

US EPA ARCHIVE DOCUMENT

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128850

MRID No. 413961-07

DATA EVALUATION RECORD

- 1. **CHEMICAL:** Glufosinate.
Shaughnessey No. 128850.
- 2. **TEST MATERIAL:** HOE-039866 Technical; Code #HOE-039866
Technical OH ZC96 0002; 96.3% Active Ingredient; a white
powder.
- 3. **STUDY TYPE:** Estuarine Invertebrate Toxicity Test.
Species Tested: Mysidopsis bahia.
- 4. **CITATION:** Forbis, A.D. 1986. Acute Toxicity of HOE-039866
Technical Substance (Code: HOE-039866 OH ZC96 0002) to the
Mysid Shrimp (Mysidopsis bahia). Report No. A33265. ABC
Study No. 34155. Prepared by Analytical Bio-Chemistry
Laboratories, Inc., Columbia, Missouri. Submitted by
Hoechst Celanese Corporation, Somerville, New Jersey. MRID
No. 413961-07.

5. **REVIEWED BY:**

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

Signature: *Kimberly D. Rhodes*
Date: *June 1, 1990*

6. **APPROVED BY:**

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

Signature: *P. Kosalwat*
Date: *6/1/90*

Henry T. Craven, M.S.
Supervisor, EEB/HED
USEPA

Signature: *R.C. Petros*
Date: *12/21/90*

M. Keywood
12/21/90

7. **CONCLUSIONS:** This study is scientifically sound and
fulfills the guideline requirements for a 96-hour static
acute toxicity test for estuarine shrimp. The 96-hour LC50
value for Mysidopsis bahia exposed to HOE-039866 was 7.5 mg
a.i./L, based on nominal concentrations. Therefore, HOE-
039866 is classified as moderately toxic to mysid shrimp.
The NOEC was determined to be 1.0 mg a.i./L nominal
concentration 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) used in the test were obtained from a commercial supplier in Florida. Mysid culture techniques used were basically those described by EPA EG-3 (1982). The test mysids were acclimated to the dilution water and test temperature prior to initiation of the study. During this period, mysid shrimp were fed brine shrimp nauplii (Artemia sp.) twice per day. During testing, the mysid shrimp were fed approximately 2 mL of brine shrimp per vessel daily.

B. **Test System:** The static test was conducted in 400-mL glass vessels containing 300 mL of aged saltwater. This saltwater was prepared by dissolving the appropriate amount of synthetic seawater salts in aged well water. The temperature was maintained by a water bath at $22 \pm 2^\circ\text{C}$.

The saltwater used for culture and testing of the mysid shrimp was prepared to yield a salinity of between 15 and 35 parts per thousand (ppt) and a pH of 8.0 to 8.5. At test initiation, the dilution water control was characterized as having a salinity of 25 ppt, a dissolved oxygen concentration of 7.4 mg/L, and a pH of 8.0.

C. **Dosage:** 96-hour static acute test.

D. **Design:** Based on the results of a 96-hour range-finding test, a control, and seven nominal HOE-039866 concentrations of 1.0, 1.8, 3.2, 5.6, 10, 18, and 32 mg a.i./L were selected for the definitive test. Ten mysids were randomly added to each concentration within 30 minutes following addition of test material. All concentrations were observed once every 24 hours for mortality and abnormal effects.

Water quality parameters (temperature, dissolved oxygen, pH, and salinity) were measured in the control and the lowest (1.0 mg a.i./L), middle (5.6 mg a.i./L) and highest (32 mg a.i./L) test concentrations at test initiation. At test termination, water quality parameters were measured in the three highest test concentrations (10, 18, and 32 mg a.i./L). The

temperature of the water bath was also continuously monitored during the exposure.

- 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. (1978).

12. **REPORTED RESULTS:** Nominal test concentrations, mortality rates, and water quality measurements for HOE-039866 are presented in Table 4 (attached). The 24-, 48-, and 96-hour LC50 values for nominal concentrations of HOE-039866 were >32, >32, and 7.5 mg a.i./L, respectively. The no-observed-effect concentration (NOEC) based on lack of mortality and abnormal effects after 96 hours of exposure was 1.0 mg a.i./L. The abnormal effects of loss of equilibrium and mysids lying on the bottom of the test vessel were observed during the 96-hour exposure period.

