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ACUTE TOXICITY EFFECT OF ACEATAMIPRID 20% SP (NEONICOTINOID INSECTICIDE) EXPOSED TO THE FRESHWATER FISH *CATLA CATLA*

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Abstract

All pesticides have the potential to cause harm during their manufacture or refinement, at the time of application to crops, as residues that persist on food and cause disruption in the natural balance that exists between pests and their natural enemies. In the present study, Acetamiprid neonicotinoid insecticide toxicity was assessed in the ongoing investigation of the freshwater fish *Catla catla* was evaluated using the Finney method (1971), static and renewable technique methods. The toxicity evaluation was found to 24, 48, 72, and 96 hrs., and dose concentrations are 80 mg/l, 70 mg/l, and 60mg/l, 50mg/l respectively (Represented by table No:1 and graph No:1), and this experiment was conducted along with controls. The experimental fish were observed the mortality rate, and behavioral and morphological abnormalities were observed in the experimental groups. The study's results demonstrate that acute toxicity of Acetamiprid has a fatal impact on the behavior that is typically health. These responses and changes were more at higher concentrations and the duration of time is low, as compared to other concentrations and time durations. Even lower concentrations can also exert changes in behavior and morphology and cannot be ignored. Control fish were also monitored to record their normal behavior.

Keywords: Acetamiprid 20% SP, Toxicity evaluation, *Catla catla* and Behavioral Responses.

Introduction

All pesticides (regular and engineered) can hurt during their production or refinement, at the hour of use to crops, as buildups that endure on food, in the disturbance of the normal equilibrium that exists among bothers and their regular adversaries. Acetamiprid, (E)- N′-[(6-Chloro-3-pyridyl) methyl]-N2-Cyano-N′-methylacetamidine, is the new-age of chloronicotinyl bug splash with a fundamental likeness to nicotine (Devan *et al.*, 2015). Even though acetamiprid is significantly harmful to bugs (Tomizawa and Casida 2005). Since the last few decades, Acetamiprid is extensively utilized in horticultural, homegrown, and general well-being exercises as a substitution for additional risky pesticides like organophosphates, carbamates, and pyrethroids (Kocaman and Topaktaş 2007; Craddock *et al.*, 2019).

Since just 1% of pesticides arrive at the objective living being and the excess close to 100% is scattered in the climate, they are a critical danger to sea-going and earthly regions as well as non-target organic entities (Zhang and Zhao, 2017). The expansive range of neonicotinoid bug spray Acetamiprid has become generally utilized to build farming productivity. The successful convergences of Acetamiprid for killing objective creatures on non-target living beings and environments are obscure (Siddiqui and Wanule, 2010).

Pesticide misuse has turned into a worldwide emergency with essentially unfriendly effects on the oceanic environment and general well-being (EMCDDA, 2019; Peacock *et al.,* 2019). Colossal improvement of farming in beyond a couple of many years cum quick development of industrialization in our nation got out extraordinary increment production and use of manures, pesticides like Organochlorines, Organo-phosphorus, Carbamate, Carboxylic corrosive subsidiaries, engineered pyrethroid pesticides, Petrochemical items, Cleanser and other Manufactured synthetic compounds and rural squanders represent a danger to the water environment and oceanic life. The current research work to estimate the lethal concentrations (LC) of Acetamipride20% SP; on the freshwater fish *Catla catla*.

Materials and methods

Test Chemical: Acetamiprid 20%SP

Acetamiprid 20% SP is an expansive range of Neonicotinoid Insect spray suggested for the control of sicknesses like Sucking-Type Bugs on Verdant Vegetables, Fruiting Vegetables, Cole Harvests, Citrus Organic products, Pome Natural products, Grapes, Cotton, and Decorative Plants and Blossoms. It contains 20 % dynamic fixing which is comparable to 250g/l of the item. Acetamiprid is an α-chloro-N-heteroaromatic compound. It is a neonicotinoid is an insect spray having a place with a chloropyridinyl bunch, and its characteristic item found in Streptomyces canus which is gotten from the normally happening strobilurins. It isn't just utilized in India all through the world, the purposes of Acetamipride are immensely expanded in a couple of years.

