

Acute toxicity of Profenophos concentration on mortality and behaviour of freshwater fish; *Channa orientalis* from river Shivan, Dist-Nandurbar (M.S)

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ABSTRACT

Pesticides are toxic to aquatic organisms which are important components of food chain such as fishes. Fishes are important sources of protein in Nation's diet. So a thorough understanding of pollutant effect on fishes would be rewarding for fish conservation and fishery development. Fresh water fishes, *Channa orientalis* were exposed, in the laboratory to different concentrations of organophosphorous pesticide, Profenophos in aquarium containing 5 liters of water for up to 96 hours. Both behavior and death were monitored during the exposure. The toxicity test of Profenophos to fresh water fishes, *Channa orientalis* was carried out by Probit analysis method given by Finney. The LC10 and LC50 values calculated for 24,48,72 & 96 hours. The LC50 values decrease with increasing exposure time. Behavior changes or death were seen at concentrations as low as 15 PPM.

Keywords : *Channa orientalis*, Acute toxicity, Profenophos

INTRODUCTION

Water is the most important substance for the existence of life on earth. It is an essential constituent of all flora and fauna. The transportation of pesticides into aquatic environment via different agencies possess the problem of contamination and mostly the nontarget organisms are often affected (Bradbury et.al; 1984; Sangeetkumar et.al, 1990; Sampath et al, 1992). Persistence of toxic chemicals in aquatic environment is dangerous for survival of fish (Mawadesley, 1971; Sali and Csaba,1994; Banik et.al 1996; Saxena and Gupta, 2003) because fish forms an important part in the diet of human being. Fishes are important sources of protein in Nations diet. So a thorough understanding of pollutant effects on fishes would be much more rewarding for fish conservation and fisheries development. (Holden, 1972) Insecticides are reported by

Stratton (1987) to affect both target and nontarget organisms and destroying the structure of an ecosystem. Profenophos, a widely used pesticide is very efficient in agricultural and sanitary pest control. After use it is released directly into environment, enters the water body by runoff, and affects the aquatic ecosystem.

MATERIALS AND METHODS

Live specimens of *Channa orientalis* were collected from Shivan river of Nandurbar, Dist. Nandurbar, Maharashtra.They were maintained in the glass aquarium in the laboratory. The fishes were fed daily with small pieces of earthworms during a minimum acclimatization period of 6 to 8 days in the laboratory. They were washed with 0.1% of KMnO₄ solution to avoid dermal infection and were kept in aquaria having a working volume of 5 litres of dechlorinated tap water for three days.

Table-1: Lethal Dose and safe concentration of Profenophos to freshwater fish *Channa orientalis*

S. No	Period in hours	Regression equation	LC ₁₀ value in ppm	LC ₅₀ value in ppm	Variance	X ² value	Fiducial Limits		Lethal dose in ppm	Safe conc. 'C' in ppm
							m1 (ppm)	m2 (ppm)		
1	24	1.6440	31.2535	44.0554	0.0213	0.4369	1.3587	1.9293	1057.3296	1.1478
2	48	1.5841	25.7039	38.3795	0.0214	0.9886	1.2974	1.8708	1842.216	
3	72	1.5279	20.8545	33.7209	0.0230	0.7258	1.2308	1.825	2427.9048	
4	96	1.4467	16.3192	27.3704	0.0214	0.686	1.16	1.7334	2685.1584	

Overcrowding was avoided by keeping a small number of healthy and same sized fishes length, 5-7 cm and weight 23 to 33 gm in different aquaria. Water from aquaria was changed after every 24 hrs. At the time of experimentation, the room temperature was 28 °C and pH of the water maintained during the experimentation was 7.4 ± 0.2.

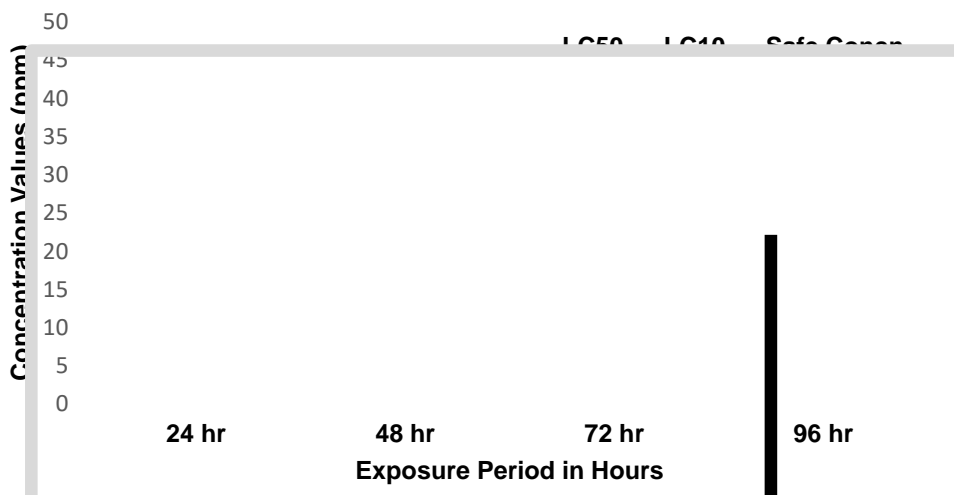
Ten Fishes of each group were exposed to different concentration of Profenophos in aquarium containing five liters of water. The resulting mortality was recorded in the range of 10% to 100% for each concentration for the duration of 24, 48, 72 & 96 hours. The data collected was then analyzed statistically by means of Probit analysis method (Finney, 1971) Safe concentration of Profenophos was calculated by method Hart et. al. (1945).

RESULTS

Behavior changes or death were seen at concentrations as low as 15 PPM. Erratic swimming, Imbalance in posture, loss in equilibrium, excess mucous secretion all over body surface followed by sluggishness, change in body colour. Colour of gill lamellae changes from reddish to light brown with coagulation of mucous on the gill lamellae of dead fish.

The LC10 and LC50 values were calculated for 24, 48, 72 & 96 hours by Finney’s method (1971) and are shown in Table – 1. Values of variance, fiducial limits, Chi square value, Lethal dose in ppm are also given in Table-1. Safe concentration of Profenophos was calculated by method Hart et al and it is 1.1478 ppm.

Figure-1. Comparison of LC50, LC10 and Safe concentration at different exposure periods of Profenophos



DISCUSSION

Acute toxicity tests offers rapid and short term result to measure relative impact of the pesticide concentration on the organism at different time intervals. The toxicity of particular pollutant depends on many factors such as animal weight, time of exposure, temperature, pH and hardness of water (Eisler, 1970). The evaluation of LC50 concentration of pollutants is an imputation of pollutants is an important step before carrying out further studies on physiological changes in animals. The mortality of aquatic organisms due to pollutant increases with increase in time of exposure period and dose of lethal concentration decrease with increase in exposure time (Nimmo and Behner, 1976). Anderson (1977) observed that that the number of death increased with increasing exposure time.

During the present study of toxicity evaluation of organophosphorous pesticide, Profenophos to *Channa orientalis* it was observed that the LC50 value decreased as the time of exposure increased.

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