The dissolved oxygen concentrations, corrected for temperature and salinity for the controls, ranged from 5.8 to 7.4 mg/L (77 to 98% saturation at 22°C, respectively) during the test. Salinity ranged from 25 ppt to 27 ppt during the 96-hour test. The pH remained at 8.0 throughout the 96-hour exposure period.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**
No conclusions were made by the author.

The study was conducted following the intent of the Good Laboratory Practice Regulations and the final report was reviewed by Analytical Bio-Chemistry Laboratories' Quality Assurance Unit.

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 ppt salinity should be used when testing euryhaline shrimp species. The natural seawater used during the toxicity study had a salinity of 25 to 27 ppt.

o The SEP states that the dissolved oxygen concentration must be measured at the beginning of the test and every 48 hours thereafter to the end of the test in the control and the high, medium, and low

concentrations. This study only reported the dissolved oxygen concentration for the control, high, medium and low test concentrations at test initiation and the three highest test concentrations at test termination.

o The SEP states that the pH should be measured at the beginning and end of the test in the control and the high, medium, and low toxicant concentrations. This study only reported the pH for the control, high, medium and low test concentrations at test initiation and the three highest test concentrations at test termination.

o The SEP states that all organisms must be maintained under actual test conditions (temperature and water quality) for at least 48-hours before the test actually begins. The report did not provide complete descriptions of holding and acclimation conditions. Furthermore, the report did not mention the percent of mysid mortality during the 48-hour period prior to test initiation.

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 provide information on the photoperiod of the test.

o The SEP states that each designated treatment group should be exposed to a concentration of toxicant that is at least 60% of the next highest concentration. Each designated treatment group for the test was only 56% of the next highest concentration.

- B. **Statistical Analysis:** The reviewer used the Toxanal computer program to calculate the 96-hour LC50 value. These calculations are attached. The moving average method provided a 96-hour LC50 value of 7.5 mg a.i./L nominal concentration with a 95 percent confidence interval of 5.4 to 11.1 mg a.i./L which is the same as that reported by the author. The NOEC was determined to be 1.0 mg a.i./L
- C. **Discussion/Results:** This study appears to be scientifically valid. Although the water quality parameters were not measured consistently in the high, middle and low test vessels during the appropriate time intervals of the exposure, the water quality measurements that were recorded are within the guideline requirements. The 96-hour LC50 value based upon nominal concentrations of HOE-039866 was

determined to be 7.5 mg a.i./L. Therefore, HOE-039866 is classified as moderately toxic to the mysid (Mysidopsis bahia). The NOEC was determined to be 1.0 mg a.i./L nominal concentration 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, 05-15-90.

16. **REFERENCES:**

Stephan, C.E., K.A. Busch, R. Smith, J. Burke and R.W. Andrew. 1978. A Computer program for calculating an LC50. U.S. Environmental Protection Agency, Duluth, Minnesota.

U.S. Environmental Protection Agency, Office of Pesticides and Toxic Substances. Mysid Shrimp Acute Toxicity Test. EG-3. August, 1982.

Shaughnessy No. 128850
Study/Species/Lab/
Accession _____

Chemical Name Glufosinate Chemical Class _____ Page _____ of _____
(HOE-039866)

14-Day Single Dose Oral LD50

Species _____

Lab _____

Acc. _____

Results
LD50 = . mg/kg (95% C.L.) Contr. Mort. (X) = _____
Slope = # Animals/Level = _____ Age (Days) = _____
Sex = _____
14-Day Dose Level mg/kg/(% Mortality)
() () () () () ()
Comments: _____

14-Day Single Dose Oral LD50

Species _____

Lab _____

Acc. _____

LD50 = mg/kg. (95% C.L.) Contr. Mort. (X) = _____
Slope = # Animals/Level = _____ Age (Days) = _____
Sex = _____
14-Day Dose Level mg/kg/(% Mortality)
() () () () () ()
Comments: _____

8-Day Dietary LC50

Species _____

Lab _____

Acc. _____

LC50 = ppm (95% C.L.) Contr. Mort. (X) = _____
Slope = # Animals/Level = _____ Age (Days) = _____
Sex = _____
8-Day Dose Level ppm/(% Mortality)
() () () () () ()
Comments: _____

