

MAY 25 1990
MIRD No. 405360-01

DATA EVALUATION RECORD

1. CHEMICAL: Carbofuran
Shaughnessey No. 090601
2. TEST MATERIAL: Carbofuran technical (98.6% a.i.)
3. STUDY TYPE: Mysid 28-day Life Cycle Test
4. STUDY ID: Ward, Timothy J. 1988. 28-day life cycle toxicity of carbofuran to mysids Mysidopsis bahia. Enseco Incorporated, Marblehead, MA for FMC Corporation, Princeton, NJ. MRID No. 405360-01.
5. REVIEWED BY:
Clyde R. Houseknecht
Wildlife Biologist
EEB/EFED
Signature: *Clyde R. Houseknecht*
Date: *May 22, 1990*
6. APPROVED BY:
Henry T. Craven, Head
Review Section #4
EEB/EFED
Signature: *Henry T. Craven*
Date: *5/25/90*
7. CONCLUSIONS:
The 28-day LOEC (adult survival), NOEC and MATC of technical carbofuran to mysids were 0.98, 0.40 and 0.63 ug/l, respectively.
8. RECOMMENDATIONS: N/A



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9. BACKGROUND: N/A
10. DISCUSSION OF INDIVIDUAL TESTS: N/A
11. MATERIALS AND METHODS:

A. Test Animals Mysids used in this test were obtained from laboratory cultures at Enseco and were less than 24 hours post-hatch. They were maintained in natural seawater at test conditions and were fed brine shrimp nauplii at least once per day.

B. Test System: One-hundred mysids were randomly distributed among two replicates (50 mysids per replicate) of each treatment seven days after the initiation of the flow-through system. Exposure vessels consisted of glass aquaria that were 52 cm long, 26 cm wide, and filled to a depth of 2-7 cm (fluctuating water depth was due to a self-starting siphon which drained each vessel to a depth of 2 cm after it filled to a depth of 7 cm). Maximum water volume in each exposure vessel was 9.5 l. Within each exposure vessel the 50 mysids were subdivided equally into five groups, and each group was separately placed in a cage that consisted of a 9 cm diameter glass petrie dish with a 9 cm high collar of Nitex screen. Culture vessels were arranged in a water bath that was placed in an environmental chamber.

Natural sea water was collected from Marblehead Harbor, Massachusetts. It was sand filtered, fiber filtered (5 microns), stored in 200-500 gallon polyethylene tanks and aerated. Test medium was formulated and delivered to each exposure vessel by a proportional diluter. The diluter was activated an average of 116 times per day. The volume exchange in each exposure chamber averaged more than 6 times per day.

After 13 days of exposure, the surviving mysids in each replicate were randomly reduced to 20, and were divide into 10 pairs each consisting of one male and one female. Each pair was placed in a separate cage (described above). Survivorship, the occurrence of abnormal behavior, and the number of young produced by each pair were determined each day. At the conclusion of the test, the dry weight of each surviving mysid was determined.

Aeration was not employed during the test and the photoperiod was set at 16 hours light and 8 hours dark. Dissolved oxygen concentration, pH, salinity, and temperature were measured at 24-hour intervals during the test.

Analytical determination of test material concentration was performed on duplicate composite samples.

C. Dosage: Nominal concentrations of carbofuran were 5.95, 3.01, 2.17, 1.33 and 0.56 ug/l. Mean measured concentrations

were 5.0, 2.2, 1.5, 0.98, and 0.40 ug/l.

D. Design: 28-day life cycle test.

E. Statistics: Cochran's Test was used to determine that variance of mean survival and reproductive data were homogeneous. Analysis of variance and Dunnett's technique were utilized to compare survival and reproduction data between organisms in controls and test concentrations.

12. REPORTED RESULTS: The author of the study reported that the most sensitive measure of toxicity was survival of parental generation mysids at the end of the exposure period. The lowest observed effect concentration (LOEC) determined during this test was 0.98 ug/l carbofuran. All concentrations of carbofuran above 0.98 ug/l caused complete mysid mortality within 48 hours. Throughout the 28-day exposure no sublethal behavioral effects were noted except that surviving mysids exposed to 1.5 and 2.2 ug/l carbofuran for 24 hours were immobilized and unable to maintain position in the water column. The exposure of mysids to 0.40 and 0.98 ug/l carbofuran did not increase the time to first brood or number of young produced per female, when compared with the controls. The no observed effect concentration (NOEC) determined during this 28-day life cycle toxicity test with mysids and carbofuran was 0.40 ug/l. The maximum acceptable toxicant concentration (MATC), expressed as the geometric mean of the LOEC and the NOEC was 0.63 ug/l.

