RESEARCH PAPER | Zoology | Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

Alterations in Lipid Contents of Fresh Water Bivalve, *Lamellidens marginalis* Exposed to Thiamethoxam

KEYWORDS: *Lamellidens marginalis*, thiamethoxam, lipid

Minakshi Rane
Department of Zoology, D. N. College, Faizpur, Tal - Yawal, Dist – Jalgaon- 425 503 (M.S.) India

S. P. Zambare
Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad- 431 005

Bharati Kolhe
Department of Zoology, M.V.P's ACS College, Dindori- 422 009, Tal - Dindori, Dist - Nashik (M.S.) India

Satish Shinde
Department of Zoology, P.G. Research Centre S. S. V. P. S's L. K. Dr. P. R. Ghogrey Science College, Dhule – 424 005 (M.S.) India

ABSTRACT *The aim of the present investigation was to evaluate the effect of pesticides on the lipid contents in foot, mantle, gills, gonads, digestive gland and whole body tissues of freshwater bivalves, Lamellidens marginalis. Lamellidens marginalis were exposed to chronic doses (21 days) of Thiamethoxam (2.579 ppm). The effects were studied and observed into two groups as control and experimental. The dry powders were used for lipid estimation. The results were reported in mg/100 mg dry weight of tissue. In present investigation, the lipid contents were found to be significantly decreased as compared to control. From the results it is also observed that, there was decrease in lipid contents with increase in period of exposure.*

INTRODUCTION

With rapid industrialization and increase in human population, the pollution of water bodies has become a universal phenomenon in the present day world (Bela Prasad, 2008). Excessive use of pesticides has resulted in serious ecological and environmental problems as well as health hazards (Olea and Fernandez, 2007). Exposure to environmental stressors can induce oxidative stress in cells and result in a decrease in reducing potential and metabolic transformation to reactive intermediates (Simmons et al, 2011). Reactive oxygen species (ROS) induce damage to proteins, nucleic acids, and lipids leading to various cellular dysfunctions including apoptosis and necrosis (Simmons et al, 2011).

Sessile lifestyle, resistance to stress, filter feeding mechanism, high accumulation potential of a wide range of contaminants, and suitability as a model for toxicity testing are useful characteristics of fresh water bivalves for biomonitoring studies (Bernal-Hernandez et al, 2010). Biochemical composition in bivalve has been employed as biomarker in several studies that aimed to evaluate the impact of anthropogenic activities in the environment (Nahrgang et al, 2013). Lipids are responsible for variety of functions in molluscs. The lipids represent an energetic reserve because of their high caloric value and are mainly used in chronic stress conditions. In general, lipid generates more heat and energy than carbohydrates. Phospholipids, also called structural lipids, are playing an important role in the cell membrane's formation (Martinez-Pita et al, 2011).

Many workers studied the lipid alterations in various animals after exposure to toxicants (Zambare, 1991; Deshmukh, 1995; Deshmukh and Lomte, 1998; Waykar and Lomte, 2004; Shaikh, 2011).

The present study investigates the effect of Thiamethoxam-induced variation in lipid contents in the various tissues of the fresh water bivalve, *Lamellidens marginalis* after acute and chronic exposure.

Materials and Methods

The bivalves, Lamellidens marginalis were collected from the Hatnur dam situated on Tapi River near Hatnur nearly 35 kms away from Bhusawal, Maharashtra, India. The bivalves were acclimatized to laboratory conditions for 5-6 days prior to subjecting them to experiments. Only healthy and active bivalves were chosen for experiments. Two groups of healthy and active bivalves were formed. One of the two groups was considered as experimental and another was kept as control. The experimental group was exposed to chronic concentration of Thiamethoxam (2.579 ppm) for 7, 14 and 21 days. The control group was treated without pollutant. $LC_{50/10}$ values of 96 hours were used for chronic exposure to Thiamethoxam. The bivalves were dissected and their tissues like foot, mantle, gills and digestive glands were excised and whole body mass of remaining animals was taken. All tissues were dried at 80^0C in an oven till constant weight was obtained. The dried powders of different tissues of control and experimental animals were used for estimation of lipids. Total lipids were estimated by using Vanillin reagent method as given by Barnes and Blackstok (1973).

RESULTS AND DISCUSSION

Table 1 and figure 1 shows changes in lipid levels in different tissues of *Lamellidens marginalis* after chronic exposure to Thiamethoxam.

The lipid contents of different body tissues like gills, gonads, digestive gland, foot, mantle and whole soft body tissues were found to be decreased with increase in the exposure period after chronic treatment of thiamethoxam. In the present study different tissues were selected because different tissues and organs have different activities and metabolic rates and therefore their responses to the same toxicant may be different. The change in lipid contents in studied tissues was due to pesticidal stress indicates the change in activity of an organism.

The biochemical changes occurring in the body gives first indication of stress. It has been reported that acute or chronic treatment of pesticide cause biochemical alterations in the organs involved in detoxification mechanisms (Shobana Rani et al, 2000; Prabhakara and Prasadrao, 2002).

