

US EPA ARCHIVE DOCUMENT

9-12-86

DATA EVALUATION RECORD

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- 1. Chemical: PP 321 - *Lambda cyhalothrin*
- 2. Test Material: EC Formulations
JF9509-5.54% ai
GFU383C-12.92% ai
- 3. Study/Action Type: Aquatic Invertebrate Acute Toxicity -
Daphnia magna
- 4. Study ID: PP 321: Toxicity of formulations JF9509 and
GFU383C to first instar Daphnia magna, E. Farrelly,
M.J. Hamer, and I.R. Hill, ICI, May 1, 1985.
EPA Accession No. 259807.

5. Reviewed By: Ann Stavola
Aquatic Biologist
EEB/HED

Signature: *Ann Stavola*
Date: *Sept. 5, 1986*

6. Approved By: Doug Urban
Supervisory Biologist
EEB/HED

Signature: *Doug Urban*
Date: *9/12/86*

7. Conclusions:

The study is scientifically sound but does not meet EPA Guidelines requirement for aquatic invertebrate acute toxicity testing since formulated products were the test materials. The study indicates that with EC₅₀ values of <0.09 ug/L each, JF9509, and GFU383C are very highly toxic to aquatic invertebrates.

2 Test with each formulation
Lowest values entered into database

8. Recommendations:

If formulated product testing is required with either formulation, this study will be Core for that requirement.

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9. Background:

This study was submitted to support the EUP application for Karate 1 EC Insecticide.

10. Materials and Methods:

- a. Test Animals - First instar Daphnia magna, less than 24 hours old.
- b. Dosage: Two formulations of PP 321 were tested:
1. PP 321 EC formulation (JF9509), 5.54% ai, 50 g ai/L.
 2. PP 321 EC formulation (GFU383c), 12.92% ai, 1 lb ai/gal.

Stock solutions of each formulation were prepared with reconstituted hardwater as the diluent.

Dilution water was also reconstituted hard-water. Concentrations were measured by GC.

- c. Study Design: The test method is based upon the procedures recommended by EPA in Methods or Acute Toxicity Tests With Fish, Macroinvertebrates and Amphibians, EPA 660/3-75-009, April 1975 and ASTM (1980). The test was conducted with 250 mL glass beakers containing 200 mL of the test solution. There were triplicate beakers per concentration, and each beaker contained 10 Daphnia magna. The test was conducted at 20 °C with a 16 light and 8 dark photoperiod. The Daphnia magna were not fed during the test. Two separate consecutive tests were run.
- d. Statistical Analysis: The EC₅₀ values and 95% ci were calculated using the weighted linear regression of log concentration plotted against logit transformation of the Dapnia magna response. The EC₅₀ of the combined run was calculated by taking the logarithmic mean of the EC₅₀'s of the individual runs.

11. Reported Results:

A. GFU383C

Nominal Conc. (ug/L)	Measured Conc. ug/L		% Mortalities			
	Test 1	Test 2	Test 1		Test 2	
			24h	48h	24h	48h
32	13.64	17.29	56.7	100	56.7	100
16	-	-	46.7	100	66.7	100
8	-	-	56.7	96.7	60	100
4	1.64	2.06	43.3	100	60	100
2	-	-	30	100	30	100
1	-	-	3.3	86.7	26.7	100

Nominal Conc. (ug/L)	Measured Conc. ug/L		% Mortalities			
			Test 1		Test 2	
			Test 1	Test 2	24h	48h
0.5	0.37	0.345	3.3	86.7	26.7	93.3
0.25	-	-	6.7	80	20	86.7
0.125	-	-	0	66.7	13.3	60
0.06	0.03	0.04	3.3	30	0	33.3
0.03	-	-	-	-	0	20
0.016	-	0.02	-	-	0	10
Control	0	0	0	0	0	0

