US EPA ARCHIVE DOCUMENT

Text Searchable Document

DATA EVALUATION RECORD
AQUATIC INVERTEBRATE LIFE CYCLE TEST
GUIDELINE 72-4(B)

1. **CHEMICAL:** Disulfoton (Di-Syston) PC Code No.: 032501

2. **TEST MATERIAL:** Disyston technical and ^{14}C-Disyston
   Purity: 98.5 and 95.9%, respectively

3. **CITATION**
Authors: Davis, J.
Title: Chronic Toxicity of DISYSTON to the Mysid Shrimp (*Mysidopsis bahia*) Under Flow-Through Conditions
Study Completion Date: 3/24/95
Laboratory: Toxikon Environmental Sciences, 106 Coastal Way, Jupiter, FL 33477
Sponsor: Bayer (Miles Incorporated), Kansas City, MO
Laboratory Report ID: J9408005
MRID No.: 436109-01
DP Barcode: D215801

4. **REVIEWED BY:** Kathryn V. Montague, M.S., Biologist, EEB, EFED
   Signature: Kathryn V. Montague **Date:** 2/4/97

5. **APPROVED BY:** Daniel Rieder, Acting Head, Sec. 2, EEB, EFED
   Signature: Daniel Rieder **Date:** 2/6/97

6. **STUDY PARAMETERS**
Age of Test Organism: <24 hours old at initiation
Definitive Test Duration: 29 days plus 3 additional days to evaluate second generation survival
Study Method: Flow-through
Type of Concentrations: Mean measured

7. **CONCLUSIONS:**
   Results Synopsis

NOEC: not achieved (<8.26 ppb) LOEC: 8.26 ppb
Extrapolated NOEC (EC_{05}) for growth = 2.35 ppb

LOEC's for specific effects
- Young Production: 120 ppb
- Young Survival: >120 ppb
- Growth (length and weight): 8.26 ppb

8. **ADEQUACY OF THE STUDY**
   A. Classification: Core
   B. Rationale:
   C. Repairability:

9. **GUIDELINE DEVIATIONS:** Test was conducted at 27 °C instead of the recommended 20°C; also, no NOEC achieved, but extrapolated NOEC was determined by study authors and

US EPA ARCHIVE DOCUMENT

2030346

TIER II				
123-1 Seed germ./ seedling emergence	TGAI	No		No
123-1 Vegetative vigor	TGAI	No		No
123-2 Aquatic plant growth	TGAI	No		No
TIER III				
124-1: Terrestrial plant field testing	TEP	No		No
124-2: Aquatic plant field testing	TEP	No		No
158.590 NONTARGET INSECT TESTING - POLLINATORS				
141-1 Honeybee acute contact toxicity	TGAI	Yes	00066220,05001991,05004151	No
141-2 Honeybee toxicity of residues	TEP	Yes	0163423	No
141-5 Field testing for pollinators	TEP	No		No

72-2 Freshwater Invertebrate EC_{50}					
	a. TGAI		Yes	00003503,00143401	No
	b. TEP		No		No
72-3 Marine/Estuarine Acute LC_{50}					
a. fish		TGAI	Yes	400716-01	No
b. mollusk		TGAI	Yes	400716-02	No
c. shrimp		TGAI	Yes	400716-03	No
d. fish		TEP	No		No
e. mollusk		TEP	No		No
f. shrimp		TEP	No		No
72-4a Fish early life stage		TGAI (freshwater)	Yes	419358-01	No
		(marine-estuarine)	Yes	426290-01	No
b Aquatic invert. life-cycle		TGAI (freshwater)	Yes	419358-02	No
		(marine-estaurine)	Yes	436109-01	No
72-5 Fish Life Cycle		TGAI (marine-estuarine)	No		Yes
72-6 Aquatic organism accumulation		TGAI	No		Reserved
72-7 Simulated or actual field testing - aquatic organisms		TEP	No		No