8-Day Dietary LC50

Species _____

Lab _____

Acc. _____

LC50 = ppm (95% C.L.) Contr. Mort. (X) = _____
Slope = # Animals/Level = _____ Age (Days) = _____
Sex = _____
8-Day Dose Level ppm/(% Mortality)
() () () () () ()
Comments: _____

48-Hour LC50

Species _____

Lab _____

Acc. _____

LC50 = pp (95% C.L.) Contr. Mort. (X) = _____
Sol. Contr. Mort. (X) = _____
Slope = # Animals/Level = _____ Temperature = _____
48-Hour Dose Level pp/(% Mortality)
() () () () () ()
Comments: _____

96-Hour LC50

Species Mysidopsis bahia

Lab Analytical

Acc. 413.961-07

LC50 = 7.5 ppm (95% C.L.) + Moving Average method
Con. Mort. (X) = 10%
Sol. Con. Mort. (X) = N/A
Slope = N/A # Animals/Level = 10 Temp. = 22 ± 2 °C
96-Hour Dose Level ppm/(% Mortality)
10 (1.8) 10 (3.2) 20 (5.6) 30 (10) 70 (18) 60 (32) 100
Comments: Based on nominal concentrations of the active ingredient.

96-Hour LC50

Species _____

Lab _____

Acc. _____

LC50 = pp (95% C.L.) Con. Mort. (X) = _____
Sol. Con. Mort. (X) = _____
Slope = # Animals/Level = _____ Temp. = _____
96-Hour Dose Level pp/(% Mortality)
() () () () () ()
Comments: _____

NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY. THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

KIMBERLY RHODES HOE-039866 MYSIDOPSIS BAHIA 05-15-90

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB. (PERCENT)
32	10	10	100	9.765625E-02
18	10	6	60.00001	37.69531
10	10	7	70	17.1875
5.6	10	3	30	17.1875
3.2	10	2	20	5.46875
1.8	10	1	10	1.074219
1	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT 1.8 AND 32 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 7.483314

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	6	*LC50	95 PERCENT CONFIDENCE LIMITS
6	.1144046	<u>7.479542</u>	(5.407661 - 11.11827)

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	6	H	GOODNESS OF FIT PROBABILITY
4	.1552374	1	.5298125

SLOPE = 2.30054
 95 PERCENT CONFIDENCE LIMITS = 1.394123 AND 3.206957

LC50 = 8.082646
 95 PERCENT CONFIDENCE LIMITS = 5.529175 AND 12.31845

LC10 = 2.267301
 95 PERCENT CONFIDENCE LIMITS = .9376789 AND 3.582456

TABLE 4

Mortality Rates and Water Quality Measurements During the Acute Toxicity Test of HOE-039866 to Mysid Shrimp (Mysidopsis bahia)

Nominal Concentration (mg/l)	Percent Mortality		Water Quality								
	24	48	0 hours			96 hours					
			Temp. °C	D.O. ^a mg/l	pH ^b	Salinity ^c ‰	Temp. °C	D.O. mg/l	pH	Salinity ‰	
Control	0	0	22	7.4	8.0	25	*	*	*	*	*
1.0	0	0	22	7.4	8.0	25	*	*	*	*	*
1.8	0	0	22	7.4	8.0	25	*	*	*	*	*
3.2	20	20	22	7.4	8.0	25	*	*	*	*	*
5.6	0	0	22	7.4	8.0	25	*	*	*	*	*
10	0	30	22	7.4	8.0	25	22	6.2	8.0	27	27
18	0	20	22	7.4	8.0	25	22	5.8	8.0	27	27
32	0	100	22	7.4	8.0	25	22	5.8	8.0	27	27

*Samples were inadvertently discarded before water chemistry was performed.

^aDissolved oxygen concentrations - Dissolved Oxygen Probe (YSI Model 54).

^bpH - pH Probe (Corning Model 476182) used with a Corning Model 125 pH and mV meter.

^cSalinity - S-C-T Meter (YSI Model 33).

NOTE: Dissolved oxygen saturation corrected for salinity of 25 and 27‰, at the test temperature of 22°C is 7.5 mg/l.