B. JF9509

Nominal Conc. (ug/L)	Measured Conc. ug/L		% Mortalities			
			Test 1		Test 2	
			Test 1	Test 2	24h	48h
32	14.23	13.05	63.3	100	53.3	100
16	-	-	60	100	50	100
8	-	-	53.3	100	56.6	100
4	1.82	1.82	43.3	100	53.3	100
2	-	-	40	100	36.7	100
1	-	-	23.3	96.7	26.7	100
0.5	0.275	0.21	13.3	96.7	13.3	100
0.25	-	-	3.3	83.3	10	66.7
0.125	-	-	0	56.7	3.3	66.7
0.06	0.045	0.035	3.3	23.3	3.3	40
0.03	-	-	-	-	0	23.3
0.016	-	0.02	-	-	0	13.3
Control	0	0	0	0	0	0

EC₅₀ Values (ug/L) and 95% ci (Based on nominal concentrations)

Test A. GFU383C

<u>Test</u>	<u>24h</u>	<u>48h</u>
1	12.1 (7.8-21.9)	0.09 (0.06-0.13)
2	5.5 (3.5-9.8)	0.08 (0.06-0.11)
Mean 1 and 2	8.2	0.09

Test B. JF9509

<u>Test</u>	<u>24h</u>	<u>48h</u>
1	7.7 (5.0-13.1)	0.11 (0.08-0.14)
2	8.9 (5.5-16.6)	0.08 (0.06-0.10)
Mean 1 and 2	8.3	0.09

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DO levels remained \geq 8.0 mg/L (87% saturation) throughout the test. The pH ranged from 7.8 to 8.5.

12. Study Author's Conclusions/OA Measures:

The 48-hr EC₅₀'s of two formulations of PP 321 to Daphnia were 0.09 ug/L.

"During the conduct of this study the Quality Assurance Unit carried out the following audits in accordance with ICI Policy of Good Laboratory Practices."

13. Reviewer's Evaluation:

- a. Test Procedures: The protocol is acceptable since it follows the procedures recommended by EPA. Formulated products and not the technical grade were the test compounds.
- b. Statistical Analysis: The data were analyzed using EEB's "Aquatox Program." The 48-hr LC₅₀ values and their 95% ci for each formulation are:

JF9509

Test 1 (Nominal conc.) = 0.110 (0.081-0.140) ug/L
Test 1 (Measured conc.) = 0.075 (0.055-0.106) ug/L
Test 2 (Nominal conc.) = 0.079 (0.03-0.5) ug/L
Test 2 (Measured conc.) = 0.040 (0.032-0.061) ug/L

GFU383C

Test 1 (Nominal conc.) = 0.091 (0.055-0.123) ug/L
Test 1 (Measured conc.) = 0.065 (0.035-0.108) ug/L
Test 2 (Nominal conc.) = 0.081 (0.063-0.102) ug/L
Test 2 (Measured conc.) = 0.068 (0.049-0.102) ug/L

The EC₅₀ values computed from the measured concentrations indicate a slightly greater sensitivity compared to the values based on the nominal concentrations. As not all the test concentrations were measured and since there are not larger differences between the nominal EC₅₀'s and the measured EC₅₀'s use of the nominal EC₅₀'s to indicate toxicity is acceptable. The reported EC₅₀ values are valid.

c. Discussion/Results

The data indicate that two formulations of PP 321, JF9509, 5.54% AI, and GFU383C, 12.92% AI, are very highly toxic to freshwater invertebrates.

d. Conclusions

1. Category: Supplemental.
2. Rationale: Use of formulated products and not the technical grade.
3. Repairability: If formulated product testing is required with either of these formulations, then this study will be Core for that requirement.

STAVOLA PP321 EC GFU383C DAPHNIA ACUTE 48 HR *Test I Nominal*

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
32	30	30	100	9.313226E-08
16	30	30	100	9.313226E-08
8	30	29	96.66666	2.8871E-06
4	30	30	100	9.313226E-08
2	30	30	100	9.313226E-08
1	30	26	86.66666	2.973807E-03
.5	30	26	86.66666	2.973807E-03
.25	30	24	80	7.154533E-02
.125	30	20	66.66667	4.936857
.06	30	9	30	2.138698

THE BINOMIAL TEST SHOWS THAT .06 AND .25 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 .0896786

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD
 SPAN G LC50 95 PERCENT CONFIDENCE LIMITS
 2 .2431652 9.090019E-02 5.497575E-02
 .1232845

