

Acute Toxicity and Behavioural Response in Fresh water Fish *Danio aequipinnatus* (Ham Buch) Exposed to Floraguard (Biopesticide).

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Abstract: The Flora guard is agro-biopesticide that is widely used in agriculture. Floraguard is organic research product, is an agro-biopesticide. It acts as systemic as well as contact poison to the pest of the crop. It is immediately control all sucking pests, like thrips, aphids and jassids. It is commonly applied on grapes, mango, strawberry, brinjal, chili and onion etc. Aim of present the study was to assess acute toxicity and behavioural changes of this chemical on fresh water fish *Danio aequipinnatus*. The fish were exposed to Floraguard to determine the LC₅₀ values. The static bioassay experiments were carried out by Finney's method (1971). The fish was exposed to different concentrations of floraguard and the result showed the LC₅₀ values at 24, 48, 72 and 96 hours were 2.6230 ppm, 2.3474 ppm, 2.1478 ppm and 1.9870 respectively. The results of the present study indicates that floraguard has highly toxic effects on the fish *Danio aequipinnatus*.

Keywords: Acute toxicity, Behavioural changes, *Danio aequipinnatus*.

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I. INTRODUCTION

Water is most significant component for the existence of life on the Earth. It is distributed in environment in different forms such as river water, rain water, mineral water and spring water etc. Aquatic ecosystems are ultimate sinks for agricultural residues as well industrial pollutants and it has become a global environmental problem in recent days^[1]. Pesticides through surface runoff reaches to the unrestricted areas like rivers, ponds which alters quality of water and toxic to aquatic animals and cause serious effect or even death to the aquatic organisms. Hill^[10], Sibley and Kaushik^[16] reported contamination of surface waters by pesticides used in agriculture is a problem of worldwide importance. Fishes are good, suitable and sensitive bio-indicators of water media to identify the aquatic pollution. Such contaminants change water quality and may cause many problems to fish, such as diseases and structural alterations^[6]. In recent years, incidences of fish mortality due to pesticides, industrial effluents and sewage pollution have been reported^[2]. Indiscriminate use of these chemicals in agriculture and public operations has changed the ecological balance of many non-target organisms like fishes^[4]. Therefore, an attempt to minimize these problems, natural products is used as an alternative. Eco-friendly biopesticide agents are available abundantly in nature^[18]. Botanical insecticides are environmentally friendly and do not leave any harmful residue in the aquatic environment due to their biodegradability^[5],^[12]. 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. Various pesticides belonging from different groups are available in the market. Flora guard was selected for present study because, no records of toxic effects of the pesticide on the fish were found. The Flora guard is agro-biopesticide that is widely used in agriculture. Floraguard is organic research product, is an agro-biopesticide. 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 Danio inhabiting the fresh water sources is widely cultured in ponds, lakes of this region. The *D.aequipinnatus* was originated from much of northern India and its neighbouring countries including Nepal, Bangladesh, Srilanka, Myanmar Northern Thailand and India. *D.aequipinnatus* is commonly known as golden giant Danio is a member of family cyprinidae under the cypriniformes order. This species is available abundantly throughout the year in Rangavali River at Navapur, Dist-Nandurbar, Maharashtra (India). It is commonly known as Chatya conava by local tribal community. It has great nutritive importance in tribal community of Navapur tehsil and literature about pesticidal stress on *D.aequipinnatus* is scanty. Present work is aimed to find out acute toxicity and effects of Floraguard on freshwater fish *D.aequipinnatus* by determining the LC₅₀ values at different exposure periods.

This type study will helps to estimate the safe level dose and strengthen the baseline data by which comparative sensitive of biopesticide could be analyzed.

II. MATERIALS AND METHODS

Live and healthy fish *Danio aequipinnatus* ranging in length 6-7 cm and weight 4-5 grams were collected by local fishermen from Rangawali dam of Navapur Taluka. The dam located on the coordinates of 210, 0''N latitude and 73⁰, 52', 0''E longitude. The collected fishes were brought alive in to the research laboratory, A.C.s College Navapur, Dist. Nandurbar. They were treated with 0.05% KMnO₄ solution to obviate dermal infection, thereafter acclimatized to standard laboratory condition for at least two weeks in dechlorinated tube-well water contained in large glass aquarium at room temperature 27± 1°C and p^H of the water maintained was 7.0 ± 0.2. Proper aeration was provided to prevent hypoxic condition. During the acclimatization fish were fed on fishmeal procured from market. Physicochemical parameters of water used for experimentation were studied by method given in APHA and AWWA^[3]. The fishes then kept in the plastic through having 10 liters of water and each through contains 10 fishes. They were exposed to various concentration of flora guard for 24, 48, 72 and 96 hours along with one control group. The control group was kept in plastic through containing water without addition of pesticide flora guard. Fish were not given any food during experiment. Water with test concentration of pesticide was replaced after every 24 hours up to 96 hrs and resulting mortality was recorded in the range of 10% to 100% for each concentration for the duration of 24,48,72 and 96 hours. The collected data was computed according to probit analysis method of Finney (1971)^[8]. The LC₁₀ and LC₅₀ values, variance, chi square test, lethal dose, fiducial limits were calculated for 24, 48, 72 and 96 hours. Safe concentration of floraguard was calculated by method described by Hart *et al*,^[9]. Simultaneously behaviour changes of the fish were also observed and recorded during the exposure period.

