MRID 00126864

DATA EVALUATION RECORD

1. CHEMICAL: Carbofuran (FMC10242)

2. FORMULATION: Technical

3. CITATION: ABC Laboratories. 1982. Chronic toxicity of carbofuran (FMC 10242 Technical) to Daphnia magna under flow-through test conditions. Chronic toxicity final report #27292. Submitted to FMC Corporation, Princeton, N.J. 4/2/82. Accession No. 249978.

4. REVIEWED BY: Mary L. Gessner
Fishery Biologist
EEB/HED

5. DATE REVIEWED: 5/12/83

6. TEST TYPE: Aquatic invertebrate life-cycle test
Species: Daphnia magna

7. REPORTED RESULTS: Results were reported as follows:
MATC: 9.8-27 ug/l.
21-day incipient LC_{50}: 19 ug/l

8. REVIEWER'S CONCLUSIONS: This study is scientifically sound and is adequate to fulfill that portion of the guideline requirement pertaining to the toxicity of technical carbofuran in an aquatic invertebrate life-cycle test. The results indicate that the lowest concentration of carbofuran, which has a significant ($\alpha = 0.05$) adverse effect upon survival, growth, or reproduction of Daphnia magna is between 9.8 and 27 ug/l.

Materials/Methods

Test Procedure

Test organisms (Daphnia magna) were obtained from an in-house daphnia culture, which has been maintained by ABC for five years. All daphnids were held at 20+2°C under a 16-hour daylight photoperiod. During holding Daphnids were fed primarily a suspension of Selenastrum capricornotum supplemented with a standard PR-11 mix. "Only first-instar daphnids (<24 hours old) were selected for testing." A half-liter proportional diluter system described by Mount and Brungs (1967) as modified by McAllister et al. (1972) was used for the intermittent introduction of carbofuran and diluent water. Aerated well water was delivered to each test chamber at a rate sufficient to replace the 1 liter test volume 3.6 times in a 24 hour period. The test aquaria were immersed in circulating water held at 20°C.

Testing was initiated by randomly distributing 10 first-instar Daphnids into each of four replicate exposure chambers for five toxicant concentrations and 1 control. Each test chamber received 20-30 ml of the algal suspension three times daily, which was supplemented by trout chow once daily. "The chambers were cleaned every Monday, Wednesday and Friday." Survival of test organisms was also recorded on these days, and reproductive success was measured by counting and discarding the offspring produced in each concentration. Upon termination of the study (Day 21) the surviving adults were removed from the test chambers and measured (length). Water quality parameters of temperature, D.O., and pH were measured on Days 0, 4, 7, 14, and 21 in the control, low, middle, and high concentrations. Mean measured test concentrations were 1.7, 3.0, 6.3, 9.8, and 27 ug/l.

Statistical Analysis

"The selected parameters of adult length (pooled), survival, and total young/adult/reproduction day were analyzed using a completely randomized design and subjected to a one-way ANOVA." When treatment effects were indicated, a multiple means comparison test (Fisher's protected LSD) was used to determine which exposure levels differed from the controls.

Discussion/Results

Significant effects on length, survival, and reproduction were indicated only at the 27 ug/l concentration when compared to controls.

Therefore, the MATC limits are estimated to be between 9.8 and 27.0 ug/l carbofuran. "The calculated 21-day incipient LC_{50} and 95% C.I.s were 19 (9.8-27)ug/l."

Reviewer's Evaluation

A. Test Procedure

Testing generally followed EPA-recommended protocols. No solvent control was run with the test, even though the test concentrations were made up with acetone. The range of measured toxicant concentrations deviated from the desired geometric series in which each concentration is at least 50% of the next higher one. Nominal concentrations were 1.9, 3.8, 7.5, 15, and 30 ug/l, but mean measured concentrations were 1.7, 3.0, 6.3, 9.8, and 27 ug/l. The resultant gap between 9.8 and 27 ug/l is wider than what is preferred. Results of the 48-hour EC_{50} test used to determined test dosage levels were not reported.