During the stress to overcome this altered situation extra energy is needed. According to Ramana Rao and Ramamurthi (1982) the increased lipase activity to split up lipid stores of the body to meet the increased demand of energy to over-

Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

come the pollution stress ultimate reduction in lipid content. The decrease in total lipid content in almost all organs suggested that the lipid might have been channelized to meet the metabolic demand for the extra energy that is needed to diminish the toxic stress (Patil et al, 1993; Patil et al, 1995).

The results obtained in the present study are in harmony with the observations of different workers as a response to the stress. Deshmukh and Lomte (1998) reported significant decrease in the lipid contents in all tissues of *Parreysia corrugata* after exposure to copper sulphate. Bhavani and Dawood (2003) reported decrease in levels of lipids in the body tissue of *Perna viridis*, due to metal toxicity. Waykar and Lomte (2004) reported significand reduction in the lipid content from soft tissues of freshwater bivalve, *Parreysia cylindrica* after exposure to pesticide. Patil et al, (2011) reported a decrease in lipid content in the foot of a freshwater snail, *Indoplanorbis exustus* exposed to heavy metals.

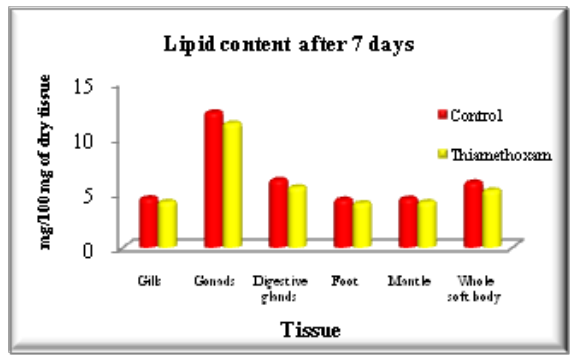
TABLE - 1
LIPID CONTENTS IN DIFFERENT TISSUES OF FRESH WATER BIVALVE, *LAMELLIDENS MARGINALIS* AFTER CHRONIC EXPOSURE TO THIAMETHOXAM. (VALUES ARE IN MG/100MG DRY WEIGHT).

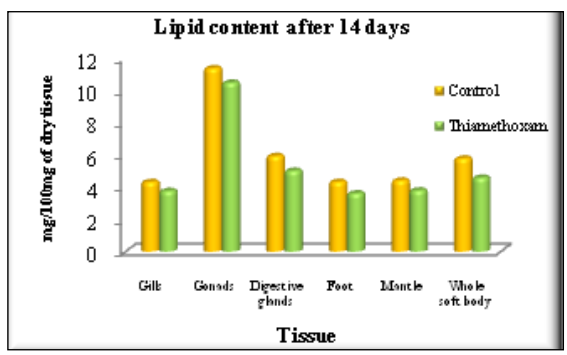
Sr. No.	Tissues	Control		Thiamethoxam (2.579 ppm)		
		7 days	14 days	7 days	14 days	21 days
1	Gills	4.46±0.64	4.31±0.45	4.13±0.54NS (-7.33)	3.76±0.42** (-12.69)	3.42±0.26 NS (-14.92)
2	Gonads	12.25±1.25	11.36±1.03	11.25±1.02NS (-8.20)	10.47±1.33NS (-7.83)	9.46±0.88** (-14.10)
3	Digestive glands	6.12±0.85	5.92±0.25	5.46±0.41NS (-10.80)	5.01±0.32** (-15.37)	4.51±0.45** (-23.65)
4	Foot	4.34±0.23	4.32±0.41	4.01±0.25NS (-7.713)	3.61±0.16* (-16.17)	3.23±0.21** (-24.30)
5	Mantle	4.43±0.51	4.41±0.52	4.11±0.21 NS (-7.10)	3.79±0.25NS (-14.08)	3.42±0.25NS (-21.11)
e6	Whole body	5.90±0.55	5.77±0.46	5.18±0.25 NS (-12.21)	4.58±0.25** (-20.65)	4.05±0.52** (-28.27)

1. Values are expressed as mg/100 mg of dry weight

2. ± indicates S. D. of three observations.

3. NS – Non significant, * - P < 0.05, ** - P < 0.01 4. (+)/(-) indicate % variation over control.





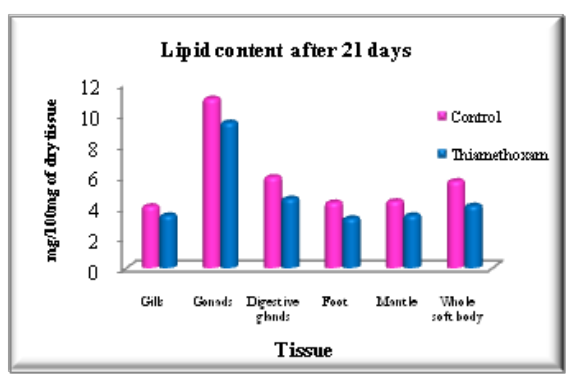


Figure 1- Lipid contents in different tissues of fresh water bivalve, *Lamellidens marginalis* after chronic exposure to Thiamethoxam (Values are given in mg/100 mg of dry tissue).