158.150 PLANT PROTECTION

Nontarget Area Phytotoxicity

TIER I

122-1 Seed germ./ seedling emergence	TGAI	No	No
122-1 Vegetative vigor	TGAI	No	No
122-2 Aquatic plant growth	TGAI	No	No

Generic Data Requirements for Disulfoton (parent compound) as of 02/07/97

Data Requirement	Composition	Use Pattern[1]	Does EPA Have Data to Satisfy Data Req.	Citation	More Data Submitted Under FIFRA 3(c)(2)(B)?
158.490 Wildlife and Aquatic Organisms					
AVIAN AND MAMMALIAN TESTING					
71-1 Avian oral LD_{50}	TGAI		Yes	25525,00095655, GS0102700,05008363,425858-03	No
71-2 Avian dietary LC_{50}	TGAI		Yes	0094233,00058746,120480	No
71-3 Wild Mammal Toxicity	TGAI		No		No
71-4 Avian Reproduction	TGAI		No		Yes
71-5 Simulated and actual field testing-mammals and birds	TEP		Partially	00095658,00095657	No
AQUATIC ORGANISM TESTING					
72-1 Freshwater fish LC_{50}					
a. Warmwater	TGAI		Yes	40098001,00068268,00003503	No
b. Warmwater	TEP		No	(00068268[2])	No
c. Coldwater	TGAI		Yes	40098001,00068268,00003503	No
d. Coldwater	TEP		No	(00068268[2])	No

[1]A=Terrestrial food, B=Terrestrial feed, C=Terrestrial nonfood, D=Aquatic food, G=Aquatic nonfood, H=Greenhouse food crop, I=Greenhouse nonfood, J=Forestry, K=domestic outdoor, L=Indoor

[2]Submitted study was classified as supplemental and must be repeated in order to fulfill Guidelines requirements

reviewer (see attachments).

10 **SUBMISSION PURPOSE:** Submitted in support of reregistration of disulfoton.

11. **MATERIALS AND METHODS**

A. Test Organisms/Acclimation

Guideline Criteria	Reported Information
Species *Daphnia magna*	*Mysidopsis bahia*
Source	In-house culture
Parental Acclimation Conditions Parental stock must be maintained separately from the brood culture in dilution water under test conditions.	Maintained in dilution water for 14 days under test conditions prior to the start of the test.
Parental Acclimation Period At least 21 days.	14 days (acceptable for mysids)
Age of Parental Stock At least 10-12 days old at the beginning of the acclimation period.	Not reported
Food Synthetic foods (trout chow), algae, or synthetic foods in combination with alfalfa yeast and algae.	Fed live brine shrimp, *Artemia salina* daily during acclimation and testing
Food Concentration 5 mg/L (dry wt.) of synthetic food or 10^8 cells/L of algae is recommended.	No standard for mysids
Were mysids in good health during acclimation period?	Yes

B. Test System

Guideline Criteria	Reported Information
Test Water Unpolluted well or spring that has been tested for contaminants, or appropriate reconstituted water (see ASTM for details).	Filtered and aerated seawater from a saltwater well, adjusted to salinity of 20 ppt with carbon-treated, aerated freshwater. Dilution water regularly tested for contaminants.
Water Temperature 20°C ± 2°C. Must not deviate from 20°C by more than 5°C for more than 48 hours.	Target: 27 ±2°C Range: 25.4 to 30.7°C
pH 7.6 to 8.0 is recommended. Must not deviate by more than one unit for more than 48 hours.	8.0 to 8.2
Total Hardness 160 to 180 mg/L as $CaCO_3$ is recommended.	Not reported
Dissolved Oxygen Renewal: must not drop below 50% for more than 48 hours. Flow-through: ≥ 60% throughout test.	4.5 to 6.4 mg/L (≥64%)
Test Vessels or Compartments 1. Material: Glass, No. 316 stainless steel, or perfluorocarbon plastics 2. Size: approx. 250 ml 3. Fill volume: 200 ml	Glass aquaria 24 liter 15.3 liters
Covers Renewal: Test vessels should be covered with a glass plate. Flow-through: openings in test compartments should be covered with mesh nylon or stainless steel screen.	Retention chambers for adult mysids pairs were glass petri dishes (13 cm) with 17 cm high nitrex screen collars attached

