.)

Kumar S and Gautam RK*

Department of Zoology, School of life sciences, Khandari campus, Dr. B.R.A. University, Agra-282002, Utter Pradesh

KEYWORDS
Nuvan,
Channa punctatus,
Biochemical parameters,
Toxicity .

Article History:
Received on
20 Jan 2014

Accepted on
27 Jan 2014

Published on
10 Feb 2014

ABSTRACT: Nuvan (DDVP) used organophosphate used in agriculture as insecticides the concept of green revolution is mainly based on chemical fertilizers and synthetic insecticides. Organophosphate (OP) insecticides today account for approximately 80% of registered synthetic insecticides. Nuvan has been taken for the acute toxicity to a fresh water fish channa punctatus LC50 value calculated for the acute toxicity, which was 0.024 ml/L. Biochemical study of kidney Glycogen, Protein profile, Lipid profile, Glutamate pyruvate transminase (GPT), Glutamate oxaloacetate transminase (GOT), Alkaline phosphate (ALP and acid Phosphatase (ACP) after 24h, 48h, 72h and 96hour exposure to lethal toxicity of Nuvan. The observation is very important from biochemical point of view.

INTRODUCTION

Unprecedented growth in human population has posed a serious problem to fulfill the requirement of sufficient amount of food to every citizen of the country. The use of crop -protecting toxicants and pesticides now become a necessity of farmers. But, when chemicals, fertilizers and pesticides, applied on the field, its effect on survival, growth, metabolism and reproduction on non targeted organism. The fish is a good indicator and highly sensitive in such ecosystem where the water gets contaminated to toxic chemicals. Nuvan belong to widely used organophosphorous group of insecticides, which is a broad group of pesticides. It hazardous chemical has been known to accumulate in fishes tissue and other edible organisms have a chance to reach the predators like birds and man through food chain. The present study is an attempt to estimate the biochemical changes in kidney of fresh water fish *channa punctatus.*

MATERIALS AND METHODS

Fish C*hanna punctatus* were collected from the local fish market of Agra, district (U.P.).The average length and weight of fish is 12-15 cm and 60-70 g respectively. They were kept in glass aquarium (75 x 37.5 x 37.5) capacity 25 liter, having non chlorinated tap water aquaria bath 1% $KMnO_4$ solution for disinfection. The fish were acclimatized for one week before examination. The water used for toxicity test contained 20-25^oC and 7.2 pH during acclimations they were feed market food or egg yolk twice in a day. Feeding was stopped 24 hr before starting the experiment. Dead fish (If any) was removed from aquaria as soon as possible to avoid water fouling and water was changed after 2 or 3 days. Nuvan (DDVP) from Syngenta India Ltd. was use for present study. Five aquaria were set up for each concentration and each aquarium contained six fish in 25 L dechlorinated water. The data was analyzed statistically by log dose /probit regression line method, which was calculated 0.024ml/L. One control group of healthy fish was maintained simultaneously. The kidney was removes from live fish from each group after completion of exposure time. The biochemical parameters estimated by, Glycogen (Montgomery, 1957), total protein (Dumas *et al.*, 1971), total lipid (Folch *et al.*, 1957), total cholesterol (Wybenga *et al.*, 1970), high density lipoprotein (Warnick *et al.*, 1985), low density lipoprotein (FriedWald *et al.*, 1972), triglycerides (McGowan *et al.*, 1983) methods respectively.

Corresponding Author: Gautam RK, Department of Zoology, School of life sciences, Khandari campus, Dr. B.R.A. University, Agra-282002, Utter Pradesh. **E-mail**: suzootak@Gmail.com

RESULTS AND DISCUSSION

The comparative data of the biochemical parameters of both and control and experimental fishes have been summarized in the Table (1). The result indicates that there is a significant decrease in the glycogen contents in kidney as the concentration and exposure time increased.