Collection and acclimatization of test fish *Catla catla*

Test fish *Catla catla* were collected from the earthen fish pond from Kuchipudi, Tenali, Guntur (Dist), A.P. The mean weight of fish was 6.25±0.25g, fish were treated with 1%KMnO4 to remove any dermal adherent and they were acclimatized to the lab conditions in a 200L capacity tank with sufficient dechlorinated groundwater for 15 days at room temperature 25±2°C. During the conditioning period, the fish were only supplied with air and at the same time water was renewed every day to avoid the any fungal, bacterial contamination and fish feed rice bran was given to the fish every day. The percent mortality was recorded daily and dead fish was removed. After 15days of acclimation the fish was transferred randomly into the plastic aquaria to test the lethal concentrations of selected pesticide dose concentration separately.

Preparation of stock solution:

The Neonicotinoid Insecticide Acetamiprid 20%SP stock solution was prepared by mixing 1grm of the soluble powder in 1lit of distilled water. Test solutions of the required concentration were prepared by dilution of the stock solutions for the range finding and definite test.

Acute Toxicity test

During acute toxicity trials the fish were subjected to a 12-hr photoperiod and were not fed. Prior pilot experiments were conducted using 1Lit bottles and one fish for each bottle was introduced to choose the mortality concentration at which concentration the fish respond. The experiments were conducted to select mortality range from 10% to 100% for 24, 48, 72 and 96 hours to determine LC_{50} values of in Acetamiprid 20% SP exposed to the freshwater fish *Catla catla*. Four groups of fishes, 10 individuals in each group, in four separate well-aerated plastic tubs were exposed.

I). Control group (C), exposed to toxicant free lab water,

ii). Experimental Groups, exposed to Acetamipride 20%SP

All experiments were carried out in triplicate in a static renewal system of water after every 24h interval, with the regular addition of a fresh toxicant solution with the same concentration to sustain the nominal concentrations of Acetamiprid 20%SP. The dead fish were removed from test chambers immediately after death the data regarding fish mortality was recorded from the tests at the end of each specific time. Care was taken during the handling of fish to avoid stress. The physico-chemical characteristics of water were determined by standard methods of APHA (2005). The stock solutions of Acetamiprid were freshly prepared and were renewed after every 24 hours. The lethal concentrations ensure death even before noticing the behavioral abnormalities.

Statistical Analysis

All concentration-response data of each pesticide was analyzed using the probit Analysis Method (Finney, 1971 method). Similarly, the probit method was also used to analyze toxicological data for the pesticide.

The data was subjected to the following statistical equations for at LC_{50} values.

$$\text{Log } LC_{50} = \frac{\text{Log } A + 50 - a}{b - a \text{ Log}^2}$$

Where:

