International Journal of Zoology Studies
ISSN: 2455-7269
Impact Factor: RJIF 5.14
www.zoologyjournals.com
Volume 3; Issue 2; March 2018; Page No. 287-288

Effect of acute dichlorvos (Nuvan) toxicity on muscle protein concentration of fresh water prawn, *Macrobrachium lamarrei lamarrei* (H. Milne Edwards, 1837)

Mohd. Waseem, Shabnam Banoo, Nahila Sujad, Sabiha Shapoo
Department of Zoology & Applied Aquaculture, Barkatullah University, Bhopal, Madhya Pradesh, India

Abstract
The aim of Present study was to investigate the effect of acute toxicity of Dichlorvos on total protein content in muscles of freshwater prawn *Macrobrachium lamarrei lamarrei.* Dichlorvos (2, 2-dichlorovinyl dimethyl phosphate), an organophosphate compound, which is commonly used as an agricultural insecticide. It is extremely toxic to non-target organisms like shrimps and other organisms of aquatic habitat. The effect of dichlorvos on total proteins in muscle was estimated in *Macrobrachium lamarrei lamarrei.* The prawns were randomly selected and stocked at the rate of 30 prawns per aquarium in two glass aquaria for the experimental runs. Prawns were exposed to 0.0075ppm dichlorvos for 96 hours. The total protein level was measured as (0.78mg/ml) at 0^{th} day, (0.66mg/ml) at 15^{th} day, (0.41mg/ml) at 30^{th} day and (0.13mg/ml). The muscle proteins decreased consequently as compared to control group during the period of investigation.

Keywords: Dichlorvos, muscle proteins, pesticide, toxicity, *Macrobrachium lamarrei lamarrei*

Introduction
Dichlorvos belongs to one of the class of insecticides referred to as organophosphates. They are esters derived from phosphoric acid. Organophosphates affect the central nervous system by inhibiting the enzyme, acetyl cholinesterase [1], an enzyme responsible for proper functioning of nervous system. The symptoms include, loss of reflexes, headache, dizziness, nausea, convulsions, coma leading to death [2]. Organophosphorus compounds are most commonly used in agriculture, most are insecticides and miticides, their way of joining these organizations is by ingestion and contact. They are used in vegetable crops, fruit trees, grains, cotton, sugarcane, among many others.
Protein is one of the important biochemical components and plays an important role in metabolic pathways and biochemical reactions. Under extreme stress conditions, the energy will be supplied by the protein for these reactions. Therefore, an assessment of the total protein content in different tissues could be used as a diagnostic tool for determining the physiological status of an organism [3].

Macrobrachium lamerii lamerii, constituting the major fishery in India, is in great demand in world market as its muscle is a protein-rich natural resource for human consumption. In the present study, the effects of an organophosphate insecticide, dicholrvos (nuvan), on muscle proteins is being studied.

Materials and Methods
The prawns were purchased from local fish market of Bhopal near Upper Lake and were brought to laboratory in live oxygen bags and then acclimatised (14 days). Prawns were kept in two aquaria, one group which was exposed to insecticide Dichlorvos (marked as experimental group) and second group that was maintained on natural feed of planktons (marked as control).
LC50 of Dichlorvos came out to be 0.0075ppm after 96 hours. After maintaining the LC50 prawns were sacrificed at 0^{th}, 15^{th}, 30^{th} and 45^{th} day and their fresh muscles were dissected out for protein estimation. Biuret protein estimation protocol was followed during the protein estimation test.

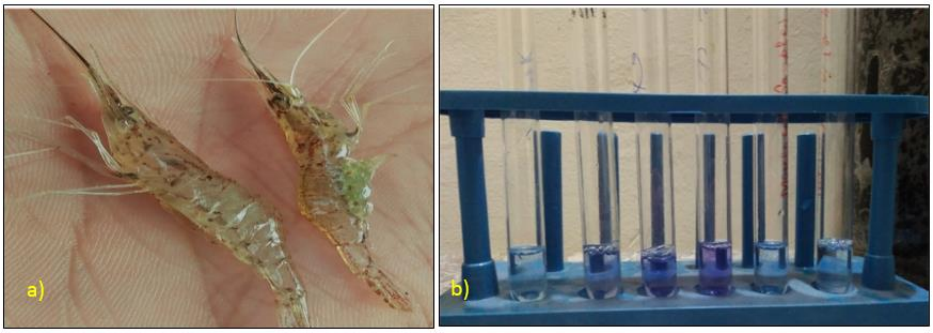

Fig (a): External morphology of male (left) and female (right) fresh water prawn *Macrobrachium lamarrei lamarrei.* (b) Arrangement of test tubes: s- blank, standard 1, standard 2, standard 3 and sample respectively (from left) following biuret method of protein estimation

