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Toxicity of Carbaryl Pesticide to Eyestalk Ablated and Extract Injected Fresh Water Crab *Barytelphusa Guerini* (H.M.EDWARD)

KEYWORDS

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ABSTRACT *The neuroendocrine complex present in the eyestalk of crustaceans plays a vital role in growth, metamorphosis, reproduction and such other physiological processes which is also true in case of fresh water crab Barytelphusa guerini. The present study incorporates aspects pertaining to evaluation of influence of an Carbaryl pesticide. Hexavin on the neuroendocrine system of normal, eyestalk ablated and eyestalk extract injected crab B. guerini. The toxicity of the Carbaryl pesticide was assessed by graphical, prohibit and D-B methods for predetermined exposure periods of 24 h, 72 h and 96 h. The LC50 values indicated that eyestalk ablated crabs are more sensitive to pesticide toxicity than the normal and eyestalk extract injected crabs.*

INTRODUCTION

Extensive use of insecticide in agriculture & public health operations are continuously polluting the aquatic environment, causing ecological imbalance and affecting many non-target organism. Many of the pesticides are considered hazardous because of their ability to kill or immobilize the aquatic organisms even at extremely low concentrations (Tarzwell, 1963; Cope, 1965). The neuroendocrine system present in the eyestalk of crustaceans is known to have influence on molting, growth, metabolism, reproduction and other physiological processes (Scharrer and Scharrer, 1954; Highnam and Hill, 1979). The laboratory studies aimed at evaluating pesticide toxicity on test animals including fresh water crabs help in the assessment and prediction of safe contaminant concentrations in the environment (Johnson and Bergman,1983) The present study was under taken to evaluate the toxicity of an Carbaryl pesticide Hexavin to the fresh water crab, *Barytelphusa guerini* employing methods of toxicity and also neuroendocrine influence over toxicity of the pesticide.

MATERIAL AND METHODS

The fresh water crab *Barytelphusa guerini* were collected from paddy fields and acclimatized to laboratory conditions by maintaining them in troughs, partially submerged in water. They were fed with slices of fog muscle and water was changed daily. Feeding was stopped one day prior to and during experimentation. Healthy and active crabs were taken and bilateral eyestalk ablation was performed. The crabs were used for exposure after 48 h of acclimation. Another set of ablated crabs were used for injecting the eyestalk extract of 0.2 ml equivalent to two eyestalks and such animals were used for exposure. Normal animals with intact eyestalk were also exposed as control.

PREPARATION OF STOCK SOLUTION

Commercial grade pesticide Carbaryl (Hexavin 50%) Hindustan Ciba Geigy Ltd, was used for the current toxicity studies. Stock solution was prepared as per requirement following standard procedures and test concentrations were prepared by dilution. Acclimatized ablated and ablated extract injected animals were used for toxicity studies. The water temperature was maintained at 26^{0}C to 28^{0}C and at 7-8 pH. A group of six animals were exposed to each test concentration and observed for mortality at regular intervals. Medium was changed every 24h to maintain the pesticides concentration. Crabs with intact eyestalk as control were also maintained along with experimental groups. The experiment was repeated twice for getting concurrent results. LC50 values for 24h, 48h, 72h, and 96h were calculated using different methods viz., Percent kill following dosage response curve (Fisher.1964), probit analysis (Finney, 1971) and Dragstedt Behren's methods using cumulative mortality (Carpenter,1975).

RESULT AND DISCUSSION:-

Carbaryl is one of the pesticide with most potential to leach into groundwater, exposure of crabs to different concentration of technical grade carbaryl showed the following trend; 96h Lc50 values as per percent kill (Fg-1) were observed to be 15.27 ppm, normal 8.40 ppm for ablated, eyestalk extract injected 12.71 ppm, 96 h Lc50 values according to probit method (Fig-2) were 13.96 ppm for normal, 8.16 ablated, 12.36 ppm extract injected animals; Further 96h Lc50 values as per Dragstedt Behren's method were higher compared to those obtained through graphical and probit methods. However the average of these values are not much different from the individual values indicating that these methods could be employed for arriving at a more reliable Lc50 values. The results summaries that the loss of eyestalk hormone. Thereby decreasing the neurocndocrine influence in ablated crabs render them comparatively more sensitive to pesticide toxicity (Klenholz & Keller,1973) Lc50 values also aid in evaluation of safe level or tolerable level (Hart et al 1945) and it is found to be 5.68 ppm normal, 4.53 ablated, 5.06 ablated and extract injected as observed in the present study (Table-1). Similar type of observation was made by Chandrakala (2007) in response to Monocrotophos pesticides in the same species.