III. RESULTS

Both behaviour and death were observed during the exposure. The behavioural and swimming patterns of the fish were normal in case of control group but jerky movements were observed. In the initial stage, fish stopped swimming and remained in static position by sudden change in the surrounding water.

The results were recorded as 10% to 90% mortality during the experiment, no mortality was found in the control fishes at 24, 48, 72 and 96 hours. Results obtained after toxicity evaluation of *D.aequipinnatus* to different concentrations of floraguard is sited in table no.1.The LC₁₀ value, LC₅₀ value, regression equations, Chi square values, Variance and 95% fiducial limits values, lethal concentration and safe concentrations are summarised in table no.1.The LC₁₀ values of the biopesticide at various concentration of the Floraguard were 1.9883 ppm, 1.7579 ppm, 1.6188 ppm, 1.4521 ppm at 24, 48, 72 and 96 hours respectively. The LC₅₀ values for 24, 48, 72 and 96 hours exposure to Floraguard are 2.6230 ppm, 2.3474 ppm, 2.1478 ppm and 1.9870 respectively summarised in table no.1.

Time of exposure	LC ₁₀ values in PPM	LC ₅₀ values in PPM	Variance	χ ² Value	Fiducial limits		Lethal Dose in PPM	Safe conc. 'c' in PPM
					M ₁ PPM	M ₂ PPM		
24	1.9883	2.6230	0.0002	0.9885	0.3884	0.4491	62.9520	0.5641
48	1.7579	2.3474	0.0002	0.6392	0.3396	0.4015	112.6752	
72	1.6188	2.1478	0.0002	0.3974	0.3010	0.3629	154.6416	
96	1.4521	1.9870	0.0003	0.2748	0.2631	0.3670	190.7520	

IV. DISCUSSION

Behavioural characteristics are evidently sensitive indicators of toxicant effect. In the present study, *Danio aequipinnatus* was subjected to different concentrations of flora guard biopesticide and its behavioural changes were observed. Behaviour is considered a promising tool in ecotoxicology^[11]. Acute toxicity studies are the very first step to determining the water quality requirements of fish and the studies reveal the toxicant concentrations that cause fish mortality even at short exposure^[13]. Worldwide investigations reported effect of pesticides on aquatic organism^{[7], [15]}. Several studies have been conducted in evaluating the toxicity of pesticide to the biota specially fishes^[19]. Ishi & Patil^[17] recorded 96 hours LC₅₀ value of a Newtech biopesticide on fresh water cyprinid *D. aequipinnatus* was found to be 1.5549 ppm. Narwaria and Saksena^[20] reported the 96 hrs LC₅₀ value of Matrin (Kethrin) on the *Labeo rohita* was to be 21.68 ppm. Bansode and Patil^[14] recorded 96 hrs LC₅₀ value of neem based insecticide Bioneem on the fresh water fish *Gara mullya* was to be 167.45 ppm. In the present investigation, 96 hrs LC₅₀ value of Floraguard to *D.aequipinnatus* was found to be 1.9870 and the safe concentration reported for *D. aequipinnatus* was 0.5641 ppm. From the study it is indicated that Floraguard is highly toxic to freshwater fish *D. aequipinnatus*.

V. CONCLUSION:

In the present investigation it can be concluded that, biopesticide Floraguard is highly toxic to the fresh water fish *D.aequipinnatus*. If the over use of this pesticide continues, cause reduce the gene pool of the fish and other aquatic organisms.

