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Acute toxicity bioassay of new tech biopesticide on fresh water cyprinid *Danio aequipinnatus* (Ham Buch)

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Abstract

Present research work was based on the evaluation of the toxic effect of New Tech biopesticide to fresh water cyprinid *Danio aequipinnatus*. Fishes were exposed to Newtech to determine LC₅₀ values for 24, 48, 72, and 96 hours. The mortality data was analysed by Finney's Probit Analysis method and was found to be 2.1698 ppm, 1.9183 ppm, 1.7649 ppm and 1.5549 ppm respectively. The present work was undertaken to evaluate the effect of newtech on acute toxicity level of *D. aequipinnatus*.

Keywords: Toxic effect, New Tech, *Danio aequipinnatus*, LC₅₀

1. Introduction

The extensive use of pesticides not only brought adverse impact on agro ecosystems but also caused alteration to non-target animals. Pesticides are biological toxic agent, which are required by human to control insect and non-insect pests. Increased use of pesticides results in contamination of natural ecosystem^[1]. These toxic substances may accumulate in the food chain and cause serious ecological and health problems^[2]. The pesticides after being used ultimately find their way to different aquatic ecosystems and have been found to be highly toxic to non-target organisms, especially aquatic life forms and their environment^[3]. The pollution of aquatic environment from industrial, domestic and agricultural waste has exposed these important aquatic organisms to contaminants which not only threatened their lives but also eventually enter the food chain leading to serious public health hazards^[4]. Geometric increase in human population coupled with rapid urbanization, industrialization and agricultural development has resulted in high impact on both quality and quantity of water in India^[5]. The application of pesticides in agriculture and in areas located close to wetlands has resulted in toxicity to many non-target species such as fish and aquatic invertebrates^[6].

Fishes are good bio-indicators to assess water pollution. Health of the fish plays an important role in protecting as well as evaluating aquatic biota. Since they are directly exposed to toxicants resulting from agro production via surface run off in directly through the food chain of ecosystem. In recent years, incidences of fish mortality due to pesticides, industrial effluents and sewage pollution have been reported^[7]. Such contaminants change water quality and may cause many problems to fish, such as diseases and structural alterations^[8].

Biopesticide is an eco-friendly and alternative to chemical pesticides. Biopesticide are certain types of pesticides derived from natural material like plants, microbes, fungi etc. The interest in biopesticide is based on the drawbacks associated with chemical pesticides. Numerous pesticides belonging from different groups are available in the market, out of them new tech was selected for present study. The New tech is agro-biopesticide that is widely used in agriculture. This biopesticide is prepared by plant alkaloids and microbial enzymes. It acts as a stomach poison to the crop pest. New tech is recommended for the control of mealy bugs, hence called as mealy Bug Insecticide. The New tech is used to control the pest of the crops, cotton, citrus, mango and guava etc. Variety of fishes are found in the Navapur region, The *Danio aequipinnatus* (Giant Danio) was selected for the present study owing to fact that, the *D. aequipinnatus* was originated from much of northern India and its neighbouring countries including Nepal, Bangladesh, Srilanka, Myanmar Northern Thailand and India. The species is listed on the IUCN Red List as Least Concern (LC). *D. aequipinnatus* is commonly known as golden giant Danio. Danio is a member of family cyprinidae under the cypriniformes order.

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The *Danio aequipinnatus* is carnivorous fish feed upon larvae and microorganisms. The species is available abundantly throughout the year in Rangawali River at Navapur, Dist-Nandurbar, Maharashtra (India). It is commonly known as Chatya conava by local tribal community. It has great economic importance. The fishes are quite active and have high requirements of nutrients. Giant Danio is an important food item and widely consumed by local tribal community from Navapur region.

Toxicity study is important to find out safe concentration as well as toxicant limit, so that there will be least harm to aquatic fauna in the future. The acute toxicity test is short term exposure to the test organisms under the laboratory condition. The mortality of the test animal is the most detectable response to find out the LC₅₀ concentration of experimental organisms. Numerous chemicals as well as biopesticides belonging from different group are available in the market, out of them newtech was selected for present study because, no records were found in the toxicity effect on fish. The aim of this study to investigate different lethal concentrations (24, 48, 72 & 96 hrs.) values of new tech biopesticide for *Danio aequipinnatus*.