Table 1: Biochemical parameters in kidney of *Channa punetatus* after Nuvan intoxication

S. No.	Parameters (mg/g)	Control	24h	48h	72h	96h
1.	Glycogen	0.9805	1.6237*	1.8262**	1.9089***	1.9731***
2.	Total Protein	0.6570	0.8746*	0.8690**	0.9578**	0.9835***
3.	Albumin	0.2106	0.4241**	0.4892***	0.3748***	0.3030***
4.	Globulin	0.2842	0.3424*	0.3259**	0.2304***	0.2400***
5.	A/G ratio	0.312	0.0315*	0.0377*	0.0687**	0.0758**
6.	Total lipid	1.4311	1.7945*	1.8165*	1.9478***	1.9831***
7.	Cholesterol	0.5119	0.7267*	0.7945***	0.8132***	0.9034***
8.	HDL	0.6127	0.5562*	0.3291**	0.2650***	0.1989***
9.	LDL	0.3460	0.3787**	0.1614***	0.2240**	0.1785***
10.	TG	0.3242	0.3489**	0.4745***	0.4968***	0.5167***
11.	VLDL	0.3470	0.2465***	0.2856***	0.3598***	0.4867***

S. Em. = Standard Error of Mean
*Non-significant ($p<0.5$)
** Significant ($p<0.1$)
*** Highly signifificant ($p<0.01$)
****Very highly significant ($p<0.001$)

The similar finding has been reported by Murthy and Devi, (1982) as observed loss of glycogen in *Channa punctatus* due to acceleration of stored glycogen breakdown in to glucose by active glycogenolysis to meet energy demands to contract to pesticide through due to the insecticide Malathion toxicity which effected carbohydrate metabolism. Singhal and Sharma, (1994) have been observed same result due to decrease rate of glycogenesis after the exposure of mercuric chloride. Kumar *et al*., (1996) and Joshi and Kumar, (1986) reported decrease kidney glycogen in *Channa gachua* (Ham.) due to over come the stress of pollution after dithane M-45 intreaction. Jha, (1999) in fresh water fish *Clarias batracus* due to house hold detergent stress. Gautam and Gautam, (2001) has reported after the pesticide exposure in carbohydrate metabolism. Soranaraj and Singh, (2002) massive reduction of tissue glycogen indicate that rapid utilization of glycogen possible throw an ascorbic glycolysis to meet the energy demands under detergent stress conditions. Neethirajan and Mathavan, (2004); Rita and Milton, (2006) and Rani *et al*., (2008) reported declined level of glycogen in the fresh water fish *Labeo rohita* due to Nuvan toxicity. Ghosh, (1985) reported depleted tissue glycogen in *Cirrhina migla* due to rapid utilization of reserved glycogen to compensate energy requirement during xenobiotic stress condition.

In the present investigation in kidney tissue protein profile decreasemeant in whole exposure duration, this result has been supported by Tilak *et al*., (2004) in *Catla catla*, *Laebo rohita* after sub lethal concentration, glyconeogenesis pathway for the synthesis of the glucose or due to less synthesis of necessary protein, there by ring detoxification mechanism less efficient and thus making recovery slow at sub lethal concentration. Ramamurthi, (1988) and Sastry and Siddiqui, (1984) reported decreased protein in *Channa punctatus* after the exposure of pesticide due to the increased energy demands for the compensation of stress. Yeragi *et al*., (2000) analysed decrease protein in crab mussels due to increased photolytic activity in tissues after pesticide exposure. Rita and Milton, (2006) analysed the depletion of total protein in all tissues due to the pesticide (Methomyl) in the fresh water cichlid *Oreochromis mossambicus*. Redy and Bashamohideen, (1988) reported decrement protein level in *cyprinus carpio* exposed to cypermethrin. Rani *et al*., (2008) reported very significant decline in protein due to increased utilization of energy in all tissue repairing and damaged tissue in fresh water fish *Labeo rohita* due to Nuvan intoxication. Maruthanayagan and David reported decreased protein level in kidney due to detergent and malathion stress in fresh water fishes. Similar finding have supported by Dalela *et al*., (1981); Dubale and Awasthi, (1982) and Rao and Rao, (1984) observed decreased protein in fresh water fishes due to pesticide exposure. Redy and Bashamohideen, (1995) reported decreased protein in different fishes due to sub lethal concentration of pesticide. Gautam and Gautam, (2001) and Gautam and Gautam, (2003) reported decreased in basic protein in *Channa punctatus* due to endosulfan and diazinon exposure.

