Biospectra : ISSN: 0973-7057, Vol. 15(2), September, 2020, pp. 105-108
An International Biannual Refereed Journal of Life Sciences

22(AS).
Animal Science

ISSN : 0973-7057

Int. Database Index: 663 www.mjl.clarivate.com

The evaluation of toxic effect (LC_{50}) of agrochemicals on freshwater snail *Pila globosa*.

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Received : 21st April, 2020 ; Revised : 18th May, 2020

Abstract-The research work helps us to understand the influence of agrochemicals on aquatic organisms, especially the gastropods. The result of this study will help in application of histopathology and biochemistry as a tool for the diagnosis of normal health condition of aquatic organisms, which will directly influence human health and economy.

Keywords : *Clarias batrachus,* endosulfan, serum total protein, serum albumin, nephrotoxicity.

INTRODUCTION

Agricultural chemicals were introduced in the Indian market soon after the Second World War. Application of organochlorines such as DDT and HCH started during the late forties and early fifties, followed rapidly by organophosphates, carbamates in 1960's and 1970's. A comparatively large-scale use of synthetic pyrethroids began in the country only by 1980's. The ability of organochlorine insecticides to accumulate in fat tissue and their stability in the environment has led to limiting their use in pest control programmes. However the use of chemical pesticides will continue as agriculture is one of the largest and most important sectors of our economy. About 70% of the people depend upon agriculture, which contribute to 40% of the national income and 35% of the total export.[1] Moreover, the estimated requirement of food in India in the year 2000 is 220M tonnes.

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Insecticides only account for over 70% of total pesticide usage in India. Out of about 32 insecticides used in Indian agriculture in (1983-83, more than 18 were organophosphates, accounting for total 13,000M. tonnes technical grades.[2] With the growing resistance of adult mosquitoes to DOT and HCH, the use of degradable insecticides like malathion, fenitrothion, temephos etc. increased considerably. Out of 10 vectors of malaria, *Anopheles culicifacies* which causes 70% of malaria in the country is resitant to DOT, BHC and malathion in states like Gujarat, Maharashtra, Punjab and Haryana.[3] Although toxic effects of Fenthion or Lebaycid have been studied by using fish as test animal[4-6] information available on the toxic effects of Fenthion on aquatic invertebrates especially, bivalve molluscs appears to be scanty. Mane *et. al.* (1986)[7] have studied acute toxicity of Fenthion to fresh water *Lamellibranch molluscs, Indonaia caeruleus* and reported the biochemical changes produced in the bivalve

MATERIALS AND METHODS

Acute toxicity test:

The snails, *P.globosa* were selectively obtained from local fish market where they arrive from different areas. The live snails were acclimated to the laboratory conditions for 2 to 3 days before being used for experiment. Only those stocks of animals in which mortality was less than 10% during acclimation were used for experimental purpose. The snails were not fed during the experimental period.

During the test period, clean glass aquaria measuring 37x22x22 cm. were used as the test containers. In each aquarium 10 snails of more or less uniform size and weight were kept in 1 liter of preaerated water. The water was subjected to a routine analysis to record its physico-chemical properties such as temperature, dissolved oxygen and pH by using the standard methods. The average values of all these parameters thus studied are given in Table 1. the water of appropriate test concentration and of the controls was renewed twice in a day at an approximate interval of 12-13 hours. Before changing the water the mortality and behaviour of surviving animals was recorded. The animals were exposed to natural diffused daylight during daytime and care was taken so as to avoid any visual or mechanical disturbance to the animals.

Acute toxicity tests were carried out over a period of 96 hours. Standard solution of the insecticide Rogor was prepared by dissolving technical grade Rogor obtained from RALLIS India Ltd., Bombay in A.R. grade acetone (10 mg/ml). Aliquots of this stock solution of the insecticide were added to the water in the test aquaria to obtain the required concentrations. As mentioned, the water of respective test concentrations was replaced after every 12 to 13 hours after recording the mortality of the animals.

During the acute toxicity test the changes in the behaviour of the animals if any were noted down during the day-time. The percentage of dead and surviving snails was noted down before changing the water during the period of 96 hours. After recording the mortality the dead snails were removed from time to time. Complete cessation of respiratory and other movements, absence of any response to prodding with a glass rod etc. were the criteria for death. The acute toxicity results in terms of 24, 48, 72 and 96 h LC_{50} values were tabulated These LC_{50} values of Rogor for *Pila globosa* were calculated by graphical interpolation. The 95% confidence limits of LC_{50} values and slope functions were calculated according to the normographic method given by Litchfield and Wilcoxon (1949)[8] (Table 1)

RESULTS AND DISCUSSION

The LC_{50} Values of Rogor for *Pila globosa* were found to be 34.0 mg/L 12.0 mg/L , and 5.4 mg/L and 3.0 mg/L for a period of 24 h, 48h, 72h and 96 h respectively. No mortality was observed in the control tanks during the test period.

In the control group, the snails after immersion in the fresh water extended the siphons and foot circulated the water within 5- 10 minutes. These always secreted mucus and excreted faecal and pseudofaecal material. All snails in the control group survived throughout the experiment. In the text concentrations the snails tightly close the shell for about first 24 hours to prevent the penetration of the pesticide medium. But later on the snails had to loosen the shells for fresh entry of the water for respiration and filtering the food and the pallial muscles or mantle border could be seen along the free margins of the shells, the siphons and foot were extended slowly in the surrounding water. In the higher concentrations the shell remained closed for a longer time then the lower concentrations. In low test concentrations the snails could open the shells more or less like the control group of snails after second day of exposures. The snails later on widely opened the shells in relation to the increasing concentrations and time of exposure. These snails did not close the shell valves even after a gentle mechanical stimulus (prodding with the glass rod). There was a lot of mucus secretion and exfoliation observed in the experimental tanks. The total mortality at the end of 24h, 48h, 72h and 96h was recorded in different test concentrations and the LC_{50} values, slope functions and 95% confidence limits were calculated.