Guideline Criteria	Reported Information
Type of Dilution System Must provide reproducible supply of toxicant. Intermittent flow proportional diluters or continuous flow serial diluters should be used.	Proportional vacuum-siphon diluter
Flow Rate Consistent flow rate of 5-10 vol/24 hours, meter systems calibrated before study and checked twice daily during test period.	10.8 vol/24 hours
Aeration Dilution water should be vigorously aerated, but the test tanks should not be aerated.	Not aerated
Photoperiod 16 hours light, 8 hours dark is recommended.	16 hours light/8 dark
Solvents Not to exceed 0.5 ml/L for static tests or 0.1 ml/L for flow-through tests. Acceptable solvents are dimethylformamide, triethylene glycol, methanol, acetone and ethanol.	Dimethylformamide, 0.003 ml/L

C. **Test Design**

Guideline Criteria	Reported Information
Duration 21 days	29 days plus 3 additional days for observation of f2 generation survival
Nominal Concentrations Control(s) and at least 5 test concentrations; dilution factor not greater than 50%.	controls, 7.5, 15.0, 30.0, 60.0 and 120.0 µg/L (ppt).

Guideline Criteria	Reported Information
Number of Test Organisms 22 daphnids/level; 7 test chambers should contain 1 daphnid each, and 3 test chambers should contain 5 daphnids each.	2 replicates of 30 mysids per level (60 individual mysids/level)
Test organisms randomly or impartially assigned to test vessels?	Yes
Renewal Parent daphnids in all beakers must be transferred to containers with fresh test solution (< 4 hours old) three times each week (e.g. every Monday, Wednesday and Friday).	N/A--flow-through study
Water Parameter Measurements 1. Dissolved oxygen must be measured at each concentration at least once a week. 2. pH, alkalinity, hardness, and conductance must be measured once a week in one test concentration and in one control. 3. Temperature	DO, pH, and temperature were measured and recorded in each replicate test vessel once a week. Temperature was also measured in a control replicated daily, and the temperature of the water bath was monitored continuously.
Chemical Analysis Needed 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.	Analytical determination of concentrations was performed with samples collected from each replicate test vessel on days 0, 7, 14, 21, and 29.

12. REPORTED RESULTS

A. General Results

Guideline Criteria	Reported Information
Quality assurance and GLP compliance statements were included in the report?	Yes

Guideline Criteria	Reported Information
Control Mortality ≤ 30%	10%
Did daphnids in each control produce at least 40 young after 21 days?	Yes
Were no ephippia produced in any of the controls?	Not reported--not applicable for mysids
Data Endpoints - Survival of first-generation daphnids, - Number of young produced per female, - Dry weight (required) and length (optional) of each first generation daphnid alive at the end of the test, - Observations of other effects or clinical signs.	- Survival of first-generation mysids - Number of young per female - Length of surviving mysids - Dry weight of surviving mysids - Survival of f2 generation - Sublethal effects
Raw data included?	Yes

Effects Data

Toxicant Concentration (µg/L)		% Dead or Immobile (29 Days)	Young per Female reproductive day	Survival of Second Generation Mysids (%)	Total Length (mm)	Dry Weight (mg)
Nominal	Measured					
Control	--	13.5%	1.85	92	6.2	1.12
Solvent Control	--	7%	1.86	71	6.2	1.12
7.50	8.26	13.5%	1.84	78	6.0*	0.99*
15.0	17.0	20%	1.59	91	5.8*	0.92*
30.0	26.3	13.5%	1.63	84	5.7*	0.91*
60.0	56.8	28.5%*	1.48	86	5.4*	0.79*
120.0	120.0	36.5%*	0.69*	76	5.3*	0.71*

* = statistically significant difference from pooled controls (second generation survival compared to solvent controls only)

Toxicity Observations:

B. Statistical Results

Most sensitive endpoint: growth (length and dry weight)