B. Statistical Analysis

Survival and reproduction data were analyzed by a computer program utilizing ANOVA and Duncan's multiple comparison test. Results indicated that only the highest treatment level (27 ug/l) was significantly different from the controls for either variable tested. The MATC is therefore determined to be between 9.8 and 27.0 ug/l.

C. Discusison/Results

Results as reported are acceptable. Test results indicate that the lowest concentration of carbofuran, which significantly affects daphnid survival, growth, and reproduction is between 9.8 and 27.0 ug/l.

D. Conclusions

1. Category: Core

2. Rationale: Testing generally followed EPA-recommended protocols and produced a significant ($\alpha = 0.05$) effect level. Treatment mortality, for four of the five treatment levels, was not significantly different from control mortality, indicating that the solvent (acetone) had no effect on survival of test organisms.

Survival

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESPONSE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	21770.83333333	4354.16666667	95.00
ERROR	18	825.00000000	45.83333333	PR > F
CORRECTED TOTAL	23	22595.83333333		0.0001

R-SQUARE	C.V.	ROOT MSE	RESPONSE MEAN
0.963489	8.0040	6.77003200	84.58333333

SOURCE	DF	TYPE I SS	F VALUE	PR > F
TRT	5	21770.83333333	95.00	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
TRT	5	21770.83333333	95.00	0.0001

GENERAL LINEAR MODELS PROCEDURE

DUNCAN'S MULTIPLE RANGE TEST FOR VARIABLE: RESPONSE
NOTE: THIS TEST CONTROLS THE TYPE I COMPARISONWISE ERROR RATE,
NOT THE EXPERIMENTWISE ERROR RATE.
OALPHA=0.05 DF=18 MSE=45.8333
OMEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	100.000	4	B
A			
A	100.000	4	D
A			
A	100.000	4	E
A			
A	97.500	4	C
A			
A	92.500	4	A
B	17.500	4	F

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	6	A B C D E F

Young / Adult / Reproductive Day

NUMBER OF OBSERVATIONS IN BY GROUP = 24

TESTNO=2

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESPONSE

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
MODEL	5	211.05208333	42.21041667	29.73
ERROR	18	25.55425000	1.41968056	PR > F
CORRECTED TOTAL	23	236.60633333		0.0001

R-SQUARE	C.V.	ROOT MSE	RESPONSE MEAN
0.891997	11.7525	1.19150349	10.13833333

SOURCE	DF	TYPE I SS	F VALUE	PR > F
TRT	5	211.05208333	29.73	0.0001

SOURCE	DF	TYPE III SS	F VALUE	PR > F
TRT	5	211.05208333	29.73	0.0001

1

TESTNO=2

GENERAL LINEAR MODELS PROCEDURE

DUNCAN'S MULTIPLE RANGE TEST FOR VARIABLE: RESPONSE

NOTE: THIS TEST CONTROLS THE TYPE I COMPARISONWISE ERROR RATE, NOT THE EXPERIMENTWISE ERROR RATE.

OALPHA=0.05 DF=18 MSE=1.41968

OMEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	11.702	4	A
A			
A	11.700	4	C
A			
A	11.600	4	B
A			
A	11.500	4	D
A			
A	10.782	4	E
B	3.545	4	F

KBM L.C. study DATA EVALUATION RECORD

PAGE 1 OF

CASE GS ___ CARBOFURAN PM ___ __/__/__

CHEM 090601

BRANCH EEB DISC ___

FORMULATION ___

FICHE/MASTER ID GEOCAR 10

CITATION: ABC Laboratories. 1982. Chronic toxicity of carbofuran (FMC 10242 Technical) to Daphnia magna under flow-through test conditions. Chronic toxicity final report # 27292. Submitted to FMC Corporation, Princeton, N.J. 4/2/82.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 6 (MH) START DATE 5/12/83 END DATE 5/13/83

REVIEWED BY: Mary L. Gessner
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ORG: HED/EEB
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SIGNATURE: Mary L. Gessner DATE: 5/24/83

APPROVED BY:
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LOC/TEL:

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