RESULTS CALCULATED USING THE PROBIT METHOD
 ITERATIONS G H
 GOODNESS OF FIT PROBABILITY
 4 8.413588E-02 1
 .1274783

SLOPE = 1.349038
 95 PERCENT CONFIDENCE LIMITS = .9577335 AND 1.740343

LC50 = 8.645689E-02
 95 PERCENT CONFIDENCE LIMITS = 4.647816E-02 AND .1310433

LC10 = 9.894374E-03
 95 PERCENT CONFIDENCE LIMITS = 2.420142E-03 AND 2.213274E-02

C

stavele PR221 EC DAPHNIA ACUTE 40 HR

GRU 383C Test I (1/11/88)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. PERCENT
10.04	30	30	100	9.912226E-08
1.04	30	30	100	9.912226E-08
.37	30	26	86.66666	2.973807E-03
.03	30	0	30	2.133690E-02

THE BINOMIAL TEST SHOWS THAT .03 AND .37 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 .0695762

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	H
1	.1785368	.0695762	3.408808E-02	.1185739

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H
5	.1222485	1

GOODNESS OF FIT PROBABILITY: .7648534

SLOPE = 1.638725
 95 PERCENT CONFIDENCE LIMITS = 1.065761 AND 2.21169

LC50 = 6.545628E-02
 95 PERCENT CONFIDENCE LIMITS = 3.515334E-02 AND .1081401

LC10 = 1.098901E-02
 95 PERCENT CONFIDENCE LIMITS = 2.377679E-03 AND 2.264916E-02

STAVOLA PP321 EC GFU383C DAPHNIA ACUTE 48 HR

Test II (Nominal)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
32	30	30	100	9.313226E-08
16	30	30	100	9.313226E-08
8	30	30	100	9.313226E-08
4	30	30	100	9.313226E-08
2	30	30	100	9.313226E-08
1	30	30	100	9.313226E-08
.5	30	29	96.66666	2.8871E-06
.25	30	26	86.66666	2.973807E-03
.125	30	18	60.00001	18.07973
.06	30	10	33.33334	4.936857
.03	30	6	20	7.154533E-02
.016	30	3	10	4.215167E-04

THE BINOMIAL TEST SHOWS THAT .03 AND .25 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 9.511598E-02

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
5	6.103393E-02	.1069825	8.247501E-02
6.301277E-02			

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
6	.0467687	1	.9964789

SLOPE = 2.135271
95 PERCENT CONFIDENCE LIMITS = 1.673496 AND 2.597047

LC50 = 8.065112E-02
95 PERCENT CONFIDENCE LIMITS = .0629361 AND .1022919

LC10 = 2.050399E-02
95 PERCENT CONFIDENCE LIMITS = .0126234 AND 2.881759E-02

G FU383 C-Test II (Meas.)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. PERCENT
17.20	30	30	100	9.3132208E-08
2.06	30	30	100	9.3132208E-08
.345	30	28	93.33334	4.938984E-05
.04	30	10	33.33334	4.938984E-05
.02	30	3	10	4.215167E-04

THE BINOMIAL TEST SHOWS THAT .02 AND .345 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 6.822413E-02

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
3	3.835284E-02	5.718507E-02	8.408193E-02
		.1190039	

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
5	.101058	1	.9656061

SLOPE = 2.214249

95 PERCENT CONFIDENCE LIMITS = 1.510347 AND 2.91815

LC50 = .0682502

95 PERCENT CONFIDENCE LIMITS = 4.865439E-02 AND .1020326

LC10 = .0182199

95 PERCENT CONFIDENCE LIMITS = 9.721511E-03 AND 2.704297E-02

Test I (Nominal)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
32	30	30	100	9.313226E-08
16	30	30	100	9.313226E-08
8	30	30	100	9.313226E-08
4	30	30	100	9.313226E-08
2	30	30	100	9.313226E-08
1	30	29	96.66666	2.8871E-06
.5	30	29	96.66666	2.8871E-06
.25	30	25	83.33333	1.624571E-02
.125	30	17	56.66667	29.23324
.06	30	7	23.33334	.261144