Endpoint	Method	NOEC	LOEC
Survival	Fisher's exact test	26.3 ppb	56.8 ppb
Reproduction	ANOVA with Dunnett's	56.8 ppb	120 ppb
Second Gen. Survival	Fisher's exact test	120 ppb	> 120 ppb
Dry Weight	ANOVA with Dunnett's	< 8.26 ppb	8.26 ppb
Length	ANOVA with Dunnett's	< 8.26 ppb	8.26 ppb

13. VERIFICATION OF STATISTICAL RESULTS

Most sensitive endpoint: Growth (length and dry weight)

Endpoint	Method	NOEC	LOEC
Survival	ANOVA with William's	26.3 ppb	56.8 ppb
Reproduction	ANOVA with William's	56.8 ppb	120 ppb
Second gen. survival	ANOVA with William's	120 ppb	> 120 ppb
Wet weight	ANOVA with William's	< 8.26 ppb	8.26 ppb
Length	ANOVA with William's	< 8.26 ppb	8.26 ppb

14. REVIEWER'S COMMENTS:

Results were generally in agreement with study author's results. The study author extrapolated a NOEC for growth, using pooled controls as a reference. The reviewer extrapolated a NOEC for growth using solvent controls only, according to EFED policy (see

attached memo). Using probit analysis (SAS System) of the percent reductions in dry weight and length of the treatments vs the solvent controls, the "NOECs" (EC_{05}) were 2.35 ppb and 5.81 ppb, respectively (see attachments). The more conservative dry weight NOEC of 2.35 ppb will be the value used for risk assessment purposes.

SUBJECT: Determination of a point estimate (NOEC/EC_x) for use in risk assessment (Re: Fipronil mysid chronic study, D216635)

NOTE TO: Tom Bailey, Chairman, ARET

FROM: Richard Lee RL 7/11/96

THRU: Ann Stavola, Head, Sec. 5

I have reviewed the ARET review regarding the NOEC determination of the most sensitive endpoint (male dry weight) in Fipronil mysid chronic study. The NOEC should be less than 5 pptr (the lowest concentration tested), because LOEC is 5 pptr. Based on the probit analysis using SAS software, EC_{10} and EC_5 are 10.55 pptr and 0.73 pptr, respectively (Data on percent deduction in male weight comparing with the solvent control is used; The data point from the highest testing concentration, 57 pptr, was not used due to its effect on survival). Therefore, a LOEC value of 5 pptr is appropriate. A repeated testing will not necessarily produce useful information due to the nature of biological testing with a great variability and uncertainty.

Another issue of concern is the registrant's procedure used in determination of EC_5. The data set is required to be transformed twice in order to assume linearity in dose response. In another words, effects should be expressed as a percent-deduction in probit units while dosages are in log units. the registrant also repeatedly misuse the William test when there were no progressive dose responses.

As to the issue of pooling the positive and negative controls, it is theoretically unsound. The negative control is the assurance for using healthy testing animals, while the positive control is to check if the solvent effect exists. When two controls are pooled, the data is, statistically, said to be confounded with "solvent effect". Even when T-test is conducted and found to be non-significantly different, it does not necessarily mean they are same. Instead, it rather indicates that the test failed to detect the difference, especially in the case of a study with limited replicates (i.e., insufficient power of test). Therefore, only solvent control should be used for statistical analysis.

Attachment: SAS printout

CC: N. E. Federoff

length - % red VS SC

SAS 14:20 Monday, January 1, 1996
1

OBS	DOSE	N	RESP
1	8.26	46	3.2
2	17.00	37	6.4
3	26.30	43	8.1
4	56.80	36	12.9
5	120.00	28	14.5

SAS 14:20 Monday, January 1, 1996
2

Probit Procedure

Iter	Ridge	LogLikelihood	INTERCPT	Log10(DOSE)
0	0	-131.6979643064	0	0
1	0	-93.8628016767	-1.998793793	0.9428097699
2	0	-92.51352388677	-2.574668472	1.2547542371
3	0	-92.50562070783	-2.624197527	1.2819411437
4	0	-92.5056203306	-2.624542774	1.2821306126

