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Intentional Study of Bioaccumulative Behaviour of Isomers of Organochlorine Pesticide Thiodan (Endosulfan 35% Ec) In Fresh Water Mollusc, Lamellidens Corrianus During Monsoon Season.

KEYWORDS: Pesticide, Bioaccumulation, Endosulfan , Molluscs, Isomers

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ABSTRACT *Present study is an attempt to assess bioaccumulation of different isomers of the organochlorine pesticide into the various soft body parts such as hepatopancreas, gills and gonads from fresh water lamellibranch molluscs , L .corrianus found in Chincholi tank, Sangola Dist. Solapur (M.S.) India. In present investigation it was noticed that during monsoon season the β isomer of Endosulfan accumulated more as compare to the β isomer. The organs are considered for the study of bioaccumulative behaviors of these isomers.*

Introduction

Different kinds of pesticides are used to the agricultural field for controlling a variety of crop pests. Pesticides are potentially more lethal to aquatic fauna; many freshwater ecosystems are faced with specially or for the short term alarming high level of xenotoxic chemicals (Diez ., 2002; and Akalch, 2004; Barias, et al.,2006; Schneider et al, 2006; Benamu et al., 2007). Aquatic animals are very sensitive to all kinds of changes generally to various environmental changes to which they exposed. At certain stage in life cycle is susceptible to environmental changes and pollution stress (Von-Westermnhang, 1988).

Unionideae species are under the great threat of disappearance due to wide use of pollution. Environmental pollution from pesticides is important issue that draw wide spread public concern. Among them some organophosphate and organochlorine pesticides are routinely used in agriculture (Forgot, 1991). Organochlorine class of pesticide (Dieldrin, Aldrin, Malathion, Heptachlor, Endosulfan) contributed two third of the total consumption of pesticide in the country due to low cost and versatility in action against various pest (Jayshree and Vasudevan, 2007; Darko and Achuaah, 2008). Pesticides are hazardous to the animals, human beings and the overall environment. Kamble and Shinde (2011) noticed severity of the Thiodan on glycogen content from gonads of freshwater molluscs L .corrianus during summer season was more pronounced and observed considerable decrease in glycogen content due to sub lethal treatment of this pesticide. Pesticides are responsible for the death of aquatic biota and resulted in reproductive failure. Pesticides such as Endosulfan , B.H.C. Phorate, Monochrotophos, Quinolphos, Ekalux, Asataf, Malathion etc., were used by farmers from this drought prone area (Kamble et al., 2012).

India is one of the largest manufacturer and consumer of pesticide in south Asia and about 81,000 metric tons of Endosulfan was manufactured in India during 1999-2000 (Li and Macdonald,2005). Endosulfan is an organochlorine belonging to cyclodiene group is extensively used as broad spectrum to treat a wide variety of invertebrate pests and bird repellent on fruit crop in more than 70 countries (Abraham, 2004). This pesticide was first time introduced by German companies Hoechst AG and FMC Corporation in 1950 as pesticide on crops such as cereals, coffee, tea, fruits, vegetables, tobacco and cotton (Maier-Bode, 1968). Robert (1992) while studying chronic toxicity of Endosulfan to a mussel, Mytilus edulis noticed changes in the digestive gland. Present study is an attempt to study induced bioaccumulation of different isomers of the Endosulfan into the different soft body parts of fresh water molluscs , L .corrianus found in Chincholi tank, Sangola Dist. Solapur (M.S.) India.

Material and method

The soft organs of freshwater lamellibranch molluscs, Lamellidens corrianus such as gills, hepatopancreas and gonads were exposed to pre-decided 1/10th of LC_{50} value 0.0425 ppm of Endosulfan 35 % EC for a period of 5, 10 and 15 day, respectively. The present study was conducted during monsoon season 2010-11 at Chincholi tank, Sangola Dist. Solapur, (M.S.) India. The pesticide residues Thiodon,® (Endosulfan 35 %EC), from soft body part were analyzed by using GCMS-MS method (VARIAN-4000) (AOAC- official method of analysis), 1975. The results obtained by thiodon accumulation from various parts were subjected for statistical analysis by using students "T" test for confirmation.

