4-11-80

1. <u>Chemical</u>: Cypermethrin (PP383)

2. <u>Formulation</u>: Technical, 92.9%

3. <u>Citation</u>: Hill, R. W, Maddock, B.G., Hart, B., and Gilbert, J. L.
    (1977) Determination of the acute toxicity of PP383 to
    bluegill sunfish (<u>Lepomis macrochirus</u>). ICI Brixham
    Laboratory Report NO. BL/B/1775, March 1977. (Accession
    No. 241598.)

4. <u>Reviewed by</u>: Carol Matti Natella
    Wildlife Biologist
    EEB/HED

5. <u>Date Reviewed</u>: April 11, 1980

6. <u>Test Type</u>: Fish acute 96-hour LC_{50} (Bluegill)

7. <u>Reported Results</u>: 96 hr. LC_{50} - 2.2 ppb

8. <u>Reviewer's Conclusions</u>:

    This study does not fulfill the requirements for a fish acute 96-
    hour LC_{50}. Probit analysis cannot be performed on these data
    due to the fact that only one dose level resulted in the death of
    less than 100% and more than 0% of the test organisms.

Material/Methods

Test Procedures

A continuous flow-through bioassay system was used. The test vessels were made of glass of 20 liter capacity and each test vessel was fed with the required test concentration at a rate of 200 ml/min. A complete exchange of the test solution occurred within 3 hours.

In order to prepare the necessary stock solutions prior to dilution in the exposure vessels a stock working solution was prepared of 0.1 mg/l PP383 (Cypermethrin) in Dimethyl Sulfoxide (DMSO)/water mixture. The amount of DMSO was kept to the minimum and did not exceed a level of 10 mg/l in any test solution. The reported 48 hour LC_{50} value of DMSO to Bluegill Sunfish is of the order of 33,500 mg/l.

Statistical Analysis

The individual times of death of the fish were recorded in minutes and a computer program was used to process these times to obtain the Geometric Median Survival Periods (GMSP). A toxicity graph was constructed by plotting the GMSP values against concentration on logarithmic scales. The resulting graph was used to read off 24, 48, and 96 hr. LC_{50} values.

Discussion/Results

24 hr LC_{50} value = *7.2 ppb
48 hr LC_{50} value = *3.7 ppb
96 hr LC_{50} value = *2.2 ppb

*calculated from the Geometric Median Survival Periods. See table and graph.

At concentrations of 2 ppb and higher, the fish were seen to swim with greater rapidity of movement. Other toxic symptoms include jaw spasms and the tendency to swim with the head up and the tail down.

Reviewer's Evaluation

A. ### Test Procedure

The test procedure generally complies with USEPA protocol for a basic flow-through acute toxicity test.

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B. Statistical Analyses

The LC_{50} values given in this study were not determined by probit analysis. No mortality resulted at the two lowest levels - 1 ppb and 0.68 ppb. At the next highest level, 2.2 ppb, three of the fish had died by 96 hours (or 5760 minutes). In order to perform probit analysis, at least two of the dose levels must result in partial mortality after a given time span. Since only one partial mortality was observed, the LC_{50} values reported in this study could not be verified by probit analysis.

A binomial test performed on the computer terminal using Stephan's program gives confidence limits of 0 and 4.7 ppb. An approximate 96 hour LC_{50} for these data is 2.6 ppb. This compares with an LC_{50} value of 2.2 ppb derived from the Geometric Mean Survival Periods as given in the results of the study.

C. Conclusions

1. Category: Supplemental

2. Rationale: The results of this study can not be verified by probit analysis due to the fact that only one dose level resulted in the death of less than 100% and more than 0% of the test organisms. This study is designed to provide information on the mean survival time at various concentrations. Most of the concentrations tested are much higher than the calculated LC_{50} and resulted in 100% mortality before 96 hours had elapsed. In order to obtain a more accurate determination of the LC_{50} lower concentrations and concentrations closer together should be used in further tests.

3. Repairability: No

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5. RESULTS

The individual times of death of the fish were recorded
in minutes and these are tabulated in Table 1. An approximate
estimate of the time for 50% of the test population to die
(i.e., ET50) is the geometric mean survival period (GMSP),
which was computed with the formula:

$$GMSP = \exp\left\{ \sqrt[\sum_{i=1}^{n} n_i]{(\log_e t_1)^{n_1} (\log_e t_2)^{n_2} \ldots\ldots (\log_e t_n)^{n_n}} \right\}$$

where n_i is the number of fish which die at time t_i and $\sum_{i=1}^{n} n_i$
is the total number of fish used in the test. For this test $\sum_{i=1}^{n} n_i = 10$

A sample plot of the number of dead fish against time usually
gives a skewed distribution. The above formula normalises
the distribution by taking the natural logarithms of the times
of death and employs the assumption that, for a nearly normal
distribution, the geometric mean approximates to the actual median.

The GMSP values are reported in Table 1.

A graph was then constructed of the Geometric Mean Survival
Period values against concentrations using logarithmic scales.
(See figure 1).

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Carol Natella
LC50, bluegill,
Cypermethrin

```
9000  data 6
9001  data 100,47,22,10,4.7,2.2

9002  data 10,10,10,10,10,10
9003  data 10,10,10,10,10,3
run
```

  80/04/09. 08.37.41.
BASIC   PROGRAM   S79LC50

h. O'Neill

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
100	10	10	100	9.76563E-2
47	10	10	100	9.76563E-2
22	10	10	100	9.76563E-2
10	10	10	100	9.76563E-2
4.7	10	10	100	9.76563E-2
2.2	10	3	30.	17.1875

THE BINOMIAL TEST SHOWS THAT 0 AND 4.7 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS SINCE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 2.61625

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT
DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE
PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.
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SRU   1.212 UNTS.

RUN COMPLETE.


```
9000  data 6
9001  data 100Q47,22,10,4.7,2.2

9002  data 10,10,10,10,10,10
9003  data 10,10,10,10,9,0
run
```

  80/04/09. 08.41.26.
BASIC   PROGRAM   S79LC50

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