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TOXICITY AND EFFECT OF CYHALOTHRIN ON DNA IN DUSKY COTTON BUG *OXYCARENUS HYALINIPENNIS* COSTA (HEMIPTERA: LYGAEIDAE)

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ABSTRACT

Cyhalothrin (2.5 E.C) was used to determine its lethal effect against *Oxycarenus hyalinipennis* Costa after 24 h of treatment by using filter paper impregnation method. The LC_{50} value was found to be 0.020µg/cm^2. The DNA content of these insects was inhibited 77.07% as compared to that of control batch after the executing LC_{50} dose of this compound.

Key-words: *Oxycarenus hyalinipennis*, Toxicity, Cyhalothrin, DNA, Inhibition

INTRODUCTION

Dusky cotton bug *Oxycarenus hyalinipennis* Costa is an important pest of malvaceous and solanaceous crops in Pakistan. However, it is consider minor pest of cotton and is destructive to crop by feeding on their juices during its growing season from seedling to mature stages and the crop suffers heavy damages each year.

Many researchers have worked on different species of *Oxycarenus* and used different pesticides for the determination of toxicity such as Nurulain *et al*. (1989) have investigated the effects of neem extract and malathion on dusky cotton bug *O. lugubris* Motsch. Ahmad *et al*. (1995, 1997 and 1998) and Azmi *et al*. (1997) used different insecticides on related sucking pests and observed their effects on nucleic acids. Alzogaray and Zerba (2001) determined hyperactivity of alpha-cyanopyrethroids against *Rhodinus prolixus* and Claver *et al*. (2003) observed the functional response of predatory bugs. No work has been carried out on the management strategies of this pest using pyrethroids in Pakistan. In the present studies, we have used pyrethroid (cyhalothrin) which is less hazardous to the non-target organisms.

MATERIALS AND METHODS

Collection of insects:

Adults of *Oxycarenus hyalinipennis* were collected from the premises of Karachi University campus on *Thespesia populnea* (malvaceous) plants where they lived on leaves and inside the dry fruits of the host plant. These insects were kept in glass jar, covered with muslin cloth. Leaves and fruits of host plant were provided as food.

Preparation of compounds:

Five selected concentrations i.e., 0.009, 0.018, 0.028, 0.037 and 0.047µg/cm^2 of cyhalothrin (2.5 E.C) were prepared from 0.05% stock solution.

Method of treatment:

These insects were treated with filter paper impregnation method. Six Petri dishes were used in each experiment, five for different concentrations and one for control. The insecticides were applied by pipette to the filter paper, placed in Petri dishes. Approximately 50 insects were released in each Petri dish. A control batch of untreated insects was also kept for the determination of environmental effects and leaves of host plant also kept as diet. Each Petri dish was covered with other Petri dish. Mortalities were noted after 24 h. Each experiment was repeated five times. The data was analyzed statistically, mortality curve was drawn on log log graph paper to find out the LCso of the tested compound.

Assay procedure for DNA:

Treated and untreated samples of 0.3ml and 0.6ml of supernatants of both insects were taken for each test in separate test tubes but not in blank. The volume of the solutions was made upto 1.0ml with 0.5N PCA and 3ml DPA reagent was added in each test tube as well as in blank. The solutions were mixed well and boiled in boiling water bath for about 30 minutes when blue colour appeared, then absorbance was read at 595TJm against the blank.

Total amount of DNA was calculated by the following formula.

$$\text{Conc. of sample } \mu g/mg = \frac{\text{O.D. of sample}}{\text{O.D. of std.}} \times \frac{\text{Amount of sample in mgs.}}{\text{Conc. of std.}}$$

RESULTS

Toxicity of cyhalothrin was determined against adults of *Oxyearenus hyalinipennis* and LC_{50} of undertest compound was found by plotting average mortality values after 24 h reading on log-log paper in (Fig. 1). Its statistical analysis is shown in Table 1. According to (Fig. 1) LC_{50} of cyhalothrin was 0.020μg/cm^2
Cyhalothrin also caused significant effect on the DNA of *Oxycarenus hyalinipennis*. According to Table 2 DNA contents decreased to 77.07% in the LC_{50} treated specimens.

Table 1. Statistical analysis of Cyhalothrin.

Concentration μg/cm^2	Average mortality (%)	S.D. ±	S.E. ±	Range at 95% confidence limit X ± 1.96 x S.E.
Control	3	1.772	0.703	1.192 – 4.807
0.009	27	4.676	1.909	22.091 – 31.908
0.018	44	2.994	1.222	40.858 – 47.141
0.028	60	3.386	0.723	58.141 – 61.858
0.037	80	3.9707	1.621	75.832 – 84.167
0.047	95	3.777	1.542	91.035 – 98.964

Table 2. Estimation of DNA in *Oxycarenus hyalinipennis* after treatment with Cyhalothrin.