Observations

Changes in Behaviour

The swimming behaviour of prawns was noticed after dichlorvos treatment and compared to control prawns, following changes were recorded.

1. Loss in swimming.
2. Change in colour from transparent to bluish green.
3. Swimming imbalance and trimmers in legs.
4. Rapid swimming just after introduction of the toxicant.
5. A quick response in the form of increased movement and increased chelepede scrapping of body parts was observed just after introduction into the test medium.
6. The increased surface movement was observed in the first few hrs. of experiment which normalized within 24 hrs. of exposure there after animals settled on the bottom of aquaria.

Table 1: physicochemical parameters of water used in the experiment [4]

S. No	Parameters	Range
1.	Temperature	24 - 27^{0}C
2.	pH	7.4 – 8.1
3.	Dissolved oxygen	5.5- 7.0 mg/l
4.	Free carbon dioxide	0 – 2 mg/l
5.	Alkalinity	32 – 98 mg/l
6.	Total hardness	158 - 311

Toxicity test for 96 hours

Table 2

Dose in ml/l %age	no. of prawns taken	no. of prawns died
5	10	-
10	10	2
15	10	3
20	10	5
50%		

Effect of the insecticide dichlorovos on protein concentration of muscle of fresh water prawn *Macrobrachium lamareii lamareii* was recorded by using biuret test method described by Dumas.

Total protein concentration in muscles was calculated by the following formula:

$$\text{Total protein (mg/dl)} = \frac{optical\ \ density\ \ of\ test\ sample}{optical\ \ density\ \ of\ standard\ \ protein} \times conc.of\ standard(20\mu l)$$

Result

The values recorded at different intervals are given below (Table 2):

Table 1: Variation in total muscle protein concentration of fresh water prawn *Macrobrachium lamarrei lamarrei* when exposed to sub lethal concentration of Dichlorvos (0.0075ppm).

Table 3: Tissue Exposure period (days)

	0th (control)	15th	30th	45th
Muscle protein	0.78mg/dl	0.66mg/dl	0.41mg/dl	0.13mg/dl

Discussion

The protein concentration of experimental group of prawns showed a significant decrease as compared to control group. Because muscles are very often involved in various movements and metabolic processes at the cost of energy. By adding these insecticides, these chemicals increase muscular activity which leads to protein degradation and breakdown.

Conclusion

From present study, it can be concluded that Dichlorvos is highly toxic insecticide which affects protein content in muscles of *Macrobrachium lamarrei lamarrei*. This toxin causes alteration in metabolism of economically important prawn and other freshwater species.

Acknowledgement

The authors are very thankful to Almighty and acknowledge Dr. Vipin Vyas, Head of Department of Zoology and Applied Aquaculture, Barkatullah University Bhopal for providing laboratory and library facilities during the course of experiment and preparation of manuscript.

References

1. Sorgob MAY, Vilanova E. Enzymes involved in the detoxification of organophosphorus, carbamate and pyrethroid insecticides through hydrolysis. Toxicol. Lett. 2002; 128:215-228.
2. Sulbatos LG. Mammalian toxicology of organophosphorus pesticides. Journal toxicology environmental health. 1994; 43:271-289.
3. PMD Prasanth, Arivoli. Biochemical study of freshwater fish *Catla catla* with reference to mercury chloride. Iran. J Environ. Health Sci. Eng. 2008; 3:109-116. (Journal style).
4. APHA. Standard methods for the examination of the water and waste water 20th Edition. American Public Health Association, Washington Aquaculture Engineering. 1995; 19:119-131.