Materials and Methods

In the present study *Danio aequipinnatus* were collected from Rangawali River dam (Nagziri dam) and Manekpur Tapi River backwater, Situated at 21° 0' N latitude, 73° 52' 0" E longitude and 21° 22' N latitude, 73° 76' 2" E longitude respectively. About 18 km and 11 km away from Navapur Taluka respectively. The fishes were purchased by local fishermen. Collected fishes were transported alive to the laboratory in large plastic containers filled with reservoir

water to minimize stress and mortality. The fish were checked for injury as well as disease, if any. They were treated with 0.1% KMnO₄ solution and acclimatized to standard laboratory condition for 20 days in glass aquaria of 100 L capacity. During acclimatization process, the fishes were fed daily with fish food (Taiyo) were purchased from the market. New tech biopesticide selected for present study, is the product of the Asean Agro technologies (I) Private Limited Nasik Maharashtra India, and were purchased from the market. Food supply was withdrawn 24 hrs preceding the experiment. The control and experimental fishes were exposed to the pesticide Newtech at 1.6 to 2.8 ppm, 1.4 to 2.6 ppm, 1.2 to 2.4 ppm, 1.0 to 2.2 ppm concentration of Newtech for 24, 48, 72 and 96 hours respectively. The data were collected and determined by Finney's probit analysis method [9]. The study was carried out from June 2015 to December 2015.

Results

No mortality was found in the control group of fish. In the Experimental group of fish, results were noted as 10% to 90% mortality during the experiment at 24, 48, 72, and 96 hours summarised in table 1. The LC₁₀ values obtained for Newtech exposed for 24, 48, 72 and 96 hours exposure were 1.6174 ppm, 1.3722 ppm, 1.2750 ppm and 1.0281 ppm for 24, 48, 72, and 96 hours respectively summarised in table 2. The LC₅₀ values found to be 2.1698 ppm, 1.9183 ppm, 1.7649 ppm, 1.5549 ppm at 24, 48, 72 and 96 hours respectively summarised in table 2. From the above results it was observed that the toxic effect of Newtech is very high to *Danio aequipinnatus* and it was considered to highly toxic biopesticide to the Non-target fishes.

Table 1: *D. aequipinnatus* exposed to various concentrations of Newtech.

Concentration in ppm and mortality observed							
Sr. No.	01	02	03	04	05	06	07
24 hrs	1.6 ppm	1.8 ppm	2.0 ppm	2.2 ppm	2.4 ppm	2.6 ppm	2.8 ppm
Mortality	1	2	4	5	6	8	9
48 hrs	1.4 ppm	1.6 ppm	1.8 ppm	2.0 ppm	2.2 ppm	2.4 ppm	2.6 ppm
Mortality	1	3	4	5	7	8	9
72 hrs	1.2 ppm	1.4 ppm	1.6 ppm	1.8 ppm	2.0 ppm	2.2 ppm	2.4 ppm
Mortality	1	2	4	5	6	8	9
96 hrs	1.0 ppm	1.2 ppm	1.4 ppm	1.6 ppm	1.8 ppm	2.0 ppm	2.2 ppm
Mortality	1	3	4	5	6	7	9

Table 2: LC₁₀ and LC₅₀ values of Newtech exposed to fresh water cyprinid *D. aequipinnatus*.

Sr. NO.	Exposer period in hour	LC ₁₀ values	% Mortality	LC ₅₀ Values	% mortality
01	24	1.6174	10%	2.1698	50%
02	48	1.3722	10%	1.9183	50%
03	72	1.2750	10%	1.7649	50%
04	96	1.0281	10%	1.5549	50%

Discussion

Biopesticide are gaining momentum as they are environment friendly and can replace some of the chemical pesticides [10]. The toxicological action of the euphorbias may be due to the presence of a group of diterphenenophorbol esters [11]. While alkaloids, sterols and triterpenoid present in plants of family *Apocynaceae* are responsible for toxicity [12]. Several studies have been conducted in evaluating the toxicity of pesticide to the aquatic biota especially fishes [13, 14]. Hassain *et al.* [15] recorded the 96 hrs. LC₅₀ value of a neem biopesticide (triology) on grass carp *Ctenopharyngodon idella* was found to be 112 ppm. Imtiyaz *et al.*, [16] reported the 96 hrs LC₅₀

value of Matrine (Kethrin) on the *Labeo rohita* was to be 21.68 ppm. Gavit and Patil [17] reported the 96 hrs LC₅₀ value of Acephate on the *Puntius sophore* was to be 1117 ppm. Ansari and Sharma [18] reported Achook, a neem based pesticide to be toxic to zebra fish. Biopesticides which are target specific, eco-friendly and biodegradable as potential alternative to chemical pesticides in addressing various pest management issues [19]. Keeping the above fact in mind, the effect of widely used biopesticide New tech were taken up studying to find out toxicity in fresh water fish *Danio aequipinnatus*, as experimental animal. The experimental fish *D. aequipinnatus* is very sensitive to New tech. The results of

toxicity test in the present study indicated that the Newtech is toxic to the fresh water fish *Danio aequipinnatus* and showed 50% mortality at 1.6 ppm during 96 hours exposure.

Conclusion

In the present investigation it can be concluded that microbial biopesticide New tech is highly toxic to the fresh water fish *Danio aequipinnatus*. If the rampant use of this pesticide continues, it may cause high mortality of the *D. aequipinnatus* and thus, reduce the gene pool of fish.

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