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TITLE

TOXICITY OF 1,2-DIBROMO-3-CHLOROPROPANE TO DAPHNIDS

7

PAGES
IN FULL
REPORT

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*H. P. Alexander*This
report
is:☐ INTERIM☒ FINAL

and mainly:

☒ NEW☐ REVIEWDESCRIPTIVE SUMMARY
WITH CONCLUSIONS:

(Include in this space references to data books, and to earlier related reports, patents and publications.)

1,2-Dibromo-3-chloropropane was evaluated for acute toxicity to an aquatic invertebrate species, Daphnia magna Straus, using a static water test method.

The 48-hour LC 50 for the daphnids was 24 (22-26)* mg/l.

*95% Confidence Interval

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INTRODUCTION

1,2-Dibromo-3-chloropropane, a nematocide, was evaluated for acute toxicity to an aquatic invertebrate, Daphnia magna Straus, using a static water test method. The acute daphnid toxicity was run for the purpose of pesticide registration.

MATERIALS & METHODS

Pesticide

The sample of 1,2-dibromo-3-chloropropane used for this acute toxicity test was identified as AGR 133748 with an assay of 98.2%. Test solutions were prepared on an as received basis. The test solution was prepared in dechlorinated Lake Huron water. One-half ml/l acetone was added to the test solution for better dissolution of the compound.

Water

Water used in the acute toxicity test was dechlorinated Lake Huron water. This water exhibits chemical characteristics in the following ranges: dissolved oxygen (D.O.)^a, 7.7 mg/l; pH 7.6^b; total alkalinity, 85 mg/l as CaCO₃; total hardness,

^aYellow Springs Instruments Model 54 - Oxygen Meter

^bSargent-Welch pH Meter - Model LS

100 mg/l as CaCO_3 ; specific conductivity, 1770 $\mu\text{mhos/cm}$; and resistivity^C, ~570 ohms/cm. Other water data are in Table I¹.

The static water acute toxicity test follows the test method described in the EPA publication, "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates, and Amphibians"².

Daphnids

The static acute toxicity test method consisted of exposing first instar daphnids reared in our laboratory to various concentrations of the material being tested in dechlorinated Lake Huron water at room temperature (25°C).

A stock solution was prepared in dechlorinated Lake Huron water with 0.5 ml/l of acetone added. The concentration of the stock solution was 0.1 mg/ml. Stock solutions older than 48 hours were discarded.

The required amount of stock solution was combined with sufficient dechlorinated Lake Huron water to make a final volume of 200 ml in the 250 ml test beakers. A control was set using dechlorinated Lake Huron water. Because acetone was used in the stock solution, a second series of beakers were exposed containing the largest

^CYellow Springs Instruments Model 31 - Conductivity Bridge

TABLE I

RAW LAKE HURON WATER ANALYSES

Turbidity, as ppm SiO ₂	<1
Color, APHA	*<5
Alkylbenzene sulfonate, ppm	<0.5
Arsenic, ppm	>0.005
Barium, ppm	0.008
Cadmium, ppm	**nd(0.01)
Chlorine, ppm	7.0
Chromium, ppm	nd(0.005)
Copper, ppm	0.02
Cyanide, ppm	nd(0.01)
Fluoride, ppm	nd(0.5)
Iron, ppm	0.02
Lead, ppm	nd(0.01)
Magnesium, ppm	7.0
Manganese, ppm	nd(0.001)
Nitrate, ppm	nd(3)
Phenols, ppm	nd(0.001)
Selenium, ppm	nd(0.01)
Silver, ppm	nd(0.01)
Sulfate, ppm	16
Total dissolved solids, ppm	116
Zinc, ppm	<0.05
PCB's, ppm	nd(0.101 x 10 ⁻³)
Mercury, ppb	nd(2)

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*< - indicates detected, but at a value less than shown
 **nd - is not detected, followed by minimum detectable amount

amount of solvent used in any concentration to act as a solvent control. The concentration of solvent in any beaker did not exceed 0.5 ml/l. Ten first instar daphnids were then added to each beaker. Three beakers were used for each exposure concentration and each control. The standard exposure time was 48 hours. Death was defined as no response to a gentle prodding. Dead daphnids were not removed from any beaker during the test.

Statistical Calculations

For each set of mortality data, the LC values and their 95% confidence intervals are given. The LC 50 is the estimated concentration of the test material at which 50% of the test organisms are dead in a specified time interval. This value is determined using Finney's probit analysis method³ with a computer program.

RESULTS

The 24 and 48-hour LC 50 values and their 95% confidence intervals were determined on Daphnia magna. The 24-hour data should not be used because of significant lack of fit for the probit model. 1,2-Dibromo-3-chloropropane exhibited a 48-hour LC 50 value of 24 (22-26) mg/l to the daphnids. Concentrations tested and mortality data are shown in Table II. The control daphnids exhibited a 10% mortality during the test.

TABLE II

THE TOXICITY OF 1,2-DIBROMO-3-CHLOROPROPANE
TO DAPHNIA MAGNA AND STATISTICAL DATA

1,2-DIBROMO-3-CHLOROPROPANE 100/L DAPHNIA MAGNA 24 HR.

PROBIT SLOPE (USING LOG CONC.) = 2.73. 95% C.I. = (1.74, 3.72)

CHI-SQUARE FOR LACK OF FIT IS 1.11 WITH 4 DEGREES OF FREEDOM
CRITICAL VALUE (ALPHA = .05) IS 9.49

THERE WERE 50 OBSERVATIONS AT EACH CONCENTRATION

CONC.	LOG(CONC.)	% RESPONSE	UNS. PROBIT	EXP. PROBIT
1.00	1.20	23.	4.199	3.938
24.00	1.38	37.	3.439	4.200
37.00	1.57	50.	4.570	4.793
50.00	1.70	73.	5.673	4.943
62.00	1.79	70.	5.574	5.234
74.00	1.86	50.	5.253	5.631

CI	ESTIMATE	LOWER C.I.	UPPER C.I.
1	14.77	1.10	20.07
2	16.07	27.30	53.33
3	17.04	41.34	253.24

1,2-DIBROMO-3-CHLOROPROPANE 100/L DAPHNIA MAGNA 48 HR.

PROBIT SLOPE (USING LOG CONC.) = 5.48. 95% C.I. = (5.03, 10.94)

CHI-SQUARE FOR LACK OF FIT IS 4.87 WITH 2 DEGREES OF FREEDOM
CRITICAL VALUE (ALPHA = .05) IS 5.99

THERE WERE 50 OBSERVATIONS AT EACH CONCENTRATION

CONC.	LOG(CONC.)	% RESPONSE	UNS. PROBIT	EXP. PROBIT
1.00	1.20	23.	4.272	3.973
24.00	1.38	37.	4.660	5.032
37.00	1.57	77.	5.834	6.627
62.00	1.79	100.	*****	7.094

CI	ESTIMATE	LOWER C.I.	UPPER C.I.
1	14.01	13.79	18.00
2	23.77	21.75	25.85
3	33.37	33.31	39.48

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