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# STUDIES ON ACUTE AND BEHAVIOURAL TOXICITY OF TRIAZOPHOS ON FRESHWATER FISH *CYPRINUS CARPIO*

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**ABSTRACT** The present study was undertaken to evaluate the median lethal concentration ($LC_{50}$), and changes in behavioural responses caused by commercial formulations of triazophos on freshwater fish *Cyprinus carpio*. The $LC_{50}$ value was recorded to be 1.5mg/L and changes in behavioural responses were studied at sublethal concentration of 0.3mg/L ($1/5^{th}$), for a duration of 1, 10, 20 and 30 days, which revealed findings like, loss of fright response in addition to changes in swimming pattern that comprised of partial jerks, sinking at the bottom of the tank and whirling cork like movements. These changes were identified to be duration dependent thereby acknowledging the direct cause of damage due to triazophos. Based on the outcome of the present study, it is recommended that care must be taken when triazophos is used at agricultural sites especially nearby the aquatic ecosystems.

**KEYWORDS :** Acute toxicity, Aquaculture, Behavioural responses, Pesticide and Toxicity

## INTRODUCTION

Pesticides belong to the only group of harmful chemicals that have been used as an effective weapon to protect agricultural products from the attack of pests (David et al., 2018). The increased usage of pesticides have posed a major threat to the aquatic habitats in the past few decades (Jones et al., 2009; David and kartheek, 2015). Pesticides comprise of different classes, among which, the organophosphates (OP's) form the largest and diverse group of insecticides, their toxicity to the non-target organisms range from extremely toxic to some of the least toxic pesticides known (David et al., 2016). Most OP's are not persistent and will break down to non-toxic materials in one to 30 days, depending on the compound, however, several OP's are known to persist in the environmental conditions for longer durations, posing a serious threat to the inhabiting fauna (David and Kartheek 2015).

Pesticide pollution in water affects fish and other aquatic animals which indirectly impact on the higher organisms through foodweb (Svensson et al., 1994; Kartheek and David, 2017). The preliminary reflection in terms of health of an aquatic environment is determined by the health status of fishes which are relatively sensitive to changes. Fish health may thus reflect, and give a good indication of the health status of a specific aquatic ecosystem, especially to those which are located under close proximity to agricultural landscapes (Burkepile et al., 2000; Kartheek and David, 2016).

The level of toxicity of any substance is determined by its acute toxicity value against a given experimental animal (Kartheek and David, 2018). The acute toxicity ($LC_{50}$) tests are generally carried out to determine the receptiveness and survival potential of organisms to particular toxic substances, such as pesticide, which usually diffuse in to water bodies impacting greatly on the surviving ability of the aquatic organisms (Halappa and David 2009). Higher $LC_{50}$ values indicate less toxicity because greater concentrations are requisite to fabricate 50% mortality in organisms (Eisler and Gardner 1973; David and Kartheek, 2016). *Cyprinus carpio* (*C. carpio*) is an important species that constitutes nearly 10% of annual freshwater aquaculture production globally (Xu et al. 2014). The selected fish is known to dominate the freshwater aquaculture practice in terms of the production quantity and demand (Bostock 2010). *C. carpio* is one of the major species of freshwater fish that contributes to around 35% of inland aquaculture in certain areas of Karnataka, India (Yaraguntappa et al. 2007) where dynamic mining activities are evident since decades (Kolb et al. 2005). The pesticide induced responses include, reduced feeding, growth and swimming activity (Van Buskirk, 2002). Previously, many authors have reported the acute toxicity studies for different toxicants against various non-target organisms. Since the previously reported data validate the toxicity of various toxicants, the need for verifying the same for Triazhophos is important for evaluating toxicity levels. The present investigation was aimed to elucidate with the 96 h $LC_{50}$ value of Triazhiophos and further elaborate investigations for the behavioural changes in the freshwater fish *Cyprinus carpio* following sublethal exposures.

## 2.0 Materials and methods

### *2.1 Toxicant selected and test solutions*

Commercial grade Triazophos (TAP) of 40% EC was selected as the toxicant for the present study and was procured from the local market under the trade name Trizocel. Stock solution of the concentration 1 g/L was prepared by dissolving 1 g of TAP (40% EC) in 1000 ml of double distilled water. The required test concentrations were freshly prepared by diluting the stock solution just before the initiation of acute toxicity studies.

### *2.2 Procurement and maintenance experimental fish*

Healthy *C. carpio* of both sexes, weighing 7.0 ± 2.0 g with a length of 8.0 ± 1.0 cm, were procured from State fisheries department, Neersagar, Dharwad (Karnataka, India). The fish were allowed to acclimate in cement tanks (250 l) under laboratory conditions for 10 days. During acclimation, the water was aerated with a static system and the photoperiod of 12 h light and 12 h dark was maintained. Water was renewed daily and the physico-chemical characteristics were analysed following standard methods as mentioned in APHA (2005).

### *2.3 Grouping of Experimental Fish*

For experimentation, the fish were divided into four groups namely, Control ©, 1 day exposure (E1), 10 day exposure (E2), 20 day exposure (E3) and 20 day exposure (E4). Each group was maintained in triplicate and consisted of 10 individual fishes each irrespective of their gender.

### *2.4 Exposure to sublethal concentrations*

A single sublethal concentration of 0.3mg/l was selected. 10 healthy *C. carpio* were randomly selected and transferred to each glass aquaria containing 1000 ml water with its respective concentration of TAP solution. The tadpoles remained there for 96 h. However, before the tadpoles were transferred, it was made sure that the aquaria were clean enough and free from any kind of toxicant. For each concentration, including the control, 3 replicates were maintained and the mean values of these were taken into account for the present study. Further, the behavioral changes were observed and the body morphology of fish exposed to different sublethal concentrations of TAP was examined.

### *2.5 Behavioural Responses*

The behavioural responses of fish under control and those under exposed group were monitored daily video recording.

### *2.6 Ethics statement*

The present study was carried out at Department of PG Studies and Research in Zoology, Karnatak University, Dharwad (Karnataka, India) as per ethical committee regulations. The test animal used were