A = Concentration of pesticide at 50% mortality

a = Percent kill just below 50% mortality

b = Percent kill just above 50% mortality

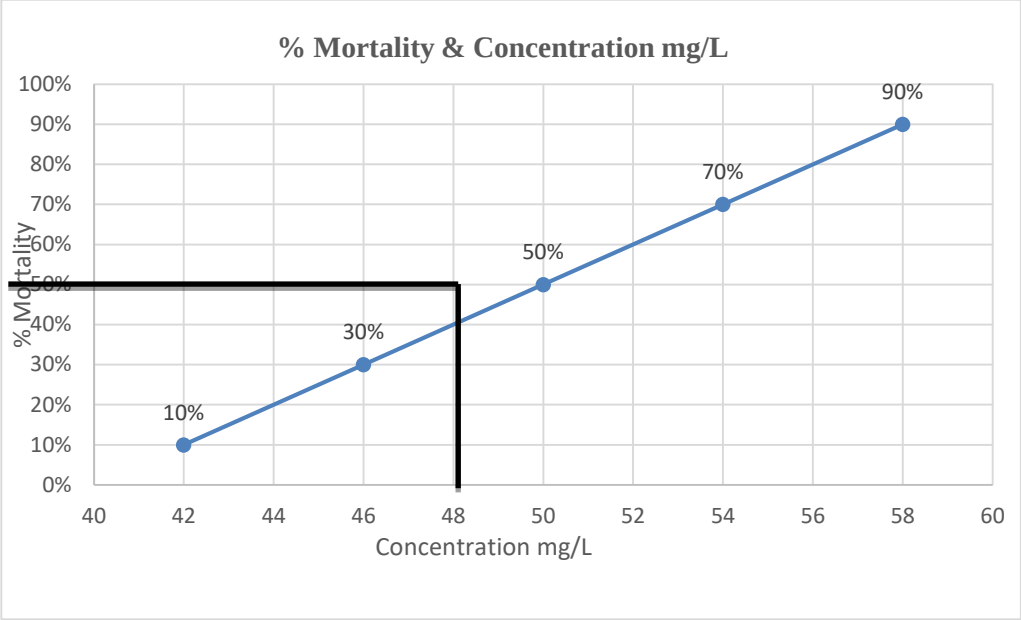
Results

The toxicity of pesticide and other chemical substances is influenced by physical factors like temperature, pH and biological factors like size, national status, species specificity, and chronobiology of the animal. The toxicity of a pesticide and heavy metals could vary from species to species and this variation is due to the differential tolerance of animals to exposure. The data was computed according to Probit Analysis Method (Finney, 1971) and the LC_{50} values were determined. The time-response relationship indicated that the fish responded in a time-dependent manner to the exposed pesticides. In the present study the individual LC_{50} values of *Catla catla* for 24hr, 48hr, 72hr, and 96hrs exposed to Acetamipride 20%SP are 80mg/l, 70mg/l, 60mg/l, and 50mg/l respectively. All the LC_{50} values were given in the table.

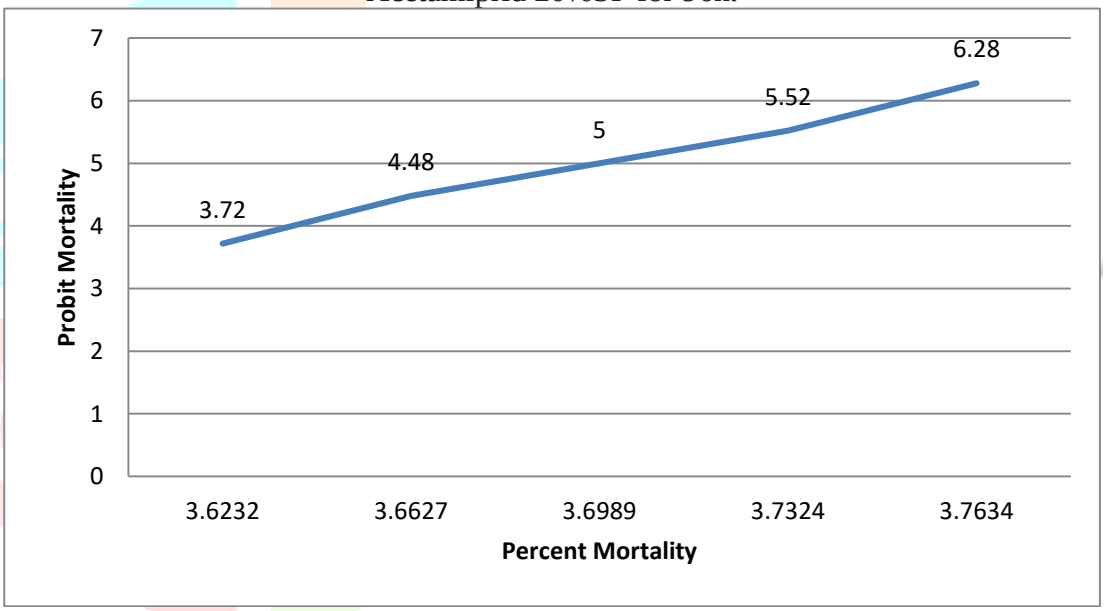
Table. 1. Calculated LC_{50} values of Acetamiprid to the fish *Catla catla* under static exposure for 24, 48, 72 and 96 hrs.