The results showed that the carbaryl pesticide Hexavin is highly toxic to eyestalk ablated crabs . It may be due to the consequence of loss of a neurocndocrine system, since pesticide causes toxic stress (Matsumura,1985). Cumulative effect must be operating on ablated and Hexavin exposed crabs, resulting in eyestalk ablated crabs becoming highly sensitive to pesticide toxicity. As observed by Lorenzan et al (2000) to eyestalkless shrimp. *P.elegance* on toxicity to Hg was found

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to be high. In eyestalk extract injected crabs the toxicity of Hexavin is reaching the control level than when compared with the eyestalk ablated crabs indicating the influence of neurocndocrine extract; similar observation has been made earlier by Raman Rao et al (1992) in Metapenaeus monoceros; and Chandrakala and Ravindra Paul (2008) made a observation on exposure to monocrotophos for normal, ablated and extract injected crabs *B.guerini* and found monocrotophos was more toxic than any other. Gupta and Sundararaman (1991) have observed some behavioural changes in the Pheritima posthoma exposed to carbaryl; Bhavan & Geraldine (2002) report decrease in o suffix 2 or oxygen consumption in prawn H. malcolmsonii on exposure to carbaryl; Jayapradha (1996) studied carbaryl toxicity and recovery to Metapenacus monoceros and found to be high. In (2008) Chandrakala et al reported neuroendrocrine organs are important in maintaining the physiological activity of organism.

The observation based on the present study indicates increase in Hexavin toxicity to *B.guerini*, more to eyestalkless crabs than when compared to normal or eyestalkless extract injected crabs thus substantiating the influence of eyestalk hormons as evidenced by Lc50 values which were arrived as average values by multiple methods. Toxicity studies have immense use in identifying the sensitivity of the species to any pesticide, to evaluate the toxic potentiality of the pesticide, to determine sublethal concentrations for physiological and biochemical studies on the effects of pesticides on non- target organisms, to arrive at safe dosage levels and to determine the tolerance limits of a pesticide.

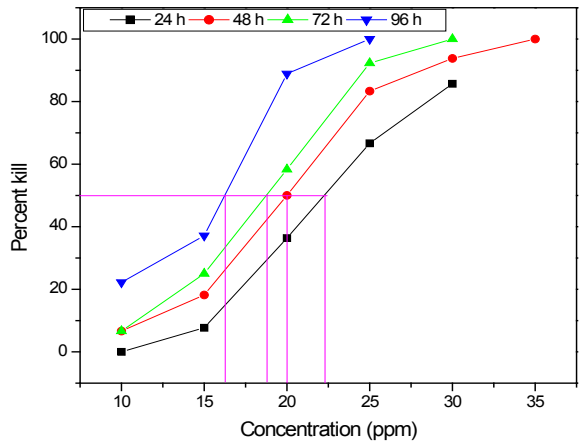
Lc50 values (ppm) of carbaryl (Hexavin) for different exposure periods determined by different methods *B.guerini*.

Table-1

Sl No.	Experimental Group	Methods	Duration of Exposure				Safe Concentration
			24h	48h	72h	96h	
1	Normal	Graphical	22.70	19.54	18.73	15.27	5.68
		Probit	23.11	19.74	18.80	13.96	
		Drag-stedt-Behrins	27.32	37.05	25.22	17.35	
		Average	24.37	22.12	21.02	17.35	
2	Ablated	Graphical	17.54	17.04	13.49	8.40	4.53
		Probit	18.61	17.98	13.02	8.16	
		Drag-stedt-Behrins	25.16	19.79	17.82	9.06	
		Average	20.43	18.28	14.78	8.54	
3	Extract Injected	Graphical	20.00	19.48	16.02	12.71	5.06
		Probit	19.71	19.32	16.02	12.36	
		Drag-stedt-Behrins	22.62	22.96	16.96	13.34	
		Average	20.77	20.58	16.33	12.08	

LC50 values of 96 h exposure of Hexavin to B. guerini iof different groups.

Figure-1



LC50 values of 96 h exposure of Hexavin to B. guerini iof different groups.

Extract injected Ablated Normal

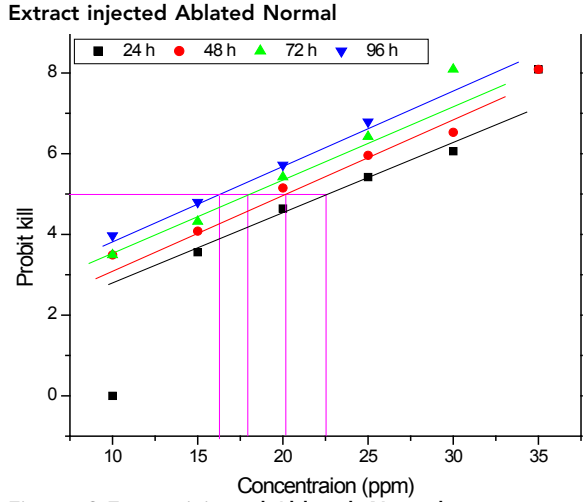


Figure -2 Extract injected Ablated Normal

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