

DATA EVALUATION RECORD  
§ 72-2 -- ACUTE LC<sub>50</sub> TEST WITH A FRESHWATER INVERTEBRATE

1. CHEMICAL: Lamda-Cyhalothrin

PC Code No.: 128<sup>897</sup>~~867~~

2. TEST MATERIAL: 25 CS Formulation (#WF2289); white liquid  
Purity: 23.7%

3. CITATION

Authors: S.J. Kent, S.A. Sankey, J.E. Caunter and P.A. Johnson

Title: Lambda-Cyhalothrin: Acute Toxicity to *Daphnia magna* Of a 25 CS Formulation

Study Completion Date: 1995

Laboratory: Brixham Environmental Laboratory, Brixham, Devon, UK

Sponsor: Zeneca Ag Products

Laboratory Report ID: AA1091/B

MRID No.: 4390881<sup>1</sup>

DP Barcode: D223935

4. REVIEWED BY: Joanne S. Edwards, Entomologist, EEB, EFED

Signature: *Joanne S. Edwards*

Date: *5/13/96*

5. APPROVED BY: Leslie Touart, Head of Section 1, EEB, EFED.

Signature: *L. Touart*

Date: *6-11-96*

6. STUDY PARAMETERS

Scientific Name of Test Organism: *Daphnia magna*

( Age of Test Organism: <24 hrs

Definitive Test Duration: 48 hours

Study Method: Static

Type of Concentrations: Final measured

7. CONCLUSIONS:

Results Synopsis (Stefan's moving angle method)

technical lambda cyhalothrin:

48-hr EC50: 0.18 ppb

95% C.I.: 0.14 -0.23 ppb

25 CS Formulation:

48-hr EC50: 0.76 ppb

95% C.I.: 0.61 -0.98 ppb

8. ADEQUACY OF THE STUDY

A. Classification: Core

B. Rationale: N/A

C. Repairability: N/A

9. Guideline Deviations

See under item #14, Reviewer's Comments

10. SUBMISSION PURPOSE:

11. MATERIALS AND METHODS

A. Test Organisms

Guideline Criteria	Reported Information
<u>Species</u> Preferred species is <i>Daphnia magna</i>	<i>Daphnia magna</i>
All organisms are approximately the same size and weight?	Yes
<u>Life Stage</u> Daphnids: 1 <sup>st</sup> instar (<24 h). Amphipods, stoneflies, and mayflies: 2 <sup>nd</sup> instar. Midges: 2 <sup>nd</sup> & 3 <sup>th</sup> instar.	1st instar; less than 24 hrs old
<u>Supplier</u>	In house lab cultures
All organisms from the same source?	Yes

B. Source/Acclimation

Guideline Criteria	Reported Information
<u>Acclimation Period</u> Minimum 7 days	Parental stock were 18 ± 1 day old
Wild caught organisms were quarantined for 7 days?	N/A
Were there signs of disease or injury?	No evidence of disease
If treated for disease, was there no sign of the disease remaining during the 48 hours prior to testing?	N/A

Guideline Criteria	Reported Information
<u>Feeding</u> No feeding during the study.	Daphnids were not fed during the study
<u>Pretest Mortality</u> No more than 3% mortality 48 hours prior to testing.	Not reported

**C. Test System:**

Guideline Criteria	Reported Information
<u>Source of dilution water</u> Soft reconstituted water or water from a natural source, not dechlorinated tap water.	Reconstituted water
<u>Does water support test animals without observable signs of stress?</u>	Yes
<u>Water Temperature</u> Daphnia: 20°C Amphipods and mayflies: 17°C Midges and mayflies: 22°C Stoneflies: 12°C	20 ± 1°C
<u>pH</u> Prefer 7.2 to 7.6.	8.06 to 8.14
<u>Dissolved Oxygen</u> Static: ≥ 60% during 1 <sup>st</sup> 48 h and ≥ 40% during 2 <sup>nd</sup> 48 h; flow-through: ≥ 60%.	8.6 to 9.0 mg/l
<u>Total Hardness</u> Prefer 40 to 48 mg/L as CaCO <sub>3</sub> .	238 mg/L as CaCO <sub>3</sub>
<u>Test Aquaria</u> 1. <u>Material:</u> Glass or stainless steel. 2. <u>Size:</u> 250 ml (daphnids and midges) or 3.9 L (1 gal). 3. <u>Fill volume:</u> 200 ml (daphnids and midges) or 2-3 L.	Borosilicate glass beakers 250 ml capacity; each vessel contained 200 ml test solution
<u>Type of Dilution System</u> Must provide reproducible supply of toxicant.	Static; no aeration during study