Studies on the behavioural aspects have been reported by Holden (1970)[9] in case of fishes and in case of invertebrates by Scherer (1976)[10] and their effects on the survival of aquatic organisms have been discussed. Behaviour reflects the integration of many biochemical and physiological processes. Such behavioural studies have been rarely reported in case of lamellibranch molluscs.[11] It has been reported earlier by Ranade (1964)[12] and many others that the bivalves close their valves during unfavourable conditions. Sathe (1989)[13] and others have noted down similar observations while studying the toxicity of different pollutants to snails and noted the significant different between 24h and 96h LC_{50} values.

Table 1.1 : LC_{50} values of fenthion for *Pila globosa*

Methods	24h	48h	72h	96h
LC_{50} (Mg/L)	34.0	12.0	5.4	3.0
95% C.I.	49.851-23.189	18.377-7.836	8.270-3.526	3.693-2.437
Slope F	2.396	2.762	2.646	1.699

Water characteristics:	Temperature	-	28±2^{0}C
	pH	-	7.6±0.2
	Dissolved oxygen	-	6.6±0.4 mg/L
	Size of the snail	-	35±0.5 mm
	Weight of the snail	-	12±1 gm with shell.

CONCLUSION

In the present text, therefore, an attempt has been made to study the toxicity of Rogor the freshwater edible Snail, *Pila globosa* commonly found in north India, exhibits fresh ponds banks Steams Rivers, paddy fields. The results of the acute toxicity tests conducted during the present investigation revealed that these snails can tolerate the presence of high concentration of Rogor in surrounding water for a short period due to their ability to close the shell tightly. However, after 96 hours, Rogor concentration ten times lower than that for 24 hours is sufficient to kill 50% of the animals.

ACKNOWLEDGEMENT

Authors are thankful to Department of Biochemistry and Department of Zoology, Patna University, Patna and P.G. Department of Zoology, A.N.College, Patna, Bihar for providing necessary equipment's to complete the entire research works.

CONFLICT OF INTEREST

Authors declare no conflict of interest regarding publication or any other activity related to this article.

REFERENCES

1. **Ramachandran. 1993**. Through personal communication: Nuclear Agriculture Division (NAD) BARC, Bombay.
2. **Shroff K.C and Vashi. S.R. 1984.** Contribution of organophosphates in the control of pests of pests in India. In: Proceedings of the lecture series on "Recent advances in Plant protection Chemicals" Bombay, 21st Dec., 1984. Indian chemical Manufacturer's Association, Bombay. Proceedings First International Symposium on Global monitoring of the oceans, MONO, Talin, USSR, pp. 168-184.
3. **Babu. C.J 1992.** Vectory borne diseases of human beings and their management in India; pp 118-124. In: "Pest Management and pesticides: Indian Scenario" (Ed.) B. Vasantharaj David. Namratha Publications, 1992, pp-384.
4. **Jauch D. 1979.** Gill lesions in Cichlid fishes after intoxication with the insecticide fenthion. *Experientia Specialia.* **35(3):**371-372.
5. **Soman S. 1987.** Some observations on the toxicity of the insecticides Lebaycid® 1000, to the freshwater fish Colisafasciate=a (Schneider) Ph.D. Thesis, Univ. of Bombay.

6. **Gopi L. 1992.** Chronic toxic effects of fenthion- the organophosphorus insecticide to common freshwater carp *Cyprinus carpio* (Linn). Ph.D. Thesis, University of Bombay.

7. **Mane U.H., Akarte S.R and Kukarni D.A.1986.** Acute toxicity of Fenthion to freshwater *Lamellibranch molluse*, *Indonala caeruleus* (Prashad 1918), from Godavari River at Paithan- *A Biochemical Approach. Bull. Environ. Contam. Toxicol.* **37:**622-628.

8. **Litchfild J. T. Jr. and Wilcoxon F. 1949.** A simplified method of evaluating dose effect experiments. *J. Pharmacol. Exp. Ther.* **96:** 99- 113

9. **Holden A. V. 1970.** International Co-operative study of organochlorine pesticide residuts in terrestrial and aquatic wild life, 1967-1968. *Pestic. Monit. J.* **4:** 117-135.

10. **Scherer E. 1976.** Behvioural Assay - Principles, results and problems. Proc. 3rd Aquatic Toxicity Workshop, pp 33-40.

11. **Mane U. H. and Muley. 1984.** Acute Toxicity of the Endosulfan 35EC to two freshwater bivalve molluscs from Godavari River at Maharashtra State, India. *Toxicol Letters.* **23:** 147-155.

12. **Ranade M.R. 1964.** Studies on the biology, ecology, psysiology of the marine clams. Ph. D. Thesis, University of Biology.

13. **Sathe M.C. 1989.** The study of effect of the organophosphate insecticle - Lebaycid 1000 on the marine edible clame, *Katelysia opima* (Gmelin). M. Phil. Dissertation, University of Bombay.

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