Treatment	Mean of DNA μg/mg	S.D. ±	S.E. ±	Range at 95% confidence limit X ± 4.303 x S.E.	Inhibition %
Control	1.784	0.0113	0.0065	1.7558 – 1.8122	0.000
Cyhalothrin	0.4090	0.005	0.0029	0.3964 – 0.4215	77.07

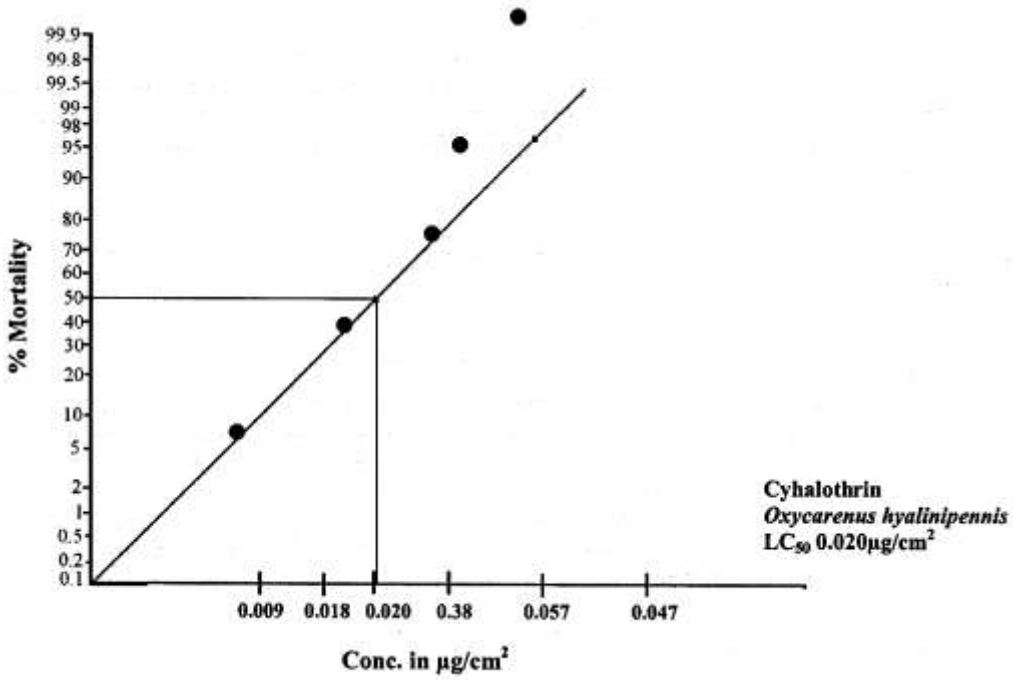

Fig. 1. Toxicity curve of cyhalothrin against *Oxycarenus hyalinipnnis*

DISCUSSION

The present research is concerned with the toxic effect of cyhalothrin in Fig. 1 and reveals the effectiveness of this compound with different concentrations in Table 1. A number of workers have reported the insecticidal effect of pyrethroids on hemipterous insects.

Khaemba and Mamibiri (1989) studied on the residual activity of three synthetic pyrethroids cypermethrin, fenvalerate and permethrin against *Dysdercus* spp. Marcondes (1989) reported, efficacy of alpha-cypermethrin for the control of *Triatoma* bugs. Kaur (1989) reported *Chrysanthemum indicum* as an effective growth and development inhibitor of *Dysdercus similes*. Bloomquist (1993) reported neuroreceptor mechanisms in pyrethroid mode of action and resistance in pyrethroid mode of action. Ahmad and Perveen (1992) estimated DNA content in testes of cotton Stainer *Dysdercus koenigii*. Ahmad *et al*. (l995) observed the efficacy of RB-a and RB-b, the two neem fractions on comparison with cypermethrin against *Dysdercus koenigii*. The LC_{50} for RB-a was 2.8%, for RB-b was 3.2% and LC_{50} of cypermethrin was found 0.00052%. Ahmad *et al*. (1997) reported the effect of cypermethrin and RB-a (neem extract) on toxicity and nucleic content of *Halys dentatus* and observed the mortality after 24 h of treatment. The LC_{50} value of cypermethrin was found to be 0.08 $\mu g/cm^2$. The RNA and DNA contents were decreased after insecticide treatment. This decrease was higher in cypermethrin than in RB-a (neem extract). Azmi *et al*. (I997) studied the effect of cyfluthrin (pyrethroid) and Bakayan Berry *Melia azedarach* extract on nucleic acid of *Halys dentatus*. They found the LC_{50} value of cyfluthrin as 0.1 $\mu g/cm^2$, and for RB extract as 150 $\mu g/cm^2$. The DNA & RNA contents of these insects decreased after the treatment of these compounds. Ahmad *et al*. (1998) estimated quantitatively the DNA contents in ovaries and testes of legume bug *Piezodorus hybneri* in untreated and cypermethrin treated insects. The LC_{50} concentration (0.004%) of cypermethrin caused significant effect on the DNA of ovaries and testes. The DNA contents decreased upto 40.57% and 54.12% in ovaries and testes of *Peizodorus hybneri* respectively. Alzogaray and Zerba (2001) reported hyperactivity, incoordination, recovery, and mortality produced by four alpha - cyanopyrethroids (beta -cypermethrin, beta cyfluthrin, lambda - cyhalothrin and deltamethrin against *Rhodnius prolixus*. Claver *et al*. (2003) determined the impact of cypermethrin on the functional response and predatory and mating behaviour of non-target potential biological control agent *Acanthaspis pedestris* (Stål).

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