

TOXICITY OF METHYL AMINE ON CATLA CATLA (HAM) FINGERLINGS

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ABSTRACT

The toxicity of methyl amine was studied by finding out its Lc 50 values for *Catla catla* (Ham) fingerlings. On the basis of Lc 50 values, the harmless concentration of methyl amine was found to be 12.8 ppm. This indicates that methyl amine is fairly toxic to *C. catla* fingerlings and needs care for its disposal in aquatic environment.

INTRODUCTION

Methyl amine is the immediate byproduct of methyl isocyanate (MIC) gas on reaction with water. The 1984 MIC gas tragedy of Bhopal is still fresh in the memory of millions, killing people and affecting many. To find out the long term effects of MIC gas on aquatic life, a research project was initiated by the authors under the Central Institute of Fisheries Education (ICAR), Bombay, at Bhopal. The present bioassay study is a part of the project and was conducted at Fish Farm, Patra, Bhopal.

There is considerable study on the toxicity of various chemicals on different animals including the fishes (Pickering et al; 1962; Johnson, 1968; Bhatia, 1971; Lal, 1974; Verma et al; 1975-77; Shrivastava, 1977; Nagarathnamma, 1981; Pawar, 1983; Sharma 1984; Geeta Kumari, 1986), but most of these toxic agents were either pesticides, herbicides or the piscicides. Methyl amine is one of the important ingredients of MIC gas which is used to prepare the insecticide 'SEVIN' by the Union Carbide India Ltd. at Bhopal. Thus methyl amine is a very uncommon toxicant and it had drawn very little or no attention of the ichthyologists. Hence the present study will be a useful addition to the toxicological studies on aquatic life.

MATERIAL AND METHODS

Live specimens of *C. catla* fingerlings weighing 3 to 4 grams and 5.5 to 6.5 cm in length were procured from the fish farm at Patra, near Bhopal. These fingerlings were acclimatized for 10 days in borewell aerated water in 6 x 3 size plastic pool and were fed with zooplankton and the traditional supplementary feed. The feeding was stopped 48 hours before exposure to methyl amine. Bioassay tests were conducted in glass aquaria (18"x19"x12" size) with 20 litres of stored ground water. The test solution of desired concentration, viz., 42, 44, 45, 46.5, 48, 49 and 50 ppm were prepared by dissolving the calculated quantity of methyl amine directly into aquaria water. One aquarium was kept as control.

Ten fishes were used for bioassay test for each concentration and control. The test solution was renewed every 24 hours. Fish mortality was observed every two hours till the first eight hours and then at 24, 48, 72 and 96 hours (Table 1). The Lc 50 values were calculated by straightline graphical interpolation method (APHA, 1985) for the 24, 48 and 96 hours (Table-1).

TABLE 1: MORTALITY RATE OF *C. CATLA* IN DIFFERENT CONC. OF METHYL AMINE

Conc. (ppm.)	No. of Test Fishes	- Number of test Fishes dead at hrs.								Mortality % at 96 hrs.
		2	4	6	8	24	48	72	96	
Control	10	0	0	0	0	0	0	0	0	0
42	10	0	0	0	0	0	0	0	0	0
44	10	0	0	0	0	0	1	1	1	10%
45	10	0	0	0	1	2	4	6	6	60%
46.5	10	0	0	0	1	3	5	7	9	90%
48	10	0	1	1	2	4	6	8	10	100%
49	10	0	1	2	3	7	8	10	10	100%
50	10	1	3	4	4	7	10	10	10	100%

Simultaneously the important physicochemical parameters of control and test water were recorded for 96 hours (Table-2). Water analysis was carried out as per standard methods (APHA, 1985).

TABLE 2 : PHYSICO - CHEMICAL PARAMETERS OF WATER

Parameters	Control (ppm)	Test Water (Solution)						Remarks
		44 ppm.	45 ppm.	46.5 ppm.	48 ppm.	49 ppm.	50 ppm.	
Temp. Room	25.0	25.0	25.0	25.0	25.0	25.0	25.0	
°C Water	24.5	24.5	24.5	24.5	24.5	24.5	24.5	
pH	7.3	9.4	9.6	9.9	10.1	10.3	10.5*	Values at statr.
	7.3	7.5	7.7	7.6	7.6	7.7	7.7*	After 48 hrs.
	7.3	7.5	7.6	7.6	7.6	7.6	7.7***	After 96 hrs.
DO	8.0	7.6	7.6	7.2	7.4	7.6	7.6	- d o -
	5.0	3.9	4.0	4.4	5.2	3.8	5.4	- d o -
	4.6	4.0	4.4	4.9	5.2	4.0	4.6	- d o -
Free Co ₂	1.6	Nil	Nil	Nil	Nil	Nil	Nil	
	2.0	1.3	1.5	1.6	1.7	1.8	2.0	- d o -
	2.0	2.8	2.5	2.5	2.4	Nil	1.8	
		0.530						
Amn. Nitrogen	0.450	0.600	0.530	0.550	0.600	0.600	0.680	
	0.420	1.140	1.220	1.220	1.360	1.520	1.520	- d o -
	0.450	1.520	1.800	1.900	2.100	2.150	2.300	
Nitrate Nitrogen	0.800	0.920	1.200	1.140	0.920	0.920	0.900	
	1.240	0.780	0.860	1.140	0.940	1.340	1.420	- d o -
	0.500	0.920	1.060	0.660	0.520	0.600	0.660	
Total Alkalinity	120	136	158	154	152	150	150*	At starting time only.
Total Hardness	68	60	72	66	66	68	70*	-do-

RESULTS AND DISCUSSION

The fishes started erratic movements just after the addition of methyl amine to the test aquaria water. Secretion of excessive mucus was observed. Soon after, the fishes lost their balance and showed vertical movements with head pointing downwards. Just before the death, the fishes turned upside down. The mortality started after two hours at 50 ppm. The mortality rate increased rapidly with increasing time and concentration of methyl amine (Table 1). The Lc 50 values of methyl amine for *Catla catla* fingerlings at 24, 48 and 96 hrs were calculated to be 48.4, 46.5 and 44.8 ppm respectively. From these values the harmless concentration (C) of methyl amine was calculated by the following formula given by Hart et al (1945):

where C = harmless concentration, S = 24 hrs T_{1m}/48hrs T_{1m} and T_{1m} = Lc 50.

The safe concentration of methyl amine thus calculated was 12.8 ppm. The toxicity of a specific pesticide varies greatly according to species (Pickering et al., 1962) and size (Nagarathnamma and Remamurthi, 1981).

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