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# Total protein Alteration in Different Tissues of Fresh Water Bivalve, *Parreysia cylindrica* After Dichlorovos Exposure

KEYWORDS: Dichlorovos, Protein content, Parreysia cylindrica

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**ABSTRACT** *The indiscriminate use of synthetic dichlorovos causes serious pollution problem in aquatic environment. The variation in protein contents in different tissues i.e. mantle, foot, gills, digestive glands, gonads and whole soft body tissues after chronic exposure to dichlorovos of fresh water bivalve, Parreysia cylindrica was studied. The bivalves were exposed to (0.9376 ppm) as chronic treatment, decrease in total protein content of all tissues was observed with an increased exposure time. The most change of protein content occurs in digestive gland followed by gills, mantle, whole soft body and foot.*

**Introduction:-**

Pesticides constitute an important component in agriculture development and protection of public health in India since the tropical climate is very conducive to pest breeding. There are about 20 major diseases which have been brought under control by the use of pesticides. The major amongst them are malaria, filariasis, dengue, Japanese encephalitis, cholera and louse-borne typhus. In India, DDT spray was instrumental in reducing the annual incidence of malaria from 75 million in 1952 to 2-4 million. Synthetic organic pesticides are used to control weeds, insects and other organisms in a wide variety of agricultural and non-agricultural settings.

Insecticides cause serious exotoxicological problems mainly due to their persistence and high toxicity. In aquatic bodies, these pesticides affect many non target organisms due to biomagnifications through food chains. Pickering and Henderson (1966) reported the acute toxicity of some pesticides to fish which indicate that several of these pesticides are extremely toxic and could represent a hazard to aquatic life. Pesticides and other toxic chemical cause such harmful effect on varieties of aquatic animals like frog, fishes, crabs, mussels etc (Rajagopalan, 2005). A major environmental impact has been the widespread mortality of fish and marine invertebrates due to the contamination of aquatic systems by pesticides. Most of the fish in Europe's Rhine River were killed by the discharge of pesticides, and at one time fish populations in the Great Lakes became very low due to pesticide contamination. It is evident that pesticides cause major losses in global fish production. Konar (1975) reported the mass mortality of commercial fishes due to washing organophosphorous insecticides by heavy rains in adjacent aquatic resources. According to Jhingran (1974), in India majority of fish population die due to water pollution and increased use of pesticides in agriculture. The poisoning by pesticides from agricultural fields is a serious water pollution problem and its environmental long term effect may result in the incidence of poisoning of fish and other aquatic life forms (Jyothi and Narayan, 1996). Owing to the excessive use of pesticides, the environment and water resource are being polluted, thus endangering aquatic life directly and human life indirectly (Gill *et al.*, 1988). dichlorovos is an organophosphate (OP), widely used alone or in mixture as an insecticide. It is differ from most other OPS in that it produces an insecticidal concentration of a vapor that make it promising for the control of malaria transmission. dichlorovos is used to control household, public health, and stored product insects. It is effective against mushroom flies, aphids, spider mites, caterpillars, thrips, and white flies in greenhouse, outdoor fruit, and vegetable crops (Meister, 1992). Therapeutically, dichlorvos is used to treat a variety of parasitic worm infections in dogs, livestock and humans. dichlorovos can be fed to livestock to control botfly larvae in the manure. It acts against insects as both a contact and a stomach poison. dichlorovos is available in aerosol and soluble concentrate formulations. It is used as a fumigant (Meister, 1992) and has been used to make pet collars and pest strips (Hayes and Laws, 1990).

Organophosphate is a broad spectrum insecticides that provides rapid knock down with short residual effect, which makes it safe and effective insecticide. It is soluble in water and contains an active in gradient dichlorovos by about 76%. The present investigation was aimed to study biochemical changes in the different tissue of fresh water bivalve *Parrysia cylindrica* after sub-lethal exposure to dichlorvos.