S. No.	Exposureperiod	Concentrationin mg/L	No. of fishexposed	Percent mortality	Probit mortality
1	**24 h**	72	10	10%	3.72
2		76	10	30%	4.48
3		**80**	10	**50%**	**5.00**
4		84	10	70%	5.52
5		88	10	90%	6.28
6	**48 h**	62	10	10%	3.72
7		66	10	30%	4.48
8		**70**	10	**50%**	**5.00**
9		74	10	70%	5.52
10		78	10	90%	6.28
11	**72 h**	52	10	10%	3.72
12		56	10	30%	4.48
13		**60**	10	**50%**	**5.00**
14		64	10	70%	5.52
15		68	10	90%	6.28
16	**96 h**	42	10	10%	3.72
17		46	10	30%	4.48
18		**50**	10	**50%**	**5.00**
19		54	10	70%	5.52
20		58	10	90%	6.28

Observed the % mortality, dose concentration mg/l of LC_{50} value of the fish *Catla catla* exposed to Acetamiprid 20% SP for 96hrs.



Observe the response curve between the % mortality and Probit mortality of the fish *Catla catla* Exposed to Acetamiprid 20%SP for 96h**.**



The confidence interval values obtained in this study are important statistical outputs that can be used to evaluate whether one is more significantly sensitive to another result. The results of regression analysis indicated that the mortality rate (Y) is positively correlated with the concentration (X). The toxicity factor indicates that the toxicity of the single pesticide.

Discussion

Pesticides are essentially harmful and, in this manner, poisonous to living creatures at specific portions. Pesticides become a piece of the water section and fish ingest the pesticides, typically through their gills, albeit some of the time through their scales. Fish has considered the most significant and fundamental connection in the natural pecking order of the biological system. Numerous pesticides have been accounted for to create various biochemical changes in fish both at deadly and more regularly, at sublethal level changes in particle S. Justin Raj and baby Joseph (2015).

Present study Acetamiprid 20%SP was exposed to 24hr, 48hr, 72hr, and 96hrs to the *Catla catla* fish, the LC_{50} values were 80mg/l, 70mg/l, 60mg/l, and 50mg/l respectively. The present results were considered with other researchers, in an alternate report it was accounted for that acetamiprid20%SP was essentially nontoxic to fish because the LC_{50} esteem was more noteworthy than 100 mg/l. In any case, different

examinations have revealed LC_{50} values that recommend acetamiprid was poisonous to amphibian species. Raj and Joseph (2015) decide the acetamiprid LC_{50} values of an incentive for *Oreochromis mossambicus* as 5.99 mg/L. Zhang and Zhao (2017) found the 96-h LC_{50} an incentive for *Brachydanio rerio* was 24 mg/L. The mean LC_{50} value of cyanide toxicant in *C.catla* was found to be 0.76 ± 0.04 mg/L Basaling and Praveen (2011). The toxicity range in *Cirrhinus mrigala* 3.043 mg/L, exposed to glyphosate in static renewal test for 96h A. Rajeswari (2020).

Present study the determination of Acetamiprid20%SP toxicity influenced by exposure conditions, formulation and size of fish and water quality. It was reported that the static renewal values of LC_{50} higher than the continuous flow-through systems. Parveen *et al., (*2021) the LC_{50} values decreased with the increase in the period of exposure toxicant flubendiamide 2.892 $mg5^{\sim 1}$ for 96 hrs exposed fish *Catla catla*. Fipronil 5%SC represent the LC_{50} values were 1.32 and 1.5mg/l for 96hrs in fresh water fishes *Labeo rohita and Ctenopharyngdon Idella* respectively Ch. Anitha *et al*., (2022).

Conclusion

In the current examination the test species, *Catla catla* has shown differential poisonousness level with the capability of period. This shows that the more is the term time frame the less is the fixation required. The noticed rate mortality and probit mortality of *catla* for Acetamiprid in static tests persistent for various hours and various fixations were displayed. My research work is considered with other researchers.

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