SAS 14:20 Monday, January 1, 1996
3

Probit Procedure

Data Set =WORK.DATA1
Dependent Variable=RESP
Dependent Variable=N
Number of Observations= 5
Number of Events = 45.1 Number of Trials = 190

Log Likelihood for NORMAL -92.50562033

Last Evaluation of the Gradient

INTERCPT	Log10(DOSE)
0.000000245	0.000000254

SAS 14:20 Monday, January 1, 1996
4

Probit Procedure

Last Evaluation of the Hessian

	INTERCPT	Log10(DOSE)
INTERCPT	89.934848	137.137153
Log10(DOSE)	137.137153	222.176334

SAS 14:20 Monday, January 1, 1996
5

Probit Procedure

Goodness-of-Fit Tests

Statistic	Value	DF	Prob>Chi-Sq
Pearson Chi-Square	0.3339	3	0.9535
L.R. Chi-Square	0.3294	3	0.9544

Response Levels: 2 Number of Covariate Values: 5

NOTE: Since the chi-square is small (p > 0.1000), fiducial limits will be calculated using a t value of 1.96.

SAS 14:20 Monday, January 1, 1996
6

Probit Procedure

Variable	DF	Estimate	Std Err	ChiSquare	Pr>Chi	Label/Value
INTERCPT	1	-2.6245428	0.434878	36.42268	0.0001	Intercept
Log10(DOS)	1	1.28213061	0.276683	21.47331	0.0001	

Estimated Covariance Matrix

	INTERCPT	Log10(DOSE)
INTERCPT	0.189119	-0.116733
Log10(DOSE)	-0.116733	0.076554

SAS 14:20 Monday, January 1, 1996
7

Probit Procedure

Probit Model in Terms of Tolerance Distribution

MU	SIGMA
2.047017	0.779952

Estimated Covariance Matrix for Tolerance Parameters

	MU	SIGMA
MU	0.019462	0.018966
SIGMA	0.018966	0.028329

SAS 14:20 Monday, January 1, 1996
8

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits Lower	Upper
0.01	0.23258	-0.73802	0.64006
0.02	0.44519	-0.37396	0.79387
0.03	0.58009	-0.14392	0.89241
0.04	0.68157	0.02842	0.96724
0.05	0.76411	0.16800	1.02872
0.06	0.83437	0.28624	1.08162
0.07	0.89597	0.38937	1.12853
0.08	0.95113	0.48118	1.17107
0.09	1.00129	0.56414	1.21030
0.10	1.04747	0.63995	1.24697
0.15	1.23865	0.94525	1.40734
0.20	1.39059	1.17048	1.55221

SAS 14:20 Monday, January 1, 1996
9

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits	
		Lower	Upper
0.25	1.52095	1.34219	1.69800
0.30	1.63801	1.47546	1.84987
0.35	1.74649	1.58340	2.00615
0.40	1.84942	1.67600	2.16427
0.45	1.94901	1.75967	2.32318
0.50	2.04702	1.83830	2.48327
0.55	2.14503	1.91449	2.64581
0.60	2.24462	1.99020	2.81267
0.65	2.34755	2.06718	2.98641
0.70	2.45602	2.14731	3.17050
0.75	2.57309	2.23296	3.37000
0.80	2.70344	2.32759	3.59288

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits	
		Lower	Upper
0.85	2.85538	2.43718	3.85338
0.90	3.04657	2.57431	4.18192
0.91	3.09274	2.60734	4.26137
0.92	3.14290	2.64318	4.34772
0.93	3.19806	2.68254	4.44270
0.94	3.25967	2.72647	4.54882
0.95	3.32992	2.77651	4.66991
0.96	3.41247	2.83525	4.81224
0.97	3.51394	2.90737	4.98729
0.98	3.64884	3.00313	5.22010
0.99	3.86146	3.15384	5.58727