In a lipid profile, total lipids are broadly as any fat soluble, naturally occurring molecules, such as fats, oils steroids, fat soluble vitamins etc. Cholesterol is an unsaturated steroid alcohol of high

molecular weight. Its mainly synthesized in the liver while the high density lipoprotein (HDL) are synthesized by both liver and intestine and low density lipoprotein is synthesized in the liver only. Very low density lipoprotein is triglyceride rich lipoproteins secreted by the liver and its main function is to distribute the triglyceride produce by the liver. In the present investigation observed kidney tissues lipid profile decrease through the whole exposure periods. Present findings got the support with the finding of Lowry and Sargent in fishes reported the increase lipid metabolism during stress condition. Sadadamani and Kalamani giving the same result in *channa punctatus* due to increase utilization of the lipids under stress condition, the free fatty acids are converted into triglycerides in any organism. Rani *et al.*, (2008) reported the same findings in *Labeo rohita* after exposure of Nuvan pesticide due to increase break down of fats in to fatty acids for more energy demand in stress conditions. Murthy and Devi, (1982); Verma *et al.*, (1983); Rao and Rao, (1984) and Kumar *et al.*, (1996) reported decreased lipid in *H. fossilis* due to Malathion exposure which affected lipid metabolism during pesticidal stress condition. Joshi and Kumar, (1986) showed depletion of lipid level in Channa punctatus due to pesticidal effect on metabolic pathway. Jha, (1999) in *Channa gachua* and Kumar, (2000) in *Channa punctatus* and Gautam and Gautam, (2001) in *F.pennanti*, due to inhibited lipid synthesis and started mobilizing the stored lipids either through β-oxidation or through a gradual unsaturated of lipids molecules due to pesticidal exposure. Sornarajan and Singh, (2002) increase hydrolysis of hepatic lipid to compensate stress condition that decrease tissue lipid due to pesticidal exposure. The similar findings have been reported by Sornarajan and Singh, (2002) and Rita and Milton, (2006) who attributed to abnormalities in fat deposit ion in the cells of liver and also changes in lipid contents may be due to cellular level and increases lipolysis of mitochondrial injury which impaired the function of citric acid cycle and affect fatty acid oxidation mechanism due to the pesticidal toxic stress.

REFERENCES

Dalela RC, Bhatnagar MC, Verma SR. In Vivo hematological alterations in a fresh water teleost Mystus vittatus following sub acute exposure to pesticides and their combinations. J Emison boil 1981; 2(2): 79-86.

Dubale MS, Awasthi M. Biochemical changes in the liver and kidney of a cat fish Heteropneustes fossilis exposed to diemthoate. Comp Physiol Ecol 1982; 5: 260-261.

Dumas BT, Wastson W, Biggs MG. Albumin standard and the measurement of serum albumin with bromocresol green. Clim Chim Acta 1971; 31: 87-96.

Folch J, Lees M, Stanley GHS. A simple method for the isolation and purification of total lipids from animal tissues. J Biol Chem 1957; 226: 497-509.

Friedwald WT, Levy RI, Fredickson DS. Estimation of concentration of low density lipoprotein in plasma with out use of the preparative ultracentrifuge. Clin chem 1972; 18: 499-502.

Gautam K, Gautam RK. Diazinon and Endosulfan showed marked decrease in basic proteins in gastrointestinal tract of Channa punctatus. J N Conser 2001; 12(2): 181-184.

Gautam K, Gautam RK. Pesticidal effect on the gastrointestinal proteins of Channa punctatus. J Nakon 2003; 15(2): 331-334.

Ghosh TK. Toxic impact of three organophosphate pesticides on carbohydrate metabolism in a fresh water Indian catfish clarias batrachus. Proc ind Nat Sci Acad 1985; B53(2): 135-142.

Jha BS. Impact of chronic exposure of the household detergent Surf and key on tissue biochemistry of the fresh water fish, Clarius batachus (Linn). Indian J Environ Ecoplan 1999; 2: 281-284.