Results and Discussion

Table:1 - Thiodan (α- Endosulfan and ß-Endosulfan) accumulation from the different body parts of lamellibranch molluscs, Lamellidens corrianus **after sub-lethal exposure during monsoon season.**

Organs	5 Days		10 days		**15 days**	
Sub-unit	α - **Endo-sulfan**	β – **En-dosulfan**	α– **En-dosulfan**	β – **En-dosulfan**	α– **Endo-sulfan**	β – **Endo-sulfan**
Hepato-pan-creas	99.29 ±4.88	175.92 ±3.77	13.18** ±11.17 (13.98)	252.27*** ±10.17 (43.40)	156.67*** ±7.48 (57.79)	302.37*** ±10.86 (71.87)
Gill	63.17 ±3.81	109.93** ±597	91.43** ±7.78 (44.73)	186.44*** ±9.65 (69.59)	139.63** ±6.18 (121.03)	205.68*** ±9.38 (87.10)
Gonad	47.28 ±2.81	96.94 ±4.00	53.78* ±4.47 (13.74)	96.19 NS ±5.13 (0.77)	65.05** ±5.58 (37.58)	103.23 ● ±6.05 (6.48)

*= P< 0.05,**= P< 0.01***= P< 0.001 ●= NS (Bracket value indicate percentage difference)

Volume : 6 | Issue : 4 | April 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

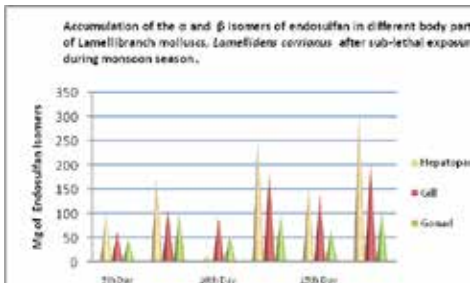

Fig. No. 1. Showing levels of accumulation of α isomers and β isomers from
Thiodan (Endosulfan 35% EC)

The levels of ● isomer and ● isomers from Thiodan (Endosulfan 35% EC) was analyzed from different soft body parts of freshwater molluscs, L. corrianus includes hepatopancrease, gills and gonads. For about 15 days at the interval of 5 days. The levels of these isomers was analyzed on 5th, 10th and 15tha day of sub-lethal treatment of Thiodan **(Table No. 1 and Fig. No.1)**

The ● isomer level from hepatopancreas recorded was 99.29 ±4.88 mg, 13.18±1.17 mg and 156.67±7.48 mg, respectively. In gill it was 63.17±3.87 mg, 91.43±7.8 mg and 139.63±6.18 mg, respectively, on 5th, 10th and 15tha day of exposure. In gonads the level of isomer was 47.28±2.81 mg, 33.78±4.47mg and 65.00±5.58mg, respectively.

The level of ● isomers in hepatopancreas was 175.92±3.77 mg, 252.27±10.17 mg and 302.37±10.86 mg respectively for 5th, 10th and 15th days of exposure. In gills value recorded were 109.3±5.97 mg, 186.44±6.18 mg and 205.68±9.38 mg. The accumulative values of ● isomers in gonads were 96.94±4.47 mg, 96.16±5.13 mg and 103.23±6.05 mg, respectively.

Various studies have been carried out regarding bioaccumulation of Endosulfan and its isomer from various aquatic animals. Bor-Cheng Han et al., (2000) have studied the organochlorine pesticide exposure and potential health threats by consumption of edible oysters. They have suggested that, there was a high risk of carcinogenesis in the maximum consumption of oyster. ● - Endosulfan was identified in snow in Canadian arctic in 1986 first time and concentration range measured during 1989 up to 1.34 ng/m (Tududri, et al .,2006). Kamble et al., (2012) recorded increasing trends of ●-Endosulfan accumulation from gonads (251.38%) hepatopancreas (839.36%) followed by gills (919.77%) of freshwater lamellibranch molluscs, Lamellidenes corrianus due to sub-lethal treatment during summer season.