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits	
		Lower	Upper
0.01	1.70835	0.18280	4.36573
0.02	2.78735	0.42271	6.22115
0.03	3.80267	0.71793	7.80560
0.04	4.80359	1.06763	9.27344
EC5 0.05	5.80912	1.47230	10.68373
0.06	6.82918	1.93302	12.06745
0.07	7.86993	2.45115	13.44410
0.08	8.93570	3.02816	14.82769
0.09	10.02980	3.66553	16.22941
EC10 0.10	11.15497	4.36462	17.65901
0.15	17.32402	8.81549	25.54676
0.20	24.58062	14.80730	35.66199

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits	
		Lower	Upper

0.25	33.18541	21.98828	49.88875
0.30	43.45198	29.88572	70.77273
0.35	55.78088	38.31742	101.42715
0.40	70.69980	47.42469	145.97073
0.45	88.92153	57.49999	210.46352
0.50	111.43374	68.91301	304.27883
0.55	139.64535	82.12827	442.39340
0.60	175.63668	97.76911	649.64173
0.65	222.61174	116.73029	969.19636
0.70	285.77471	140.38269	1481
0.75	374.18481	170.98427	2344
0.80	505.17360	212.61144	3916

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits	
		Lower	Upper
0.85	716.77809	273.64173	7135
0.90	1113	375.24358	15203
0.91	1238	404.88973	18254
0.92	1390	439.72027	22270
0.93	1578	481.44297	27714
0.94	1818	532.68315	35385
0.95	2138	597.74149	46764
0.96	2585	684.30083	64899
0.97	3265	807.92690	97115
0.98	4455	1007	165998
0.99	7269	1425	386608

Dry wt - Forced. VS SC

SAS 14:20 Monday, January 1, 1996
14

OBS	DOSE	N	RESP
1	8.26	46	11.6
2	17.00	37	17.8
3	26.30	43	18.8
4	56.80	36	29.5
5	120.00	28	36.6

SAS 14:20 Monday, January 1, 1996
15

Probit Procedure

Iter	Ridge	LogLikelihood	INTERCPT	Log10(DOSE)
0	0	-112.2898432507	0	0
1	0	-99.9511155952	-2.098044645	1.5647778126
2	0	-99.87906872279	-2.273657629	1.6980802963
3	0	-99.87906219903	-2.275327644	1.6993652929
4	0	-99.87906219903	-2.2753278	1.6993654148

SAS 14:20 Monday, January 1, 1996
16

Probit Procedure

Data Set =WORK.DATA2
Dependent Variable=RESP
Dependent Variable=N
Number of Observations= 4
Number of Events = 77.7 Number of Trials = 162

Log Likelihood for NORMAL -99.8790622

Last Evaluation of the Gradient

INTERCPT	Log10(DOSE)
-1.59872E-14	-2.81899E-14

SAS 14:20 Monday, January 1, 1996
17

Probit Procedure

Last Evaluation of the Hessian

	INTERCPT	Log10(DOSE)
INTERCPT	93.793184	122.601527
Log10(DOSE)	122.601527	168.152734

SAS 14:20 Monday, January 1, 1996
18

Probit Procedure

Goodness-of-Fit Tests

Statistic	Value	DF	Prob>Chi-Sq
Pearson Chi-Square	3.6110	2	0.1644
L.R. Chi-Square	3.6332	2	0.1626

Response Levels: 2 Number of Covariate Values: 4

NOTE: Since the chi-square is small (p > 0.1000), fiducial limits will be calculated using a t value of 1.96.

SAS 14:20 Monday, January 1, 1996
19

Probit Procedure

Variable	DF	Estimate	Std Err	ChiSquare	Pr>Chi	Label/Value
INTERCPT	1	-2.2753278	0.476546	22.79698	0.0001	Intercept
Log10(DOS)	1	1.69936541	0.355909	22.79794	0.0001	

