

EFFECT OF PH ON NUVAN TOXICITY TO *RASBORA DANICONIUS*

Ghanbahadur Ashwini \*, Ghanbahadur Girish, R.\*\*Ganeshwade R. M.\*\*\* Wagh S. B.,\*\*\*\*

\*Department of zoology RNC Arts, JDB Commerce, NSC Science College, Nashik, Maharashtra, India.

\*\*\*Department of Zoology, PDVP College, Tasgaon, Dist-Sangli, Maharashtra, India.

\*\*\*\*Department of Environment Science Rt. Prof. and Head Dr. Babasaheb Ambedkar Marathwada University  
Aurangabad, Maharashtra, India.\*Corresponding Author: ([dr.ashwinighanbahadur@gmail.com](mailto:dr.ashwinighanbahadur@gmail.com))

## ABSTRACT

An attempt was made to study the acute toxicity of Nuvan with variable PH in *Rasbora daniconius* in order to determine limits of PH tolerance. During present study it was observed *Rasbora daniconius* tolerated PH upto 5 to 10 at the extremities of this range mortality of the fish was high therefore the toxicity tests were carried out at PH ranging from 6.5 to 9.0.

**KEY WORDS:** *Rasbora daniconius*, Toxicity, Nuvan.

## INTRODUCTION

Nuvan is an organophosphate insecticide which is most toxic of all pesticides to vertebrate animals. Nuvan in the presence of trace moisture on standing breaks down with the formation of acidic products which further catalyse the decomposition. Nuvan is a short lived wide spectrum contact and stomach poison with fumigant and penetrant action. It is used as household and public health fumigant especially against mosquitoes and other dipteran insect in addition to crop protection use. Toxicity of compound is studied on several freshwater and marine fishes. (Annees. *et.al* 1975), Durairaj *et.al.* 1995), Ghosh *et.al* 1987), Khillare *et.al* 1988), Ghanbahadur *et.al* 2002. Very scanty literature is available on Nuvan toxicity on freshwater fish *Rasbora daniconius*, hence present work was carried out to study Nuvan toxicity in *Rasbora daniconius* at variable PH in order to determine limits of PH tolerance in this fish.

## MATERIALS AND METHODS

The fish *Rasbora daniconius* were collected from lake near Aurangabad and brought to laboratory. They were maintained in aquarium for nearly 30 days to acclimatize to laboratory conditions. During the period of acclimatization fishes were fed on alternate day with fish food. The water was replaced after feeding. The necessary care was taken to avoid disturbance to the aquarium. The experiments were conducted to selected concentration ranges from 0 to 1 % mortality. The acute toxicity experiments were carried out with variable PH to determine limits of PH tolerance. The PH was adjusted using sodium hydroxide and acetic acid. The acute toxicity tests for the periods of 24 hrs, 48 Hrs, 72 Hrs, and 96 hrs was carried out and observations were made on mortality of the fishes. The LC50 values of the of different time periods were calculated by regression analysis method (Finney 1971)

## RESULTS AND DISCUSSION

The observation made on the experimental fish *Rasbora daniconius* to study LC50 values of the pesticides at different time periods with variable PH have been tabulated in the Table A-1 to A-3. The LC50 values of Nuvan under normal laboratory conditions have been 0.16 for 24 Hrs, 0.12 for 48 Hrs, 0.10 for 72 Hrs and 0.06 for 96 Hrs are shown in Table A-4. The variation in LC50 values of Nuvan for different periods using variable PH are recorded in tables A-1, A2 & A-3. The survival and mortality are recorded in Table A-1, A-2, A-3. The test fish tolerates PH ranging from 5 to 10 at the extremities of this range mortality of the fish was found very high therefore the toxicity tests were carried out at PH ranging from 6.5 to 9.0. The toxic effect of pollutants have been greatly influenced by the PH, Quality, and hardness of Water (Manson 1981) LC50 values obtained in ppm for a period of 24hrs, 48hrs, 72hrs and 96hrs are 0.10, 0.12, 0.14, 0.16 at 6.5PH and 0.16, 0.14, 0.12, 0.08 at 7.5PH and 0.20, 0.16, 0.12, 0.08 at 9.0PH. The percentage of mortality increased with an increased in toxicant concentration and duration of exposure. It was also observed that low PH (6.5) increases the toxicity of Nuvan in *Rasbora daniconius*. Similar observations were recorded in *Barilius bendeleis*. (Deoray and Wagh 1987) Increase of toxicity at low PH may be due to hydrolysis of toxicant at low PH the resulting products isomers of which are more toxic than the original compound. During present it was also observed that toxicity decrease at high PH (PH 9.0) Similar observations were recorded by Ali (1982) Kamble (1983) (Holomet *et. al* 1980) (Rao and Murty 1980). The fish exposed to Nuvan show certain behavioural changes like excitation, fast

opercular movements violent movement of pelvic fins mucus secretion on body surface, loss of equilibrium and attempts to escape from the aquarium from aquarium were prominent. Similar observations were recorded by Santhakumar et al 200 in *Anabus testudineus*.

**TABLE A-1: SUMMARY OF TOXICITY TEST RESULTS OF NUVAN UNDER NORMAL LABORATORY CONDITIONS.**

Temperature	25 + 2 °C
Conductivity	0.66 mMHo
pH	6.8
Acidity (Phenolphthalein)	2.7 PPM
Alkalinity ( Bromocresol)	30 ppm
Total hardness as C <sub>a</sub> CO <sub>3</sub> (EDTA)	145
Dissolved Oxygen	5.6 ml
Fish weight	4.60 gms
Fish length	4.3 cm.

