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Short Communication

Toxic effect of a synthetic pyrethroid, cypermethrin on the brine shrimp, *Artemia*, L.

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Abstract

The present study deals with the effect of synthetic pyrethroid, cypermethrin on the brine shrimp, *Artemia*, L. The acclimatised adults were exposed to cypermethrin and LC_{50} values determined. Biochemical changes were determined on treating the shrimps with sublethal concentrations.

Key words: *Artemia*, bioassay, behaviour, glycogen, protein, lipid.

1. Introduction

The brine shrimp, *Artemia*, L, a decapod crustacean, is a good live feed organism in aquaculture, due to its high protein content and rich amino acids. Due to growing awareness of the effect of pollution, it is essential to develop standards for various toxicants. Therefore, an attempt has been made to determine the toxic effects of the pesticide, cypermethrin on *Artemia*.

2. Materials and methods

Parthenogenetic strain, *Artemia* cysts were obtained from Bahindar near Bombay and cultured in the laboratory. The adult *Artemia* were collected in a jar and aerated after every four hours to prevent hypoxic and anoxic conditions. A batch of 20 normal healthy and agile adults of about the same size and age group were exposed to different concentrations (0.005, 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07 and 0.08 ppm) of the toxicant and a control for each concentration was also run. Mortality rate and behaviour of *Artemia* for each concentration were observed after 24, 48, 72 and 96 h and LC_{50} was calculated.

The biochemical changes were studied after exposing the crustacean to 0.01 ppm of cypermethrin. The tissue glycogen content was determined as per procedure after Kemps

et al[1]. The protein content was measured by the method after Lowry *et al*[2] and for total lipid the method of Barnes and Blackstock[3] was followed.

3. Results and discussion

No significant behavioural changes were observed at a dose of 0.005 ppm. On treatment with other concentrations, *Artemia* were found to congregate at the surface. Active movements ceased and occasional circular movements which finally lead to death were observed. No significant colour change was exhibited during the exposure period.

No mortality was observed at 0.005 ppm. Total mortality was recorded on exposing the crustacean to dose levels of 0.08, 0.06, 0.05 and 0.03 ppm for 24, 48, 72 and 96 h respectively. The mortality increased on increasing the concentration and exposing period. The LC_{50} values were found to decrease with increasing exposure period. LC_{50} values for 24, 48, 72 and 96 h were found to be 0.0425, 0.0325, 0.0275 and 0.0175 ppm respectively.

The changes in the biochemical constituents are given in Table I. Glycogen content decreased at the exposure period of 24 h ($P > 0.05$). It decreased faster after an exposure of 48 h ($P < 0.05$). On the contrary, lipid contents showed an increase ($P > 0.05$). No change in protein content was observed.

In an earlier report[4] on the effect of cypermethrin on both plankton and *Cyprinus carpio* fry, it was concluded that the maximum safer concentration for both plankton and fish fry is 0.0082 ppm, while for *Artemia* it is 0.005 ppm. The pesticide at 0.02 ppm concentration is effective which increases at 0.028 ppm. In the present study, the effect of cypermethrin commences at 0.01 ppm, suggesting that *Artemia* is less resistant to pesticide as compared to plankton and common carp fry.

The decrease in glycogen in *Artemia* may be attributed to increase in carbohydrate metabolism due to toxic effect. During the exposure period the animal showed active movements resulting in an increase in metabolic rate which ultimately leads to utilisation

Table I
Biochemical constituents in normal and exposed *Artemia*, L.

Sl. no.	Biochemical constituent	Normal *Artemia* (μg/mg)	Exposed *Artemia* (μg/mg) (0.01 ppm)	
			24 hours	48 hours
1.	Glycogen	29·90	22·56 ($P > 0·05$)	16·67 ($P < 0·05$)
2.	Protein	81·00	81·00	81·00
3.	Lipid	1·74	1·98 ($P > 0·05$)	2·20 ($P > 0·05$)

of glycogen reserve. Dhavale and Masurekar[5] studied the effect of cadmium on *Scylla serrata* and reported a total depletion of glycogen in the tissues, suggesting increased glycogenolysis.

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