Rendón & Bejarano, (2010) stated that Mexico there is lack of information about Endosulfan residues in environmental systems and aquatic biota of Mexican coast. The few studies that exist are mainly focused on determining the presence of Endosulfan , identifying dispersion of DDT residues and their metabolites in environmental matrices. They also noticedisomers and metabolites in commercially aquatic organisms from the gulf of mexico and the Caribbean. The few studies that exist are mainly focused on determining the presence of Endosulfan , identifying dispersion of DDT residues and their metabolites in environmental matrices. Bioaccumulation of Thiodan (Endosulfan 35 % EC) in Lamellibranch bivalve molluscs, Lamellidenes corrianus due to chronic toxicity during monsoon season at 1/10th of LC_{50} value at concentration was (0.0425 ppm). The result showed that, the concentration of ●- and ● Endosulfan from different soft organs of the bivalve, Lamellidenes corrianus revealed a significance increase from hepatopancreas after 5th 10th and 15th day of sub-lethal concentration of Thiodon. When values compared with 5th day with 10th and 15th day showed increased concentration of ●- Endosulfan it was 35.17 % and 43.40%, respectively. Similarly, when there was a comparison between 5 day with 10th and 15th day of the treatment, there is substantial increase in the concentration of ● Endosulfan (57.00%: P< 0.001) and 43.40% and 71.86% (P<0.001),respectively.

The gills are considered as target organ of the pesticide exposure. The treatment of sub-lethal concentration for a duration of 15 day showed significant increase in ●-Endosulfan and ●- Endosulfan concentrations. When value compared to 5th day with 10th and 15th day of sub lethal treatment, the ●-Endosulfan showed increasing trend were (42.70%: P< 0.001). When compare with 5th day and 15th day of treatment similar increasing trends were observed from ●-Endosulfan (121.03%: P<0.001). The ●- Endosulfan concentration was also increase from gill after all treatments. When there was comparison between 5th and 10th day of treatment, the concentration showed increasing trends (41.01%: P<0.001). When there was comparison between 5th and 15th day of treatment, it was significant increase up to 87.10% (P<0.001). The ●-Endosulfan concentration from gonad, when compared with 5th and 10th day showed marginal increase (12.08 %: P<0.05). Similar comparison were made between 5th and 15th day of treatment which showed increasing trends of pesticide (27.31 %: P<0.01). The ●-Endosulfan concentration was also found to be increased negligibly when there is comparison between 5th and 10th day of treatment (0.257%: NS). After comparison between 5th and 15th day of treatment showed a marginal increase (6.09%: NS).

In the present investigation an intentional attempts were made to understand the bioaccumulation of organochlorine pesticide Thiodan (Endosulfan 35 % EC) from different body parts of the freshwater lamellibranch mollusc, Lamellidens corrianus during monsoon seasons. It was observed that during monsoon season the and ● Endosulfan was accumulated more in hepatopancreas as compared to the gills and gonads. It was also noticed that ● isomer of Endosulfan have high level of accumulation as compared to the isomer in to the different body parts which are considered for the present study. Zeid et al., (2005), studied the bioaccumulation of Endosulfan in African catfish and concluded these pesticides able to rapidly accumulate with the liver and intestines being the major tissues for bioaccumulation. They further stated that, the distribution of the residues in the selected tissues reveal tissue selective bioaccumulation and could contribute to the possible cause of susceptibility of the fish to the toxic effect of the insecticides. Similar might be the case in preset study where organs such as hepatopancreas, gonads and gills are vital organs of L .corrianus showed increasing trends of isomers of Endosulfan . The hepatopancreas is major detoxifying organ therefore it is accumulating more pesticide contents than other two organs.

Gabycarmen et al., (2016) stated that the Endosulfan and its isomers indicates the need to increase the number of studies of its effect on water quality and pollution of shellfish and fish for human consumption due to the various adverse effects reported on public health. Moreover,

Volume : 6 | Issue : 4 | April 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50

there are large gaps in information because of the lack of continuity in monitoring programs. Present study is an attempt to find out accumulative behaviors of different isomers of Endosulfan in freshwater molluscs of Chinchoil tank, Sangola. Dist. Solpaur (M. S.) India. However, further investigations with reference to molecular manipulations are required to come for final conclusion of to know the impact this pesticide on molluscs, L . corrianus.

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