Guideline Criteria	Reported Information
<b><u>Flow Rate</u></b> Consistent flow rate of 5-10 vol/24 hours, meter systems calibrated before study and checked twice daily during test period.	N/A
<b><u>Biomass Loading Rate</u></b> Static: $\leq 0.8$ g/L at $\leq 17^{\circ}\text{C}$ , $\leq 0.5$ g/L at $> 17^{\circ}\text{C}$ ; flow-through: $\leq 1$ g/L/day.	Not reported
<b><u>Photoperiod</u></b> 16 hours light, 8 hours dark.	16 hours light; 8 hours dark
<b><u>Solvents</u></b> Not to exceed 0.5 ml/L for static tests or 0.1 ml/L for flow-through tests.	None employed

**D. Test Design:**

Guideline Criteria	Reported Information
<b><u>Range Finding Test</u></b> If $\text{LC}_{50} > 100$ mg/L, then no definitive test is required.	Not reported
<b><u>Nominal Concentrations of Definitive Test</u></b> Control & 5 treatment levels; a geometric series with each concentration being at least 60% of the next higher one.	0.32, 0.56, 1.0, 1.8, 3.2, 5.6, 10, and 18 ppb formulation concentrations
<b><u>Number of Test Organisms</u></b> Minimum 20/level, may be divided among containers.	20/level; four replicates per level (5 daphnids in each)
<b><u>Test organisms randomly or impartially assigned to test vessels?</u></b>	Yes

<u>Water Parameter Measurements</u> 1. <u>Temperature</u> Measured continuously or, if water baths are used, every 6 h, may not vary > 1°C. 2. <u>DO and pH</u> Measured at beginning of test and ever 48 h in the high, medium, and low doses and in the control.	All criteria met
<u>Chemical Analysis</u> Needed if solutions were aerated, if chemical was volatile, insoluble, or known to absorb, if precipitate formed, if containers were not steel or glass, or if flow-through system was used	Chemical analyses were performed

## 12. REPORTED RESULTS:

Guideline Criteria	Reported Information
Quality assurance and GLP compliance statements were included in the report?	Yes
<u>Control Mortality</u> Static: ≤10% Flow-through: ≤5%	0%
<u>Percent Recovery of Chemical</u>	51 to 63% of nominal; low recovery due to adsorption of material onto surfaces the material came in contact with
Raw data included?	Excerpted

## Mortality

Concentration (ppb)	Number of Organisms	% Immobilized
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Nominal conc. of Formulation Control	Final Measured Technical/ Formulation		
			48 hrs
		20	0
0.32	0.017/ 0.072	20	0
0.56	0.029/ 0.122	20	0
1	0.058/ 0.245	20	15
1.8	0.097/ 0.409	20	25
3.2	0.18/ 0.759	20	30
5.6	0.30/ 1.27	20	70
10	0.87/ 3.67	20	90
18	0.84/ 3.54	20	100

Other Significant Results:

B. Statistical Results

Method: Stefan's Method - Moving-angle  
(mean measured concentrations)

technical lambda cyhalothrin:

48-hr EC<sub>50</sub>: 0.44 ppb 95% C.I.: 0.35 -0.56 ppb

NOEC: 0.075 ppb based on immobility

25 CS Formulation:

48-hr EC<sub>50</sub>: 1.8 ppb 95% C.I.: 1.5 -2.3 ppb

NOEC: 0.32 ppb based on immobility

13. VERIFICATION OF STATISTICAL RESULTS

Technical Lambda-Cyhalothrin

Parameter	Result (ppb)
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Binomial Test EC <sub>50</sub> (C.I.)	0.23 (0.097-0.84)
Moving Average Angle EC <sub>50</sub> (95% C.I.)	0.18 (0.14-0.23)
Probit EC <sub>50</sub> (95% C.I.)	0.2 (0.16- 0.26)
Probit Slope	2.5
NOEC	0.56 (nominal level)

#### 25 CS Formulation

Parameter	Result (ppb)
Binomial Test EC <sub>50</sub> (C.I.)	0.98 (0.41- 3.54)
Moving Average Angle EC <sub>50</sub> (95% C.I.)	0.76 (0.61 -0.98)
Probit EC <sub>50</sub> (95% C.I.)	0.86 (0.67 -1.11)
Probit Slope	2.5
NOEC	0.56 (nominal level)

Because of the low recovery of the material, we based the results on the final measured concentrations at 48 hours. Slightly more conservative results were obtained.

#### 14. REVIEWER'S COMMENTS:

The following deviations were noted.. The deviations were not found to affect the overall quality of the study.