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REFERENCES

- [1]. Alinezad R. "Determining LC50 In 96h Regent Insecticide, Hinosan unicide, Persicus.(M.Sc Thesis)." Lahijan Azad University. 2004.
- [2]. Ansari BA, Sharma DK,. "Toxic Effect of Synthetic Pyrethroids Deltamethrin and Neem Based Formulation Achook on zebra Fish *Danio rerio*." Trends in Biosciences , 2009; 2(2):: 18-20.
- [3]. APHA, AWWA. standard methods for the examination of water and waste water APHA (17TH ed) INC, New York, 1985. n.d.
- [4]. Bagheri A, Nezami A. "Effect of Weed Control and Plant Densities on Yield and Morphological Characteristics of Chickenpea in Dry Farmin of North Khorasan. ." Journal of Agricultural Science and Industries Iran. 2000: 14.
- [5]. Caguam AG, Aree RG,. "Overview of Pesticides Use In Rice Fish Farming South East Asia.In: C.R.Dela Cruz, C. Lightfood, B. Coasta Pierce, V.R. Carangal and M.P.Bimbao(Eds).Rice-fish research and development in Asia." International centre for Living Aquatic Resources Managment (ICLARM) Conf.Proc. Philippines , 1992: 24:217-233.
- [6]. Chang S, V S Zdanowicz & R A Murchelano. "Associatoions Between Liver Lessions In Winter Flounder (*Pleuronectus americanus*) and Sediment Chemical Contaminats From North East United States Estuaries." Journal of Marine Sciences, 1998: Vol 55; 954-969.
- [7]. Cripe, G.M,. "Comparative Acute Toxicities of Survival Pesticides and Metals to *Mysidopsis bahia* and Post Larval *Panaeus duorarum*." Environmental toxicology and chemistry, 1994: 13;1867-1872.
- [8]. Finney D.J. Probit Analysis 3rd Edn. Cambridge University London, 1971.
- [9]. Hart WB, Doudorof P, Greenbank J,. "The Evolution of Toxicity of Industrial Waste, Chemicals and Other Substances to Freshwater Fish". water control laboratory laboratory, Atlsntic refining Co. Philadelphia. 1945: 317(14).
- [10]. Hill.I.R. "Effects on Non Target Organisms In Terrestrial and Aquatic Environments. In: Lehney J.P (ed): The pyrethroid Insecticides. Taylor & Francis, London." 1985: 165-181.
- [11]. Imtiyaz Ahamad Bhat, Alok Varma, Geeta Saxena,. "Acute Toxicity of Marine Containing Biopesticide Kethrin On a Freshwater Fish, *Labeo rohita*(Hamilton)." Indian Journal of Lfe Sciences. 2012;2(1):: 113-116.
- [12]. Koesomadinata S. "Pesticide as a Major Constraint In Integraed Agriculture- Aquaculture Farming System. In: R.S.V Pulin and Z.H. Shehadeh (Edn.),Integrated Agriculture- Aquaculture Farming Systems. (ICLARM) Conf.Proc." 1980; 4: 45-51.
- [13]. Pandey S, R Kumar, S Sharma, N.S.Nagpure and S.K. Srivastava. "Acute Toxicity Bioassays of Mercuric Chloride and Melathion on Air Breathing Fish *Channa punctatus*(Bloch) ." Ecotoxicology and Environmental Safty , 2005: Vol-61: 114-120.
- [14]. SB Bansode, RD Patil. "Toxicity of Neem Based Insecticide Bioneem (Azadirectin) to Freshwater Fish *Gara mullya* (Sykes)." Journal of Entomology and Zoology Studies, 2016: 1013-1015.
- [15]. Shanmugam M, Venkateshwarlu M and Naveed, A,. "Effect of Pesticides on The Freshwater Crab, *Baritelphusa cunicularis*(Westwood)." Journal of Ecotoxicology and Environmental Monitoring. 2000: 10:273-279.
- [16]. Sibley P.K, Kaushik N.K. "Toxicity of Microencapsulated Permethrin to Selected Nontarget Aquatic Invertebrates." Archives of Environmental Contamination and Toxicology. 1991: 20;168-176.
- [17]. SS Ishi, RD Patil. "Acute Toxicity Bioasay of Newtech Biopesticide on Freshwater cyprinid *Danio aequipinnatus* (Ham Buch)." International Journal of Fisheries and Aquatic Studies, 2017; 5 (3): 584-586.
- [18]. Swaminathan, M.S. "Cultivating Food For Development World." *Environmental Science and Technology*, 1992: 1104-1107.

- [19]. Verma SR, Bansal SK, Pal N, Tyagi AK, Bhatnagar MC. "Bioassay Trials With Twenty Three Pesticides to a Freshwater Teleost, *Saccobranhus fossilis*." Water Research, 1982; 16(5):: 525-529.
- [20]. YS Narwaria and DN Saksena. Acute Toxicity Bioassay and Behavioural Responses Induced By Sodium Fluoride In Freshwater Fish *Puntius sophore* (Bloch). Research Report Fluoride, New Zealand.: The International Society For Fluoride Research Inclusive., 2012; 45 (1) 7-12.

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