13. STUDY AUTHOR'S CONCLUSION/QUALITY ASSURANCE MEASURES: F M C Corporation certifies that this study complies with Good Laboratory Practice regulations as published by the U.S. Environmental Protection Agency, Office of Pesticide Programs in 40 CFR Part 160.

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

A. Test Procedures:

With two minor exceptions listed below, the procedures used in this study are in accord with those recommended in the Standard Guide for Conducting Life-cycle Toxicity Tests with Saltwater Mysids published by the American Society for Testing and Materials.

- o Not all test concentrations were at least 50% of the next highest concentration.
- o The temperature of the test solutions fell slightly outside of the desired range on test days 14 and 15.

B. Statistical Analysis: In those instances where adequate raw data were presented, the EEB reviewer confirmed the statistical analyses provided in the report.

C. Discussion/Results: See 14D.(2) below.

D. Adequacy of the Study:

(1) Classification: Supplementary

(2) Rationale: Raw data were not provided to allow the reviewer to confirm survivorship and reproductive parameters.

(3) Repairability: This study can be upgraded to core if raw data for survivorship and reproduction are provided and reported results are corroborated by EEB.

15. COMPLETION OF ONE-LINER: Yes, May 22, 1990.

Table 1. Concentration of carbofuran measured during toxicity test with mysids, *Mysidopsis bahia*, conducted during July 22-August 19, 1987^a.

Date of sample collection - day of test	Measured Concentration (µg/l) ^b											
	Control (nominal = 0.00 µg/l)		Nominal = 0.56 µg/l		Nominal = 1.33 µg/l		Nominal = 2.17 µg/l		Nominal = 3.01 µg/l		Nominal = 5.95 µg/l	
	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
7-22-87 Day 0	ND	ND	0.40	0.48	0.98	0.93	1.6	1.7	2.1	2.1	4.6	4.9
7-26-87 Day 4	ND	ND	0.44	0.40	0.90	0.94	1.2	1.5	2.2	2.4	4.9	5.5
	ND		0.31	0.43								
7-29-87 Day 7	ND	ND	0.37	0.44	0.98	0.98						
8-1-87 Day 10	ND	ND	0.34	0.48	1.0	1.1						
8-5-87 Day 14	ND	ND	0.35	0.48	0.93	0.89						
8-8-87 Day 17	ND	ND	0.39	0.47	0.92	0.94						
8-12-87 Day 21	ND	ND	0.36	0.30	0.91	1.0						
8-19-87 Day 28	ND	ND	0.41	0.44	1.1	1.2						
Mean	ND		0.40		0.98		1.5		2.2		5.0	
Standard deviation	--		0.06		0.08		0.2		0.1		0.4	

^aReplicates were each composite samples collected from both exposure tanks at each concentration. Samples were not collected for analysis after complete mortality occurred at any test concentration.

^bThe detection limit is 0.1 µg/l carbofuran.

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Table 2. Summary of water quality parameters measured during toxicity test with carbofuran and mysids, Mysidopsis bahia, conducted during July 22-August 19, 1987^a

Mean measured concentration of carbofuran (µg/L)	Dissolved oxygen concentration (ppm)	pH	Temperature (°C)	Salinity (‰)
Control	5.8 ± 0.7	8.0 ± 0.1	26.7 ± 0.5	29.5 ± 0.7
0.40	5.7 ± 0.7	8.0 ± 0.1	26.7 ± 0.4	29.4 ± 0.7
0.98	5.7 ± 0.7	8.0 ± 0.1	26.8 ± 0.5	29.4 ± 0.7
1.5	5.8 ± 0.7	8.0 ± 0.1	27.1 ± 0.5	28.0 ± 0.0
2.2	5.8 ± 0.6	8.0 ± 0.1	27.1 ± 0.4	28.0 ± 0.0
5.0	6.0 ± 0.5	8.0 ± 0.1	27.4 ± 0.2	28.0 ± 0.0

^aValues presented are the mean (standard deviation).

Table 3. Summary of survival, reproduction and growth of Mysidopsis bahia exposed to carbofuran technical for 28 days.