**Materials and Methods:-**

Medium sized, healthy, fresh water bivalve, *Parreysia cylindrica* was collected from Girna Dam, 48 km away from Chalisgaon. Animals were brought in laboratory and were acclimatized for a week to tap water. The medium sized animals were selected for experiment. The animals were exposed to chronic concentration of dichlorovos (0.09376 ppm). Every day the solution was changed.

**Experimental design:-**

For experimental studies the animals were divided into Two groups –

A) Group 'A' was maintained as control.
B) Group 'B' animals were exposed to chronic dose of dichlorovos (0.09376 ppm) $LC_{50/10}$ values of 96 hrs.) up to 21 days.
C) During experimentation animals were fed on fresh water algae. After every $7^{th}$,$14^{th}$ and $21^{st}$ days of interval animals from set-I and set-II were taken out, dissected and tissues such as digestive glands, gonad, gills, foot, mantle were separated and whole body mass of re-

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maining animals was taken. All tissues were dried at 70 – 80$^0$ C in an oven till constant weights were obtained. The dried powders of different tissues of control and experimental animals were used for the estimation of total protein components.

D) The methods of estimation are as follows:

E) Protein estimation**:-**

Protein content of the tissues was estimated by Lowry's method (Lowry *et al.*, 1951).10 mg of dry powder was homogenized small amount of 10% TCA and the homogenate was diluted to 1o ml by 10% TCA. Then it was centrifuged at 3000 rpm for 15 minutes. The protein precipitate at the bottom of centrifuged tubes was dissolved in 10ml1.0 N NaOH solution. 0.1 ml of this solution of each powder was taken in three test tubes containing 4.0 ml. freshly prepared Lowry's 'C'. After adding 0.5 ml. Folin's – phenol reagent, the test tubes were incubated in dark at 37$^0$C for 30 minutes. The O. D. of blue colour developed was read at 530 nm. The blank was prepared in same way without dissolved protein precipitate.

F) The protein content in different tissues was calculated referring to standard graph value and it was expressed in terms of mg protein/100 mg of dry tissue. The Bovine serum albumen was used as a standard.

**Results and Discussion:-**

In the present study obtained results demonstrated that, after chronic exposure to pesticides dichlorovos a marked depletion in the protein contents in the mantle, foot, gills, gonad, digestive glands and whole soft body tissues of the experimental freshwater bivalve *Parreysia cylindrica* was observed as compared to bivalves maintained as control. The obtained results are presented in the table nos.1.The results showed that, there was progressive decrease in the protein content as exposure period was increased. The depletion in protein contents with increased exposure period suggest high protein hydrolysis that could be due to pesticide interfering and impairment as well as lowering of protein synthesis (Ghosh and Chatterjee, 1985). The results recorded in the present study are in harmony with the results of previous investigators (Lomte *et al.,* 2000; Mahajan and Zambare, 2005; Gulbhile, 2006; Satyaparameshwar *et al.,* 2006; Nawale, 2008; Pardeshi and Gapat, 2012).

The percentage of decreased in protein content after chronic treatment of 7, 14 and 21 days with dichlorovos was 31.89, 38.90 and 43.22 in mantle, 17.25, 24.22 and 33.12 in foot, 37.53, 44.26 and 53.29 in gills, 43.10, 57.17 and 62.44 in digestive glands, 29.15, 36.61 and 41.31 in gonad and 22.57, 37.87 and 44.04 in whole soft body.