Estimated Covariance Matrix

	INTERCPT	Log10(DOSE)
INTERCPT	0.227097	-0.165578
Log10(DOSE)	-0.165578	0.126671

SAS 14:20 Monday, January 1, 1996
20

Probit Procedure

Probit Model in Terms of Tolerance Distribution

MU	SIGMA
1.338928	0.588455

Estimated Covariance Matrix for Tolerance Parameters

	MU	SIGMA
MU	0.003736	0.000820
SIGMA	0.000820	0.015189

SAS 14:20 Monday, January 1, 1996
21

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits	
		Lower	Upper
0.01	-0.03002	-0.97394	0.37193
0.02	0.13039	-0.70353	0.48736
0.03	0.23217	-0.53222	0.56085
0.04	0.30873	-0.40352	0.61631
0.05	0.37101	-0.29897	0.66155
0.06	0.42401	-0.21009	0.70017
0.07	0.47049	-0.13226	0.73414
0.08	0.51211	-0.06267	0.76465
0.09	0.54995	0.00053	0.79248
0.10	0.58479	0.05863	0.81818
0.15	0.72903	0.29801	0.92574
0.20	0.84367	0.48629	1.01321

SAS 14:20 Monday, January 1, 1996
22

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits Lower	Upper
0.25	0.94202	0.64543	1.09062
0.30	1.03034	0.78522	1.16327
0.35	1.11218	0.91044	1.23491
0.40	1.18984	1.02321	1.30894
0.45	1.26498	1.12418	1.38869
0.50	1.33893	1.21383	1.47691
0.55	1.41287	1.29365	1.57495
0.60	1.48801	1.36646	1.68287
0.65	1.56567	1.43545	1.80067
0.70	1.64751	1.50367	1.92931
0.75	1.73583	1.57402	2.07140
0.80	1.83418	1.64986	2.23212

SAS 14:20 Monday, January 1, 1996
23

Probit Procedure
Probit Analysis on Log10(DOSE)

Probability	Log10(DOSE)	95 Percent Fiducial Limits Lower	Upper
0.85	1.94882	1.73621	2.42151
0.90	2.09306	1.84295	2.66172
0.91	2.12790	1.86851	2.71995
0.92	2.16575	1.89621	2.78329
0.93	2.20736	1.92658	2.85301
0.94	2.25384	1.96042	2.93097
0.95	2.30685	1.99892	3.01997
0.96	2.36913	2.04404	3.12465
0.97	2.44569	2.09937	3.25348
0.98	2.54747	2.17272	3.42492
0.99	2.70788	2.28800	3.69549

SAS 14:20 Monday, January 1, 1996
24

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits Lower	Upper
0.01	0.93320	0.10618	2.35466
0.02	1.35017	0.19791	3.07157
0.03	1.70673	0.29362	3.63790
0.04	2.03577	0.39489	4.13339
EC5 0.05	2.34966	0.50238	4.58722
0.06	2.65469	0.61647	5.01387
0.07	2.95455	0.73746	5.42175
0.08	3.25167	0.86562	5.81628
0.09	3.54776	1.00123	6.20123
EC10 0.10	3.84408	1.14452	6.57934
0.15	5.35838	1.98613	8.42839
0.20	6.97705	3.06398	10.30877

SAS 14:20 Monday, January 1, 1996
25

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits Lower	Upper

		Lower	Upper
0.25	8.75026	4.42006	12.32039
0.30	10.72363	6.09842	14.56378
0.35	12.94745	8.13646	17.17562
0.40	15.48262	10.54887	20.36757
0.45	18.40695	13.31021	24.47308
0.50	21.82368	16.36161	29.98546
0.55	25.87462	19.66314	37.57916
0.60	30.76177	23.25177	48.18064
0.65	36.78508	27.25541	63.19359
0.70	44.41340	31.89118	84.97896
0.75	54.42955	37.49900	117.86943
0.80	68.26280	44.65418	170.65517

SAS 14:20 Monday, January 1, 1996
26

Probit Procedure
Probit Analysis on DOSE

Probability	DOSE	95 Percent Fiducial Limits Lower	Upper
0.85	88.88373	54.47657	263.94420
0.90	123.89771	69.65419	458.90103
0.91	134.24616	73.87715	524.75155
0.92	146.47019	78.74206	607.14413
0.93	161.19979	84.44658	712.87601
0.94	179.40814	91.28957	853.03755
0.95	202.69834	99.75147	1047
0.96	233.95257	110.67210	1332
0.97	279.05528	125.70924	1793
0.98	352.74969	148.84157	2660
0.99	510.36262	194.08860	4960