Sr.No	Concentration In ppm	% Survival and mortality							
		24 Hrs		48 Hrs		72 Hrs		96 Hrs	
		S	M	S	M	S	M	S	M
1	0.02	100	-	100	-	90	10	80	20
2	0.04	100	-	90	10	80	20	60	40
3	0.06	90	10	80	20	70	30	50	50
4	0.08	80	20	70	30	60	40	40	60
5	0.10	70	30	60	40	50	50	40	60
6	0.12	60	40	50	50	40	60	40	60
7	0.15	60	40	40	60	30	70	30	70
8	0.16	50	50	40	60	30	70	20	80
9	0.18	40	60	30	70	20	80	-	100
10	0.20	30	70	20	80	10	90	-	100

LC<sub>50</sub> – 96 hours – 0.06

LC<sub>50</sub> – 72 hours – 0.10

LC<sub>50</sub> – 48 hours – 0.12

LC<sub>50</sub> – 24 hours – 0.16

S - Survival

M - Mortality

**TABLE A-2: SUMMARY OF TOXICITY TEST RESULTS OF NUVAN pH 6.5**

Temperature	25 + 2 °C
Conductivity	0.64 mMHo
pH	6.5
Acidity (Phenolphthalein)	2.4 PPM
Alkalinity ( Bromocresol)	30 ppm
Total hardness as CaCO <sub>3</sub> (EDTA)	145 ppm
Dissolved Oxygen	6.0 ml/l
Fish weight	4.60 gms
Fish length	4.3 cm.

Sr.No	Concentration In ppm	% Survival and mortality							
		24 Hrs		48 Hrs		72 Hrs		96 Hrs	
		S	M	S	M	S	M	S	M
1	0.02	100	-	100	-	90	10	80	20
2	0.04	100	-	90	10	90	10	70	30
3	0.06	90	10	80	20	80	20	60	40
4	0.08	80	20	80	20	70	30	60	40
5	0.10	70	30	70	30	60	40	50	50
6	0.12	70	30	60	40	50	50	40	60
7	0.15	60	40	50	50	40	60	20	80
8	0.16	50	50	40	60	30	70	10	90
9	0.18	40	60	40	60	20	80	-	100
10	0.20	10	90	30	70	10	90	-	100

LC<sub>50</sub> – 96 hours – 0.10

LC<sub>50</sub> – 72 hours – 0.12

LC<sub>50</sub> – 48 hours – 0.11

LC<sub>50</sub> – 24 hours – 0.16

S - Survival

M - Mortality

**TABLE A-3:SUMMARY OF TOXICITY TEST RESULTS OF NUVAN pH 7.5**

Temperature	25 + 2 °C
Conductivity	0.66 mMHo
pH	7.5
Acidity (Phenolphthalein)	2.6 PPM
Alkalinity ( Bromocresol)	29 ppm
Total hardness as C <sub>a</sub> CO <sub>3</sub> (EDTA)	136 ppm
Dissolved Oxygen	6.4 ml/l
Fish weight	4.60 gms
Fish length	4.3 cm.

Sr.No	Concentration In ppm	% Survival and mortality							
		24 Hrs		48 Hrs		72 Hrs		96 Hrs	
		S	M	S	M	S	M	S	M
1	0.02	100	-	100	-	100	-	100	-
2	0.04	100	-	90	10	80	20	70	30
3	0.06	90	10	80	20	70	30	60	40
4	0.08	80	20	70	30	60	40	50	50
5	0.10	80	20	70	30	60	40	40	60
6	0.12	70	30	60	40	50	50	40	60
7	0.15	60	40	50	50	40	60	30	70
8	0.16	50	50	40	60	30	70	20	80
9	0.18	40	60	30	70	20	80	10	90
10	0.20	30	70	10	90	10	90	-	100

LC<sub>50</sub> – 96 hours – 0.08

LC<sub>50</sub> – 72 hours – 0.12

LC<sub>50</sub> – 48 hours – 0.14

LC<sub>50</sub> – 24 hours – 0.16

S - Survival  
M - Mortality

**TABLE A-4: SUMMARY OF TOXICITY TEST RESULTS OF NUVAN pH 9.0**

Temperature	26 + 20 °C
Conductivity	0.70 mMHo
pH	9.0
Acidity (Phenolphthalein)	2.6 PPM
Alkalinity ( Bromocresol)	30 ppm
Total hardness as CaCO <sub>3</sub> (EDTA)	128 ppm
Dissolved Oxygen	6.2 ml/l
Fish weight	4.60 gms
Fish length	4.3 cm.

Sr.No	Concentration In ppm	% Survival and mortality							
		24 Hrs		48 Hrs		72 Hrs		96 Hrs	
		S	M	S	M	S	M	S	M
1	0.02	100	-	100	-	100	-	90	10
2	0.04	100	-	90	10	90	10	80	20
3	0.06	100	-	90	10	80	20	60	40
4	0.08	90	10	80	20	70	30	50	50
5	0.10	80	20	70	30	60	40	40	60
6	0.12	80	20	60	40	50	50	40	60
7	0.14	70	30	60	40	40	60	30	70
8	0.16	70	30	50	50	30	70	20	80
9	0.18	60	40	30	70	20	80	10	90
10	0.20	50	50	30	70	20	80	-	100

LC<sub>50</sub> – 96 hours – 0.08

LC<sub>50</sub> – 72 hours – 0.12

LC<sub>50</sub> – 48 hours – 0.16

LC<sub>50</sub> – 24 hours – 0.20

S - Survival  
M - Mortality

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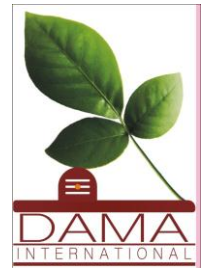
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