International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 6 No. 18 March - April - 2025

Cypermethrin-exposed freshwater crab Paratelphusa Jacquimontii (Rathbun) and its toxic effects on protein in its Muscles and Gills

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DOI - 10.5281/zenodo.14784834

Abstract:
Paratelphusa Jacquimontii (Rathbun) were exposed the concentration of cypermethrin i.e. 0.025 ml/L. Total protein contents showed decreasing trend over the period of four days.

Keywords: Paratelphusa Jacquimontii, Cypermethrin (Pyrethroid) Muscle, Gills, Total Protein

Introduction:

Pyrethroid are potential insecticides derived from the flower heads of Chrysanthemum cinerariefloium species [1]. Pyrethroid insecticides are widely used in the agricultural operation to control pest. Musa Galadima et.al, have reported that pyrethroid has harmful effect on the fish population and also direct effects on the human beings [2]. Particularly very little information exists regarding the influence of pyrethroids on the various systems of the crab. A new class of agricultural insecticides, the synthetic pyrethroid have become popular for their high toxicity to the wide range of the insects including resistant strains and low toxicity to mammals and birds [3]. The correspondence between aqueous concentration and LC_{50} for test animals, demonstrated the importance for the quantifying the bio-available portion of the pyrethroid in the field samples to characterize accurately the environmental risk associated with pyrethroid runoff after agricultural applications [4] [5].

Cypermethrin is one of the recent pyrethroids being used for the cotton crop pest in India [6]. Higher concentration of the toxicants in aquatic environment causes adverse effect on the non-target aquatic organism. Nominal sediment concentrations of cypermethrin are of 0.1 mg/kg (static) or 0.1 mg/kg (flow through) resulted in the mortality in pink shrimp (Penaeus duoraum) in the static and flow-through the test system [7].

Present study was undertaken to investigate the effect at biochemical level of a non-target species. Changes involved in total protein profile in the muscles and gills of the crab, Paratelphusa Jacquimontii, exposed to the pyrethroid pesticide cypermethrin at different experimental conditions was studied.

Table 1: total protein content in crab, P. Jacquimontii (Rathbun) under different experimental condition is for 4 days.

Tissue	N(N)	EA (N)	EAI +N	CP + CP	EA CP	EAI + CP
Muscles	6.025 + 0.25	6.516 + 0.27	6.492 + 0.31	6.437 + 0.27	6.384 +0.28	5.412 ** + 0.27
Gills	4.021+0.02	4.011 +0.21	4.092 +0.31	4.088 +0.02	3.074 +0.24	3.068 +0.22

(All values are significant at * p<0.05 and **p <0.01)

Where N: Normal crab, EA : Eyestalk ablated crab, EAI: Eyestalk ablated crab after administration of eyestalk extract injection, CP: Cypermethrin

Martial and Methods:

The crab Paratelphusa Jacquimontii (Rathbun) were collected as local fish market from Digras city, Vidarbha, Maharashtra State. The crabs were acclimatized to the laboratory condition for 7 days prior to the experimentation. Healthy active, adult medium sized, living crabs were selected for the experimental. Based on the predetermined LC_{50} values pesticide concentration was prepared for normal, eyestalk ablated and eyestalk ablated but extract injected batches of crabs. Experimental animals were scarified after experimental period and muscles as well as gills dried at 70^0c to 80^0c in an oven, till constant weights were obtained.

The dried powders of the tissues of the normal, eyestalk abled and eyestalk ablated and extract injected animals were used for the estimation of protein. The results of estimation were expressed as mg/gm dry weight of the tissues.

Result and Discussion:

Pesticides due to their potential toxicity produce biochemical changes in the tissues and organs of exposed animals. In the present study. Total protein content decreased in the gills and muscles due to cypermethrin stress. In crab, prominent total protein decrease was observed cypermethrin exposure to an increase in the acidic protein in the beginning, which was followed by decrease in the total proteins till 48 hrs. It is well established that the total proteins are used as an alternative source of energy especially under that stress conditions [8].

Similar observation was made by Srivastava et.al (2013) on freshwater crab, Baraytelphusa guerini exposed to cuprous oxide [9]. Deshpande et.al (2014) also recorded a decline in protein content in the crab barytelphusa guerini after exposure to zinc sulphate and copper sulphate [10].

It may be concluded from the present study that the protein was utilized for the production of the energy to mitigate the pesticide stress. Such change in metabolic activity cause metabolic rearrangement in the living systems. There was decrease in the total protein content in the muscle and gills of crab during early hours of exposure to cypermethrin. Similar result is reported by several investigators. Further total protein content might have acted as a fatigue retardant due to the effect of pesticide on the body parts [11]. Total protein levels in muscle and gills showed a decrease during exposure period of 24, 48,72 and 96 hrs.

Eyestalk ablation caused marked changes in total protein, nevertheless after eyestalk extract injection to ablated crabs the levels of the total protein was restored[12]. In muscles as well as gills the total protein contents decreased in the normal and eyestalk ablated, crab and again levels were restored after eyestalk extract was injected.

Injection of eyestalk extracts reestablishes low levels of proteins in the ablated animals. On injection of extract protein synthesis is again inhibited, resulting in the restoration of the original condition of low protein contents, thus the experiments of eyestalk ablation d injection of eyestalk extract in to ablated crabs provides good evidence demonstrating a protein synthesis inhibitory factor in the eyestalk of the crab. Further evidence comes from the observation that eyestalk removal increases the protein levels in the all the tissues [14].

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