106924

Table 6a. Growth, as Dry Weight, of Mysids, *Mysidopsis bahia*, Exposed to Di-system on During a 29-day Chronic Test Under Flow-Through Conditions

Mean Measured Concentration (µg/L; ppb)	Chamber	Mean Dry Weight (mg) Chamber	Replicate	Treatment
Control	A1	1.06		
	A2	1.22	1.13	
	B1	1.03		
	B2	1.13	1.11	1.12
Solvent Control	A1	1.13		
	A2	1.03	1.12	
	B1	1.12		
	B2	1.12	1.12	1.12
Pooled Control	A1	1.12		
	A2	1.13	1.12	
	B1	1.10		
	B2	1.12	1.11	1.12
8.26	A1	0.97		
	A2	0.94	0.96	
	B1	1.05		
	B2	0.99	1.02	0.99*
17.0	A1	0.94		
	A2	0.92	0.93	
	B1	0.91		
	B2	0.92	0.91	0.92*
26.3	A1	0.91		
	A2	0.88	0.90	
	B1	0.86		
	B2	0.96	0.91	0.91*
56.3	A1	0.76		
	A2	0.84	0.80	
	B1	0.76		
	B2	0.79	0.77	0.79*
120	A1	0.80		
	A2	0.68	0.74	
	B1	0.70		
	B2	0.68	0.69	0.71*

* Denotes that mean dry weight is significantly less than the pooled control ($\alpha = 0.05$). The comparison was made against the pooled control because no significant difference was detected when the control and solvent control treatments were compared using a Student t-Test.

NOTE: The extrapolated NOEC values based on mean dry weight based on the test data was 2.73 µg ai/L as calculated by linear regression using the pooled control value (1.12mg) as the NOEC criterion (Table 7).

EC10 = 3.81 ppb > based on % ↓ in dry wt vs solvent Control

EC05 2.35 ppb

A "NOEC" for Growth

106924

Table 5a. Growth, as Total Length, of Mysids, *Mysidopsis bahia*, Exposed to Di-syston During a 29-day Chronic Test Under Flow-Through Conditions

Mean Measured Concentration (µg/L; ppb)	N	Chamber	Mean Length (mm) Chamber	Replicate	Treatment
Control	40	A1	6.1		
		A2	6.3	6.2	
		B1	6.1		
		B2	6.3	6.2	6.2
Solvent Control	40	A1	6.2		
		A2	6.3	6.2	
		B1	6.1		
		B2	6.2	6.1	6.2
Pooled Control		A1	6.2		
		A2	6.3	6.2	
		B1	6.1		
		B2	6.2	6.2	6.2
8.26	40	A1	6.0		
		A2	5.9	5.9	
		B1	6.1		
		B2	6.1	6.1	6.0*
17.0	37	A1	5.9		
		A2	5.8	5.8	
		B1	5.7		
		B2	5.7	5.7	5.8*
26.3	43	A1	5.6		
		A2	5.9	5.7	
		B1	5.9		
		B2	5.7	5.8	5.7*
56.8	36	A1	5.4		
		A2	5.6	5.5	
		B1	5.3		
		B2	5.5	5.4	5.4*
120	38	A1	5.5		
		A2	5.2	5.3	
		B1	5.3		
		B2	5.1	5.2	5.3*

* Denotes that the mean length (mm) is significantly less than the pooled control ($\alpha = 0.05$). The comparison was made against the pooled control because no significant difference was detected when the control and solvent control treatments were compared using a Student *t*-Test.

NOTE: The extrapolated NOEC value for mean total length based on the test data was 3.92 µg ai/L as calculated by linear regression using the pooled control value (6.2 mm) as the NOEC criterion (Table 7).