4-9-82

Duplicate

DATA EVALUATION

1. CHEMICAL: Cypermethrin

2. FORMULATION: 36 % active ingredient (Formulation number GFU 061)

3. CITATION: Edwards, P.J., S.M. Brown, and H. Swaine (1980) Cypermethrin (PP383): Toxicity of formulation GFU061 to first instar Daphnia magna. Unpublished report from ICI Americas Plant Protection Division, submitted 12/28/81 by ICI Americas Inc., Wilmington, Delaware.

   EPA Accession No. 070562

4. REVIEWED BY: Thomas B. Johnston
   Biologist, EEB/HED

5. REVIEW DATE: April 9, 1982

6. TEST TYPE: Static acute 48-hr EC_{50}s average of 3 acute EC50's

7. REPORTED RESULTS: The reported static acute 48-hr EC_{50} of formula GFU061 for Daphnia magna is 21.6 ppb, with 95% confidence limits not reported. The 72-hr EC_{50} EC_{50}s 0.83 ppb.

8. REVIEWER'S CONCLUSIONS: This study is scientifically sound, and fulfills USEPA guideline requirements for a 48-hr EC_{50} toxicity test using an aquatic invertebrate. With a 48-hr EC_{50} of 21.6 ppb, formula GFU061 is very highly toxic to aquatic invertebrates.

MATERIALS/METHODS

Methods used generally followed USEPA guidelines. Tests were run at 17°C. Mean measured concentrations were used to calculate 24, 48, and 72-hour EC_{50}s. There were 3 tests run. Each test had 13 concentrations, with three replicate jars for each concentration. Each jar contained 10 Daphnia. The reported EC_{50} is an average of the EC_{50}s reported in tests I and III. The results of test II differed significantly from the other two tests, and so were considered unreliable and left out of the calculations.

STATISTICAL ANALYSES

Data were analyzed according to the methods of Finney. Abbott's correction was used in some cases.

RESULTS

Test I

Started 25.3.80. Number of Daphnia affected (10 Daphnia/replicate).

measured concentration ug a.i./l	24 hour			48 hour			72 hour		
	a	b	c	a	b	c	a	b	c
310	0	2	1	7	8	7	10	10	10
169	0	0	2	3	7	5	10	10	10
82	2	0	0	3	3	7	10	10	10
37.4	0	0	2	9	6	8	10	10	10
14.3	1	3	1	7	8	7	10	10	10
7.23	1	2	0	7	6	6	10	10	10
3.52	2	1	1	3	3	2	10	10	10
1.86	0	0	0	2	1	2	8	7	8
0.95	0	0	1	0	0	0	6	6	7
0.39	0	0	0	0	1	0	3	5	5
0.21	0	0	0	0	0	1	3	0	1
0.15	0	0	1	0	0	0	0	0	0
0.05	0	0	0	0	0	0	1	0	1
<0.01	0	0	0	0	0	0	0	2	2

Test II

Started 31.3.80. Number of Daphnia affected (10 Daphnia/replicate)

Measured Concentration ug a.i./l	24 hour			48 hour			72 hour		
	a	b	c	a	b	c	a	b	c
341	0	0	0	10	10	10	10	10	10
180	0	0	0	10	9	9	10	10	10
92.5	0	0	1	8	10	10	10	10	10
35.8	2	0	0	9	10	10	10	10	10
19.6	0	1	0	10	10	10	10	10	10
10.6	0	0	0	10	7	10	10	9	10
4.30	1	0	0	9	10	10	10	10	10
2.38	0	0	1	5	2	8	7	8	8
1.26	0	0	0	6	5	6	9	9	10
0.67	2	1	1	10	9	8	10	10	10
0.49	0	0	1	1	1	10	7	3	10
0.14	1	0	0	0	0	0	6	4	4
0.06	0	1	0	0	0	0	2	3	1
<0.01	0	0	0	0	0	0	0	0	0

Test III EC_{50} = <341 0.61 0.14 ppb

Started 19.5.80. Number of Daphnia affected (10 Daphnia/replicate).

Measured Concentration ug a.i./l	24 hour			48 hour			72 hour		
	a	b	c	a	b	c	a	b	c
315	0	0	0	10	6	6	10	10	10
167	0	0	0	6	9	3	10	10	10
64.0	1	2	3	6	7	4	10	10	10
40.3	5	7	4	6	10	7	10	10	10
17.9	2	4	0	9	7	7	10	10	10
7.50	3	1	1	10	7	6	10	10	10
3.64	0	1	0	6	6	1	7	9	8
2.04	0	0	0	2	1	1	7	7	7
1.00	0	0	0	0	1	0	5	7	4
0.51	0	0	0	0	0	0	5	4	5
0.34	0	0	0	0	0	0	4	4	5
0.17	0	0	0	0	0	1	3	2	2
0.06	0	0	0	0	0	1	1	2	1
<0.01	0	0	0	0	0	1	1	2	1

