



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

6/27/89

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Diazinon Registration Standard Data Submissions; EPA Acc.
Nos. 406255-01 and -02. EPA Reg. No. 100-524.

TO: George LaRocca, PM 15
Insecticide-Rodenticide Branch
Registration Division (H7505C)

FROM: Jim Akerman, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

CIBA-GEIGY Corporation has submitted the above referenced data in response to the Diazinon Registration Standard. EEB's review results are indicated below and the data evaluation records are attached.

<u>Guide.</u> <u>Ref.No.</u>	<u>Test</u> <u>Species</u>	<u>%</u> <u>AI</u>	<u>Test</u> <u>Type</u>	<u>Test</u> <u>Results</u>	<u>Toxicity</u> <u>Category</u>	<u>Study</u> <u>Status</u>
72-3	Mysid	87.7	96-hour LC50	4.2 ug/l	Very Highly Toxic	Core
72-3	Oyster	87.7	96-hour shell deposit.	0.88 mg/l	Very Highly Toxic	Core

John Noles
6/27/89
John Noles, Biologist
Ecological Effects Branch

DATA EVALUATION RECORD

1. **CHEMICAL:** Diazinon Technical
Shaughnessey No. 057801
2. **TEST MATERIAL:** Diazinon Technical; Lot No. FL-872049;
87.7% Active Ingredient; an amber-colored liquid
3. **STUDY TYPE:** Shrimp 96-hour Acute Toxicity Test
Species Tested: Mysid shrimp, (Mysidopsis bahia)
4. **CITATION:** Surprenant D.C. 1988. Acute Toxicity of
Diazinon Technical to Mysid Shrimp (Mysidopsis bahia) Under
Flow-Through Conditions. Laboratory Study No. 88-3-2676.
Prepared by Springborn Life Sciences, Inc., Wareham, MA.
Submitted by Ciba Geigy Corporation, Greensboro, NC.
Accession No. 406255-01.
5. **REVIEWED BY:**

Kimberly D. Rhodes
Associate Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: *Kimberly D. Rhodes*
Date: *May 5, 1989*
6. **APPROVED BY:**

Prapimpan Kosalwat, Ph.D.
Staff Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature: *P. Kosalwat*
Date: *May 5, 1989*

for Henry T. Craven
Supervisor, EEB/HED
USEPA

Signature: *John Niles*
Date: *June 19, 1989*
7. **CONCLUSIONS:** This study appears scientifically sound and
fulfills the Guideline requirements for a 96-hour acute
flow-through study for estuarine and marine shrimp. The 96-
hour LC50 value for Mysidopsis bahia exposed to Diazinon
Technical was 4.2 ug a.i./L, based on mean measured
concentration. Therefore, Diazinon Technical is classified
as very highly toxic to mysid shrimp. The NOEC was
estimated to be < 2.7 ug a.i./L after 96 hours of exposure.
8. **RECOMMENDATIONS:** N/A

9. BACKGROUND:

10. DISCUSSION OF INDIVIDUAL TESTS: N/A

11. MATERIALS AND METHODS:

- A. Test Animals: Mysid shrimp (*Mysidopsis bahia*) were obtained from laboratory cultures maintained at the testing facility. Mysid shrimp were fed brine shrimp nauplii two times daily and Hatchfry Encapsulon^R three times weekly. The mysid culture area received a regulated photoperiod of 16 hours of light and 8 hours of darkness. Commercial aquarium heaters were used to maintain the culture solution temperature at $25 \pm 1^{\circ}\text{C}$.
- B. Test System: The test was conducted using an exposure system consisting of a modified continuous-flow proportional diluter (Benoit et al., 1982), a temperature controlled water bath, and a set of 14 test aquaria. The dilution water was natural filtered seawater characterized as having a salinity of 31 - 32⁰/oo and a pH of 7.8 - 7.9.

The test system was designed to provide five concentrations of test material, a dilution water control and solvent control. All treatment levels and controls were maintained in duplicate. Each glass test aquarium measured 39 x 20 x 25 centimeters (cm) with a self-starting siphon attached to the drain. The flow rate of exposure solutions to each test aquarium was equivalent to 11 volume additions per 24 hours, resulting in a 90% replacement every 2.1 hours. This system allowed the aquarium volume to fluctuate between 3.1 and 7.0 L and ensured a solution exchange within the organism retention chamber. Each test aquarium contained two mysid retention chambers. The aquaria were impartially positioned in a water bath containing circulating water heated by immersion coil heaters and regulated by a mercury column thermoregulator designed to maintain the test water temperature at $25 \pm 1^{\circ}\text{C}$. A photoperiod of 16 hours of light and 8 hours of darkness was provided each day.

- C. Dosage: 96-hour acute flow-through test.
- D. Design: The test was initiated when 20 (\leq 24-hour old) mysid shrimp, ten per replicate (five per retention chamber), were impartially distributed to each of the treatment levels and controls. A control, solvent

control, and five nominal Diazinon Technical concentrations of 2.7, 4.1, 6.3, 9.8, and 15 ug a.i./L were tested. The solvent control solution contained the maximum amount of acetone present in any test concentration (21 uL/L). All concentrations were observed for mortality and abnormal effects at test initiation and at every subsequent 24-hour interval during the exposure period. The water quality parameters (dissolved oxygen, pH, salinity and temperature) were observed and recorded once daily in each replicate of the control solutions and each treatment level. The test solution temperature was continuously monitored in one replicate of the solvent control solution throughout the study. Analytical determination of Diazinon Technical was performed on all test solutions, control and solvent control at 0 and 96 hours.