CONCLUSIONS

It is concluded from this study that, overall decrease in lipid levels in different soft tissues of fresh water bivalve, *Lamellidens marginalis* was due to chronic treatment of Thiamethoxam. It has been also observed that severity of depletion in lipid content was more prominent as the exposure period increases.

Volume : 4 | Issue : 5 | May 2014 | ISSN - 2249-555X

REFERENCE

[1]Barnes, H. and Blackstock, J. (1973). Estimation of lipids in marine animals and tissues. Detail investigation of the sulpho-phosphovanillin method for total lipids. J Expt Mar Biol Ecol, 103-118. | [2]Bela, Z. and Prasad, R. 2008.Impact of pollution on fresh and marine water resources. J Poll Res, 273, 461-466. | [3]Bernal-Hernandez, Y. Y., Medina-Diaz, I. M., Robledo-Marenco, M. L., Velazquez-Fernandez, J. B., Giron-Perez, M. I., Ortega-Cervantes, L., Maldonado-Vazquez, W. A. and Rojas-Garcia, A. E. (2010). Acetylcholinesterase and metallothionein in oysters (*Crassostrea corteziensis*) from a subtropical Mexican Pacific estuary. Ecotoxicology, 19(4), 819-25. | [4]Bhavani, G., and Dawood Shareifs, S. (2003). Bioabsorption of cadmium and mercury by mussel-Perna viridis. Eco Env Conserv, 9(3), 285-289. | [5]Deshmukh, M. (1995). Some physological studies of *Parreysia corrugata* in relation to pollutant stress. Ph.D. Thesis. Dr. B.A.M.U. A'bad. (M. S.) India. | [6]Deshmukh, M., and Lomte, V. S. (1998). Impact of copper sulphate on lipid metabolism of fresh water bivalves, *Parreysia corrugata*. J Ecotoxicol Environ Monit, 8(1), 65-69. | [7]Martinez-Pita, I., I. Hachero-Cruzado, C. Sanchez-Lazo, and Moreno, O. (2011). Effect of diet on the lipid composition of the commercial clam *Donax trunculus* (Mollusca: bivalvia): sexrelated differences. Aquatic Research, 1-11. | [8]Nahrgang, J., Brooksb, S. J., Evenseta, A., Camusa, L., Jonssona, M., Smitha, T. J., Lukinaa, J., Frantzena, M., Giarratanoe, E., and Renaud, P. E. (2013). Seasonal variation in biomarkers in blue mussel (*Mytilus edulis*), Icelandic scallop (*Chlamys islandica*) and Atlantic cod (*Gadus morhua*)-Implications for environmental monitoring in the Barents Sea. Aquatic Toxicology, 127, 21-35. | [9]Olea, N., and Fernandez, M. F. (2007). Chemicals in the environment and human male fertility. Occup Environ Med, 64, 430-431. | [10]Patil, H. Z., Mahale, P. N., and Kulkarni, A. B. (2011). Alterations in the biochemical content in the foot of a freshwater snail, *Indoplanorbis exustus* exposed to heavy metals. Journal of Experimental Sciences, 2(3), 12-14. | [11]Patil, P. N., Chaudhari, T. R., Subhash, M., Deshmukh, S. B., Vedpathak, A. N., and Rao, K. R. (1995). Proc Acad Environ Biol, 4(1), 109. | [12]Patil, P. N., Rao, K. R., Sasane, S. R., Vedpathak, A. N., Shejule, K. B., and Chaudhari, T. R. (1993). Pro Acad Environ Biol, 2(2), 193. | [13]Prabhakara Rao and Prasadrao, P. V. (2002). Pollution potential of sago industry. A case study. J Ecotoxicol Environ Monot, 12(1), 53-56. | [14]Ramanarao, M. V., and Ramamurthi, R. (1982). Effect of sublethal concentrations of mercury chloride on lipid metabolism of fresh water field crab. Proc Symp Physio Rep and Poll, Marathwada University, Aurangabad, M. S. | [15]Shaikh, J. (2011). Seasonal variations in biochemical constituents in different body tissue es of freshwater bivalve mollusk, *Lamellidens marginalis* (Lamark) from Pravara River in Maharashtra. The Bioscan, 6(2), 297-299. | [16]Shobana Rani, D., Sudharsan, R., Reddy, T. N., Reddy, P. V., and Raju, T. N. (2001). Effects of arsenic on certain aspects of protein metabolism in freshwater Teleost, *Tilapia mossambica* (Peters). J Environ Biol, 22(2), 101-104. | [17]Simmons, S. O., Fan, C. Y., Yeoman, K., Wakefield, J., and Ramabhadran, R. (2011). NRF2 oxidative stress induced by heavy metals is cell type dependent. Curr Chem Genomics, 5, 1–12. | [18]Waykar, B. B., and Lomte, V. S. (2004). Carbaryl induced changes in the ascorbic acid content in different tissues of freshwater bivalve *Parreysia cylindrica*. Asian Jr of Microbial Biotech Env Sc, 6(3), 503-507. | [19]Zambare, S. P. (1991). Reproductive Physiology of the freshwater bivalve, *Corbicula striatella*. Ph.D. Thesis Marathwada University, Aurangabad. |