EC_{50} = >315 16.12 0.82 ppb

In all tests the use of nominal or measured concentrations did not significantly influence the estimated EC_{50} (P=5%). Toxicity of cypermethrin in test runs I and II were significantly different after 48 and 72 hours exposure (P=1%). Dose response slopes were also significantly different at 48 and 72 hours (P=5%). Toxicity in tests II and III were also significantly different after 48 and 72 hours exposure (P=5%). Dose response slopes were not significantly different (P=5%). Toxicity in tests I and III were not significantly different after 48 and 72 hours exposure (P=5%). Dose response slopes after 48 hours were not significantly different (P=5%) while after 72 hours they were (P=5%). The combined EC_{50} value of tests I and III based on measured concentrations were 21.6 and 0.83 ug a.i./l after 48 and 72 hours respectively.

CONCLUSIONS:

Validation Category: Supplemental

Category Rationale: The study is sound, but used a formulated product instead of technical material. The study may be considered Core for all use patterns involving the GRU061 formulation, whenever tests on the formulated product are required.

Category Repairability: This study may be considered Core under certain conditions. See "Rationale", above.

JOHNSTON CYPERMETHRIN FORMULAE GFU061 48HR EC50 DAPHNIA

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
310	30	22	73.3333	.806239
169	30	15	50	57.2232
82	30	13	43.3333	29.2332
37.4	30	23	76.6667	.261144
14.3	30	22	73.3333	.806239
7.23	30	19	63.3333	10.0244
3.52	30	8	26.6667	.806239
1.86	30	5	16.6667	.0162457
.95	30	0	0	9.31321E-08
.39	30	1	3.33333	2.8871E-06
.21	30	1	3.33333	2.8871E-06
.15	30	0	0	9.31321E-08

THE BINOMIAL TEST SHOWS THAT 3.52 AND 310 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 169

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
9	.0729191	26.6222	16.1832	48.1702

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
8	.27779	5.18131	0

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE = .74943
95 PERCENT CONFIDENCE LIMITS = .354437 AND 1.14442

LC50 = 26.7346
95 PERCENT CONFIDENCE LIMITS = 8.06899 AND 182.029

LC10 = .540072
95 PERCENT CONFIDENCE LIMITS = .0131075 AND 2.27279

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JOHNSTON CYPERMETHRIN FORMULA GFU061 DAPHNIA 48HR EC50 (TEST II)

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
341	30	30	100	9.31321E-08
180	30	28	93.3333	4.33996E-05
92.5	30	28	93.3333	4.33996E-05
35.8	30	29	96.6667	2.8871E-06
19.6	30	30	100	9.31321E-08
10.6	30	27	90	4.21516E-04
4.3	30	29	96.6667	2.8871E-06
2.38	30	15	50	57.2232
1.26	30	17	56.6667	29.2332
.67	30	27	90	4.21516E-04
.49	30	12	40	18.0797
.14	30	0	0	9.31321E-08
.06	30	0	0	9.31321E-08

THE BINOMIAL TEST SHOWS THAT .14 AND 4.3 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS .518408

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
11	.017131	1.05043	.725988	1.46044

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
6	.31682	7.27795	0

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE = 1.1141
95 PERCENT CONFIDENCE LIMITS = .487008 AND 1.74119

LC50 = .843818
95 PERCENT CONFIDENCE LIMITS = .175541 AND 2.47148

LC10 = .0611383
95 PERCENT CONFIDENCE LIMITS = 7.88394E-04 AND .25319

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JOHNSTON CYPERMETHRIN FORMULA GFU061 DAPHNIA 48HR EC50 (TEST III)

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
315	30	22	73.3333	.806239
167	30	18	60	18.0797
64	30	17	56.6667	29.2332
40.3	30	23	76.6667	.261144
17.9	30	23	76.6667	.261144
7.5	30	23	76.6667	.261144
3.64	30	13	43.3333	29.2332
2.04	30	4	13.3333	.0029738
1	30	1	3.33333	2.8871E-06
.51	30	0	0	9.31321E-08
.34	30	0	0	9.31321E-08
.17	30	1	3.33333	2.8871E-06
.06	30	0	0	9.31321E-08

THE BINOMIAL TEST SHOWS THAT 2.04 AND 315 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT.

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 4.18376

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
10	.0271566	17.7178	12.2594	26.7101

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
7	.212784	5.21674	0

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE = .858412
95 PERCENT CONFIDENCE LIMITS = .462439 AND 1.25438

LC50 = 17.2252
95 PERCENT CONFIDENCE LIMITS = 6.08025 AND 70.0751

LC10 = .571066
95 PERCENT CONFIDENCE LIMITS = .0376971 AND 1.96979

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