- o Pretest mortality was not reported.
- o The total hardness (238 mg/L as CaCO<sub>3</sub>) was higher than the recommended (40 to 48 mg/L as CaCO<sub>3</sub>).
- o Biomass loading was not reported.
- 0. Recovery was only 51-63% of the nominal. As adsorption of the material to surfaces is expected with this type of material (i.e. a pyrethroid), the low recovery does not invalidate this study. We believe a more accurate EC50 is based on the final measured concentrations, thus our findings are more conservative than that of the study authors (0.76 ppb vs 1.8 ppb for the 25 CS formulation).

This study is scientifically sound and satisfies the guideline requirement (72-2b) for testing with a formulated product. The 48-hr EC50 for daphnids exposed to a 25 CS

formulation containing lambda-cyhalothrin is 0.76 ppb based on final measured concentrations.

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- ☐ Identity of product inert ingredients.
  - ☐ Identity of product impurities.
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  - ☐ Identity of the source of product ingredients.
  - ☐ Sales or other commercial/financial information.
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.7	20	14	70	5.765915
.43	20	6	30	5.765915
.22	20	5	25	2.069473
.13	20	3	15	.1288414
.075	20	0	0	9.536742E-05
.046	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT .22 AND 1.5 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 .5486346

#### RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
7	.028451	.4364235	.3496743	.555062

#### RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H
4	.4914616	6.432716E-02
		1

SLOPE = 2.60885  
95 PERCENT CONFIDENCE LIMITS = 1.947172 AND 3.270527

LC50 = .4617129  
95 PERCENT CONFIDENCE LIMITS = .3626849 AND .5930913

LC10 = .1505107  
95 PERCENT CONFIDENCE LIMITS = 9.602669E-02 AND .2040396

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jedwards Karate daphnid

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
9.7	20	20	100	9.536742E-05
6.3	20	18	90	2.012253E-02
3	20	14	70	5.765915
1.8	20	6	30	5.765915
.93	20	5	25	2.069473
.55	20	3	15	.1288414
.32	20	0	0	9.536742E-05
.19	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT .93 AND 6.3 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 2.32379

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jedwards karate acute daphnid

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
.87	20	18	90	2.012253E-02
.84	20	20	100	9.536742E-05
.3	20	14	70	5.765915
.18	20	6	30	5.765915
.097	20	5	25	2.069473
.058	20	3	15	.1288414
.029	20	0	0	9.536742E-05
.017	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT .097 AND .84 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 .232379

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
7	2.795558E-02		.180557 .1434347

.2317155

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H
4	.0653914	1

GOODNESS OF FIT PROBABILITY

.4795555

SLOPE = 2.505684  
95 PERCENT CONFIDENCE LIMITS = 1.864937 AND 3.146431

LC50 = .2030734  
95 PERCENT CONFIDENCE LIMITS = .1580813 AND .2633227

LC10 = 6.321285E-02  
95 PERCENT CONFIDENCE LIMITS = 3.946256E-02 AND .0868088

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RESULTS CALCULATED USING THE MOVING AVERAGE METHOD  
SPAN            G            LC50            95 PERCENT CONFIDENCE LIMITS  
7            2.851291E-02            1.845791            1.478488  
2.34827

RESULTS CALCULATED USING THE PROBIT METHOD  
ITERATIONS            G            H  
GOODNESS OF FIT PROBABILITY  
4            6.430383E-02            1  
.5072152

SLOPE = 2.611196  
95 PERCENT CONFIDENCE LIMITS = 1.949044 AND 3.273349

LC50 = 1.951487  
95 PERCENT CONFIDENCE LIMITS = 1.532988 AND 2.506154

LC10 = .6367933  
95 PERCENT CONFIDENCE LIMITS = .4062809 AND .8632499

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jedwards Karate Daphnid

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
2.3	20	20	100	9.536742E-05
1.5	20	18	90	2.012253E-02

jedwards karate daphnid

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
3.67	20	18	90	2.012253E-02
3.54	20	20	100	9.536742E-05
1.27	20	14	70	5.765915
.759	20	6	30	5.765915
.409	20	5	25	2.069473
.245	20	3	15	.1288414
.122	20	0	0	9.536742E-05
.072	20	0	0	9.536742E-05

THE BINOMIAL TEST SHOWS THAT .409 AND 3.54 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 .9817992

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
7	2.796425E-02		.7622845 .6056547

.9781175

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H
4	6.533972E-02	1

GOODNESS OF FIT PROBABILITY  
.4820826

SLOPE = 2.505571  
95 PERCENT CONFIDENCE LIMITS = 1.865106 AND 3.146036

LC50 = .8571961  
95 PERCENT CONFIDENCE LIMITS = .6672476 AND 1.11148

LC10 = .2668146  
95 PERCENT CONFIDENCE LIMITS = .166567 AND .3664295

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