THE BINOMIAL TEST SHOWS THAT .06 AND .25 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 .1085226

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
2	.1625861	.1097551	8.117782E-02	.1416444

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H
6	8.856051E-02	1
.9686221		

SLOPE = 2.446336
 95 PERCENT CONFIDENCE LIMITS = 1.718328 AND 3.174344

LC50 = .1098572
 95 PERCENT CONFIDENCE LIMITS = 8.059551E-02 AND .1399064

LC10 = 3.324184E-02
 95 PERCENT CONFIDENCE LIMITS = 1.628465E-02 AND 5.025704E-02

stevale PR001 JFR609 DAPHNIA ACUTE 48 HR

Test I (Meas.)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
.14	30	30	100	3.019226E-08
.275	30	30	100	3.019226E-08
.45	30	29	96.66666	2.3371E-06
.9	30	26	86.66666	.001144

THE BINOMIAL TEST SHOWS THAT .045 AND .275 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 LTED FOR THIS SET OF DATA IS 3.086574E-02

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN 6 LC50 8.966366E-02 95 PERCENT CONFIDENCE LIMITS
 1 5.789238E-02 .106078 8.086594E-02

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS 6 G H
 GOODNESS OF FIT PROBABILITY .1510796 1 .9999504

SLOPE = 3.259091
 95 PERCENT CONFIDENCE LIMITS = 1.992316 AND 4.525866

LC50 = .0752609
 95 PERCENT CONFIDENCE LIMITS = 5.470074E-02 AND .1060424

LC10 = 3.068247E-02
 95 PERCENT CONFIDENCE LIMITS = 1.601998E-02 AND 4.375237E-02

STAVOLA PP321 EC JF950⁹ DAPHNIA ACUTE 48 HR *Test II (Nominal)*

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
32	30	30	100	9.313226E-08
16	30	30	100	9.313226E-08
8	30	30	100	9.313226E-08
4	30	30	100	9.313226E-08
2	30	30	100	9.313226E-08
1	30	30	100	9.313226E-08
.5	30	30	100	9.313226E-08
.25	30	20	66.66667	4.936857
.125	30	20	66.66667	4.936857
.06	30	12	40	18.07973
.03	30	7	23.33334	.261144
.016	30	4	13.33333	2.973807E-03

THE BINOMIAL TEST SHOWS THAT .03 AND .5 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 7.885111E-02

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD
 SPAN 5 G LC50 5.218845E-02 95 PERCENT CONFIDENCE LIMITS 8.149985E-02
 6.358269E-02 .1035379

RESULTS CALCULATED USING THE PROBIT METHOD
 ITERATIONS 6 G H 4.593299E-02 1
 GOODNESS OF FIT PROBABILITY .5560089

SLOPE = 1.859013
 95 PERCENT CONFIDENCE LIMITS = 1.46059 AND 2.257436

LC50 = 7.772741E-02
 95 PERCENT CONFIDENCE LIMITS = 5.896128E-02 AND .1005215

LC10 = 1.612189E-02
 95 PERCENT CONFIDENCE LIMITS = 9.186866E-03 AND 2.385402E-02

stavela PR321 JF9609 DAPHNIA 48HR ACUTE

Test II (Meas.)

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
19.05	30	30	100	9.913003E-08
1.82	30	30	100	9.913226E-08
.21	30	30	100	9.913226E-08
.035	30	12	40	18.07973
.02	30	4	13.33333	2.973307E-08

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THE BINOMIAL TEST SHOWS THAT .02 AND .21 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 4.362543E-02

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
3	3.888991E-02	7.268802E-02	5.272908E-02
3.635933E-02			

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	
9	.2771293	1	.9867612

SLOPE = 3.939688
95 PERCENT CONFIDENCE LIMITS = 1.865715 AND 6.013661

LC50 = 3.952312E-02
95 PERCENT CONFIDENCE LIMITS = 3.202053E-02 AND 6.103697E-02

LC10 = 1.981441E-02
95 PERCENT CONFIDENCE LIMITS = 1.053286E-02 AND 2.380045E-02