Joshi N, Kumar S. Some biochemical responses in Paralelphusa mosoniana (Handerson) during sub lithel monocrotophos poisoning. Him J Environ 1986; 10: 83-86.

Kumar R. Biochemical alterations induced by ammonia in India teleost Channa punctatus (Bloch.). Indian J Environ Ecoplan 2000; 3(3): 605-610.

Kumar R, Kumar S, Narain R. Effect of dithane M-45 on biochemical composition in some organs of Channa gachua (Ham.). Him J Environ Pollot 1996; 6: 273-275.

McGowan MW, Artiss JD, Strandbergh DR, Zak B. A peroxidase-coupled method for the colorimetric determination of serum triglycerides. Clin hem 1983; pp:538-542.

Montgomery R. Determination of glycogen. Archives of biochemistry and biophysics 1957; 67(2): 378-386.

Murthy AS, Devi AP. The effect of endosulfan and its isomers on tissue Protein, glycogen and lipid in the fish Channa Punctatus. Pesticide Biochem Physiol 1982; 17: 280-286.

Neethirajan K, Mathavan S. sumidon induced changes on some aspects of metabolism in the chosen tissues of the fresh water cat fish, Mystus vittatus (Bloch.). J Exp Zool India 2004; 7(2): 279-283.
Rani R, Gautam RK, Gautam K, Kumar S. Nuvan intoxication leads protein alteration in kidney of Labeo rohita. J Exp Zool India 2008; 11(1): 113-115.
Ramamurthi K. Impact of hephochloron hematological and selected biochemical parameters in fresh water fish Channa punctatus (Bloch.). Ph.D. Thesis S.V.S. Torupati, India 1988.
Rao PKS, Rao KV. Changes in the tissue lipid profile of fish Oreochromis mossimbicus during methyl parathion toxicity a time course study. Toxicol Left 1984; 21(2): 147-53.
Redy PM, Bashamohideen M. Alteration in protein metabolism in selected tissue of fish Cyprinus carpio during sub lethal concentration of cypermethrin. Environmental monitoring and Assessment 1995; 36: 183-190.
Redy PM, Bashamohideen MD. Toxicity of Malathion to the fresh Cyprinus carpio. Environment and Ecology 1988; 6: 488-490.
Rita JJ, Milton M. Effect of carbonate pesticide lannate (methonyl) on the biochemical components of the fresh water Cichild Oreochromis mossambicus (eters.). Indian J Environ Ecoplan 2006; 12(1): 263-268.
Sastry KV, Siddiqui A. some hematological ,biochemical and enzymological parameters of a fresh water teleost fish Channa punctatus exposed to sub lethal concentrations of quinalphas. Pestic Biochem Physiol 1984; 22: 8-13.
Singhal KC, Sharma G. Biochemical and enzymatic changes induced by lead exposure in Heteropneutes fossilis, A fresh water cat fish. Ad Bios 1994; 12(1): 101-110.
Sornarajan R, Singh AJA. Influence of commercial detergents on biochemical and physiological responses of a fresh water air breathing fish Channa punctatus. Ad Biol 2002; 21(1): 23-24.
Tilak KS, Veeraiah K, Koteswara Rao D. Biochemical changes induced by chlorpyrifos, an organophosphate compound in sublithal to fresh water fish Catla catla, Labeo rohita and Cirrhinus mrigala. J Environ Biol 2004; 26(2): 341-347.
Verma SR, Rani S, Tonk IP, Delala RC. Pesticide induced dysfunction in carbohydrate metabolism in three fresh water fishes. Environmental Research 1983; 32: 127-131.
Warnick GR, Ngugan T, Albers A. A comparison of improved precipitation methods for quantification of high density lipoprotein cholesterol. Clin chem 1985; 31: 217-22.
Wybenga DR, Pileggi VJ, Dirstine PH, Di Giorgio J. Direct manual determination of serum total cholesterol with a single stable reagent. Clin chem 1970; 12: 980-984.
Yeragi SG, Koli VA, Yeargi S. Effect of pesticide malathion on protein metabolism of the marine crab Uca merionis. J Ectorocol Environ Monit 2000; 10(1): 59-62.