**Table -1-Total protein alteration in tissues of fresh water bivalve, *Parreysia cylindrica* after chronic exposure to Dichlorovos.**

| Sr. No. | Tissue | (A)Control | | | (B)Dichlorovos | | |
|---|---|---|---|---|---|---|---|
| | | 7 day | 14 day | 21 day | 7 day | 14 day | 21 day |
| 1. | Mantle | 44.8718 ±1.32 | 43.6821 ±1.58 | 43.1478 ±1.97 | 30.5605** ± 1.00 (-31.89) | 26.6721*** ± 3.04 (-38.90) | 24.5012*** ± 2.17 (-43.22) |
| 2. | Foot | 63.4788 ±2.38 | 63.2318 ± 1.20 | 62.9123 ± 1.28 | 52.5271* ± 2.80 (-17.25) | 47.9162*** ± 3.71 (-24.22) | 42.0732*** ± 2.50 (-33.12) |
| 3. | Gills | 54.1568 ±2.43 | 53.7018 ± 1.60 | 53.2013 ± 0.58 | 33.8322** ± 3.06 (-37.53) | 29.9337*** ± 1.86 (-44.26) | 24.8513*** ±1.04 (-53.29) |
| 4. | Digestive glands | 50.7416 ± 1.21 | 51.1671 ± 0.64 | 50.8570 ± 0.50 | 28.8718** ± 1.01 (-43.10) | 21.9168*** ± 4.98 (-57.17) | 19.1020*** ±1.37 (-62.44) |
| 5. | Gonad | 48.5821 ± 0.82 | 48.2130 ± 1.56 | 47.1236 ± 0.85 | 34.4189* ± 3.14 (-29.15) | 30.5621* ± 2.31 (-36.61) | 27.6588** ± 2.20 (-41.31) |

1. Values expressed as mg/100mg dry wt. of tissue
2. (+) or (-) indicate percent variation over control
3. ± indicate S.D. of three observation
4. Values are significant at *$P$<0.001, **$P$<0.01, ***$P$<0.05
5. NS (Not significant.

The decrease in amount of protein content in different tissues after chronic exposure to pesticides indicate that, pesticides inhibits the synthesis of protein which ultimately results in increase in the free amino acid pool in the cell or due to enhancement of proteolysis to cope with the high energy demands under toxic stress (Vincent *et al.*, 1995; Waykar and Lomte, 2001). A marked fall in the protein level in all the tissues indicates a rapid initiation of breakdown of protein. To meet energy demands during toxic stress mobilization of protein might have taken place. The depletion of protein tissue was due to diversification of energy, to meet the impending energy demand under toxic stress (Vincent *et al.,* 1995) and to prevent fatigue due to pesticide toxicity (Parate and Kulkarni, 2003). At high pollution stress however, protein synthesis can be suppressed indicating disturbance of normal metabolic processes (Pottinger *et al.*, 2002). The results of total protein contents in all tissues clearly indicate that digestive glands was the most affected organ followed by gill, whole body, mantle, gonads and foot. The higher depletion of protein in the digestive gland might be due to high metabolic potency and efficiency of the gland when compared to other tissues like mantle, foot, gills, gonads and whole soft body of the bivalve. The digestive gland is the site of action of pollutants in the body of bivalves or digestive gland seems to be the main site of degradation and detoxification of pesticides and hence has the largest demand of energy for the metabolic processes resulting into increasing utilization of protein in digestive gland provides better indication of the extent of toxicity. Mule and Lomte (1992, 1993, and

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1995), Waykar and Lomte (2001) supported the most alteration of protein contents in digestive glands of freshwater bivalves. Patil (2011) observed maximum depletion of protein content in digestive glands than in mantle, gills, foot and whole body tissue.

Depletion of protein content in animal tissue after exposure to various pollutants was reported by some workers. Ramana Rao and Ramamurthi (1978) observed alteration in protein content in tissue of *Pila globosa* after sumithion exposure. Lomte and Alam (1982) reported depletion of protein content in various body tissue of snails, after malation significant decline in protein content in fresh water mussel *Lamellidens marginalis* exposed to flodit and metacid. Similar observation were made by number of workers in molluse (Maneetal 1986), Muley and Mane 1989), Mule and Lomte 1993, 1995). Thus the result obtained in the present study indicate severe distrurbances in the protein metabolisms of the bivalve, *Parreysia cylindrica* exposed to dichlorovos.

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