	Survival (%) Days 0-13	Survival (%) Days 14-28	Number of young/female	Dry weight (mg)
Control	90.0	77.5	23.0	0.992 ± 0.220
0.40	95.0	70.0	25.9	1.119 ± 0.240
0.98	93.0	65.0*	18.8	1.063 ± 0.331
1.50	0	0	0	0
2.2	0	0	0	0
5.0	0	0	0	0

*Significantly different from control (P < 0.05).

Shaughnessey No. D90601Chemical Name CARBOFURAN

Chemical Class _____

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Study/Species/Lab/ Accession #	Chemical # a.i	Results	Reviewer/ Date	Validation Status
14-Day Single Dose Oral LD50.		LD50 = mg/kg (<u>95% C.L.</u>) Contr. Mort.(%)= _____ Slope= # Animals/Level= _____ Age(Days)= _____ Lab.: _____ Sex = _____ 14-Day Dose Level mg/kg/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
14-Day Single Dose Oral LD50.		LD50 = mg/kg (<u>95% C.L.</u>) Contr. Mort.(%)= _____ Slope= # Animals/Level= _____ Age(Days)= _____ Lab.: _____ Sex = _____ 14-Day Dose Level mg/kg/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
8-Day Dietary LC50.		LC50 = ppm (<u>95% C.L.</u>) Contr. Mort.(%)= _____ Slope= # Animals/Level= _____ Age(Days)= _____ Lab.: _____ Sex = _____ 8-Day Dose Level ppm/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
8-Day Dietary LC50.		LC50 = ppm (<u>95% C.L.</u>) Contr. Mort.(%)= _____ Slope= # Animals/Level= _____ Age(Days)= _____ Lab.: _____ Sex = _____ 8-Day Dose Level ppm/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
96-hour LC50.		LC50 = PP (<u>95% C.L.</u>) Contr. Mort.(%)= _____ Slope= # Animals/Level= _____ Sol. Contr. Mort.(%)= _____ Lab.: _____ Temperature = _____ 96-Hour Dose Level pp/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
96-hour LC50.		LC50 = PP (<u>95% C.L.</u>) Con. Mor(%)= _____ Slope= # Animals/Level= _____ Sol. Con. Mor.(%)= _____ Lab.: _____ Temp.= _____ 96-Hour Dose Level pp/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		
48-hour Invertebrate.		LC50 = PP (<u>95% C.L.</u>) Con. Mort.(%)= _____ Slope= # Animals/Level= _____ Sol. Con. Mort.(%)= _____ Lab.: _____ Temp.= _____ 96-Hour Dose Level pp/(% Mortality) _____ Acc. #: () , () , () , () , () Comments: _____		

Shaughnessy No. _____ Chemical Name _____ Chemical Class _____ Page 2 of _____

Study/Species/Lab/
Accession # _____ Chemical
& Active _____ Results _____ Reviewer/
Date _____ Validation
Status _____

Avian Reproduction,
Species: _____
Lab: _____
Acc. #: _____
Group _____ Dose(ppm) _____ Effect/Parameters _____ Mort.(%) _____ %Ch Inh. _____
Control _____
Treatment I _____
Treatment II _____
Treatment III _____
Study Duration: _____
Comments: _____

Field Study(Simulated/Actual)
Species: _____
Lab: _____
Acc. #: _____
Group _____ Rate(ai/a) _____ Treatment
Interval _____ Total #
Treatments _____ Mor.(%) _____
Control _____
Treatment I _____
Treatment II _____
Treatment III _____
Crop/Site: _____ Study Duration: _____
Comments: _____

Chronic fish,
Species _____
Lab: _____
Acc. #: _____
Concentrations Tested (ppm) = _____
MAIC = > _____ < _____ ppm. _____ Effect Parameter = _____
Contr. Mort.(%) = _____ Sol. Contr. Mort.(%) = _____
Comments: _____

Chronic invertebrate, 28-Day Mysid
Species Mysidopsis 98.6 Concentrations Tested (ppm) = 0.40, 0.98, 1.5, 2.2, 5.0 ppb
Lab: BATHIA MAIC => 0.63 ppm. _____ Effect Parameter(s) ADULT SURVIVAL
Acc. #: ONSICO, MARLBOROUGH, MA Contr. Mort.(%) = 22.5 Sol. Contr. Mort.(%) = _____ CRA SUPP.
405360-01 Comments: SUPPLEMENTARY BECAUSE OF FAILURE TO 8/24/90
PROVIDE ALL RAW DATA.