E. Statistics: The concentration of test substance lethal to 50 percent of the test population (LC50) was determined by the computer program developed by Stephan et al. (1977).

12. REPORTED RESULTS: The mean measured test concentrations, the corresponding mortalities and the observations made during the 96-hour test are presented in Table 3 (attached). The mean measured concentrations of Diazinon Technical in exposure solutions during the 96-hour definitive test were 2.7, 4.1, 4.9, 9.4, and 13 ug a.i./L. The mean measured concentrations of Diazinon Technical ranged from 78 to 100% of the nominal concentrations. No mysid shrimp survived the 96-hour exposure in the highest test concentration (13 ug/L). Mortalities of 95, 80, 40, and 10% were observed at the remaining lower concentrations (9.4, 4.9, 4.1, and 2.7 ug a.i./L Diazinon Technical). No mortalities or sublethal effects were observed in the controls. The 96-hour LC50 for mysid shrimp exposed to Diazinon Technical was calculated by probit analyses to be 4.2 ug a.i./L with 95% confidence interval of 3.7 to 4.8 ug a.i./L. Based on the results of this study, the no-observed-effect concentration for mysid shrimp and Diazinon Technical was determined to be < 2.7 ug a.i./L. Based on EPA (1985) criteria, Diazinon Technical is classified as very highly toxic to Mysidopsis bahia. The water quality parameters measured during this study remained within acceptable ranges for the survival of the mysid shrimp and were unaffected by the concentrations of Diazinon Technical tested.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

The 24-, 48-, 72-, and 96-hour LC50 values for Diazinon Technical based upon mean measured concentrations were estimated to be 8.7, 6.0, 4.4, and 4.2 ug a.i./L. The NOEC (no-observed-effect concentration) was < 2.7 ug a.i./L after 96 hours of exposure.

The study was audited by the QA unit of Springborn Life Sciences, Inc. A statement of quality assurance was included in the report, indicating that the study was conducted in accordance with U.S. EPA Good Laboratory Practice Standards.

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedure: The test procedures were generally in accordance with protocols recommended by the Guidelines, but deviated from the SEP as follows:

- o The SEP states that natural or reconstituted seawater of 10 to 17 ‰ salinity should be used when testing euryhaline shrimp species. The natural seawater used during the toxicity study had a salinity of 31 - 32 ‰.

The toxicity report did not provide the following information required by the SEP:

- o The SEP recommends a 16-hour light and an 8-hour dark photoperiod with a 15- to 30-minute transition period between light and dark. The report did not state whether a 15- to 30-minute transition period between light and dark was maintained.

B. Statistical Analysis: The reviewer used the Toxanal computer program to calculate the LC50 values and the slope of the concentration-response curve. These calculations are attached. The probit method provides a 96-hour LC50 value of 4.2 ug a.i./L mean measured concentration with a 95 percent confidence interval of 3.7 to 4.8 ug a.i./L. The slope of the concentration-response curve was 6.0.

C. Discussion/Results: The study results appear to be scientifically valid. The 96-hour LC50 value based on mean measured concentrations was estimated to be 4.2 ug a.i./L. Therefore, Diazinon Technical is considered very highly toxic to mysids (Mysidopsis bahia). The NOEC (no-observed-effect concentration) was estimated to be < 2.7 ug a.i./L after 96 hours of exposure.

D. Adequacy of the Study:

(1) Classification: Core

(2) Rationale: N/A

(3) Repairability: N/A

15. COMPLETION OF ONE-LINER FOR STUDY: Yes, 04-20-89

KIMBERLY RHODES DIAZINON MYSIDOPSIS BAHIA 04-20-89

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
13	20	20	100	9.536742E-05
9.399999		20	19	95
2.002716E-03				
4.9	20	16	80	.5908966
4.1	20	8	40	25.17223
2.7	20	2	10	2.012253E-02

THE BINOMIAL TEST SHOWS THAT 2.7 AND 4.9 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 4.278786

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS
4	6.106318E-02	4.392976	3.675785 5.06048

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
5	.1541198	1	.3076916

SLOPE = 6.011161
95 PERCENT CONFIDENCE LIMITS = 3.651294 AND 8.371027

LC50 = 4.206482
95 PERCENT CONFIDENCE LIMITS = 3.659204 AND 4.823008

LC10 = 2.5861
95 PERCENT CONFIDENCE LIMITS = 1.808934 AND 3.088491

Table 3. Concentrations tested and corresponding mortalities of mysid shrimp (*Mysidopsis bahia*) during the 96-hour flow-through exposure to DIAZINON Technical.

Mean Measured Concentration (µg/L)	Cumulative Mortality (%)											
	24-hour			48-hour			72-hour			96-hour		
	A	B	Mean	A	B	Mean	A	B	Mean	A	B	Mean
Control	0	0	0	0	0	0	0	0	0	0	0	0
Solvent	0	0	0	0	0	0	0	0	0	0	0	0
Control	0	0	0	0	0	0	0	0	0	0	0	0
2.7	0	0	0	0	0	0	10	10	10	10	10	10
4.1	0	0	0	0	10	5	30	40	35	30	50	40
4.9	0	10	5	0	40	35	80	70	75	80	80	80
9.4	40	40	40	100	90	95	100	90	95	100	90	95
13	100	90	95 ^a	100	100	100	100	100	100	100	100	100

^aThe surviving mysid was lethargic.

^bOne of the surviving mysids exhibited darkened pigmentation.