

US EPA ARCHIVE DOCUMENT

Daphnia
Life-Cycle

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TYPE PRODUCT(S): I, D, H, F, N, R, S Fungicide

DATA ACCESSION NO(S). _____

PRODUCT MANAGER NO. H. Jacoby (21)

PRODUCT NAME(S) Bayleton 50WP

COMPANY NAME Mobay Chemical Corporation

SUBMISSION PURPOSE Submission of Daphnia Life-Cycle Studies for Review.

SHAUGHNESSEY NO.	CHEMICAL & FORMULATION	% A.I.
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DATA EVALUATION RECORD

1. CHEMICAL: Triadimefon (Bayleton®)
2. FORMULATION: 93% Technical
3. CITATION: Lamb, D.W. (1981) Life Cycle Study of Triadimefon (Bayleton®) to Daphnia magna, Toxicol. Report No. 226, Submitted by Mobay Chemical Corporation, Acc. No. 246736
4. REVIEWED BY: R.M. Lee, Entomologist
Ecological Effects Branch
Hazard Evaluation Division (TS-769)
5. DATE REVIEWED: March 1982
6. TEST TYPE: Daphnia life cycle study (21-day flow-through toxicity study)
 - A. Test species: Daphnia magna
7. REPORTED RESULTS: The estimated 21-day LC₅₀ and RI₅₀ (reproductive impairment of 50%) were 187 (149 to 234) ppb and 294 (270 to 320) ppb respectively. No adverse effect was observed at 50 or 100 ppb.
8. REVIEWER'S CONCLUSION: This study is scientifically sound. The 21-day LC₅₀ and the MATC value were 178 ppb and 154-314 ppb respectively in flow-through toxicity study. The study does fulfill requirements for a daphnia life cycle study.

Check
1007 MATC < 200

SW

MATERIAL/METHODS

Test Procedure

Daphnia were continuously exposed to technical triadimefon for a 21-day period in a flow-through water system. The test material was introduced into duplicate test chamber at nominal concentrations of 0, 50, 100, 200, 400 and 800 ppb. Approximately 300 ml of the final dilution was introduced and discharged from each test chamber every 20 minutes, which resulted in an aquarium turnover every two hours. Actual concentrations were monitored at days 0, 3, 7, 10, 14, and 21.

Fifteen 1st instar daphnia from the laboratory stock culture were used per treatment and twelve 2-l aquaria were used as test vessels. Dead adult and newly released young daphnids were removed from each aquarium and counted weekdays. The daphnids were fed twice daily 1 ml of a synthetic food mixture (10 g trout chow, 3 g cerophyl in 500 ml of dechlorinated tap water). The daily mean brood size per adult daphnia was determined by dividing the total offspring produced each day from day ten on by the number of surviving adults on that day. The overall mean daily brood was then calculated by dividing the total of the daily means by 12, the number of days.

Testing conditions were 17-20°C with 16:8 h photoperiod. Characteristics of test water are D.O., 87.2%; pH 8.21-8.69; hardness, 165-171 mg CaCO₃/l; and alkalinity, 91-103 mg CaCO₃/l.

Statistical Analysis

The LC₅₀ and RI₅₀ values with 95% confidence limits were calculated using moving average interpolation method by Weil (1952).

Discussion/Results

Throughout the 21 days of exposure, the mean concentrations of triadimefon in the water were analyzed to be 37, 87, 154, 314, and 710 ppb for the expected levels of 50, 100, 200, 400 and 800 ppb, respectively (Table I). Measured concentrations were approximately 19% lower than the nominal levels with less than 2% of a metabolite, triadimenol. Mortality responses, signs of toxicity and LC₅₀ values for daphnia exposed to technical triadimefon are presented in Table II. The three highest concentrations produced individuals with observable signs of toxicity as loss of equilibrium and immobilization. There was no mortality or signs of toxicity at the two low tested concentrations of 50 and 100 ppb. The three highest concentrations, 200, 400, and 800 ppb, produced mortalities of 63, 96 and 93%, respectively. The control group appeared normal throughout the 21 days of exposure.

Table III presents number of young produced and reproductive impairment values for adult daphnids exposed to technical triadimefon. The numbers of young produced in the two lowest concentrations, 50 and 100 ppb, were not significantly different from the number of young produced in the control group. Even though there was 63% mortality in the 200 ppb level, the surviving individual adult daphnia produced as many young as the control group. However, severe impairment effects were observed both at the 400 and 800 ppb levels.

TABLE I. Analysis of Technical Triadimefon in Water

Expected Concentration (ppb)	Measured Concentration (ppb)						\bar{x}
	Day 0	Day 3	Day 7	Day 10	Day 14	Day 21	
Control	0	0	0	8	5	6	3
50	41	25	15	39	54	48	37
100	105	90	66	81	86	93	87
200	185	139	126	134	184	157	154
400	370	345	293	294	267	315	314
800	720	829	617	728	724	640	710

TABLE II. 21-Day Toxicity Data of Technical Triadimefon to Daphnia magna

Expected Con- centration (ppb)	No. Tested	Cumulative Mortality/Signs of Toxicity*																				
		Days																				
		1	2	3	4	7	8	9	10	11	14	15	16	17	18	21						
Control	30	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0						
50	30	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0						
100	30	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0						
200	30	0/0	0/0	1/2	2/2	4/3	5/3	7/3	10/2	13/1	19/0	19/0	19/0	19/0	19/0	19/0						
400	30	0/0	2/2	3/3	5/5	8/6	10/10	14/2	19/3	25/2	28/0	28/0	28/0	28/0	28/0	29/0						
800	30	0/11	6/11	16/4	16/4	17/3	18/3	18/2	25/1	28/0	28/0	28/0	28/0	28/0	28/0	28/0						

* The denominator represents numbers of individuals showing signs of toxicity as loss of equilibrium and immobilization.

TABLE III. Number of Young Produced From Adult Daphnia Exposed to Technical Triadimefon

Expected Concentration (ppb)	Day																					Mean Brood Size*
	1	2	3	4	7	8	9	10	11	14	15	16	17	18	21	Total						
Control	0	0	0	0	0	0	0	14	37	184	111	96	117	88	253	900	2.5					
50	0	0	0	0	0	0	0	9	28	189	109	92	112	84	247	870	2.4					
100	0	0	0	0	0	0	0	0	17	187	104	89	119	91	250	857	2.4					
200	0	0	0	0	0	0	0	0	7	66	43	32	41	26	92	307	2.6					
400	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
800	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0					

* The daily mean brood sizes per surviving adult daphnia.

Reviewer's Conclusion

A. Test Procedure

The procedures used were scientifically sound and acceptable. However, for determination of reproductive impairment and measurement of the MATC (Maximum Acceptable Toxicant Concentration), at least four replicates are required in the experiment.

B. Statistical Analysis

Probit analysis should not be used because of poor fit of regression line as reflected in Heterogeneity chi-square test. Therefore, the moving average method should be used to analyze the data. If the experiment is conducted with four (or more) replicates, ANOVA and a multiple range-test (if necessary) should be applied.

C. Discussion/Results

Measured concentrations of triadimefon were lower than the nominal levels ranging from 13 to 26% with an average of ca. 19%. This fluctuation is quite common and acceptable in the aquatic flow-through system (personal communication with J.A. Tompkins at EPA Beltsville Lab.). Using average actual measured concentrations, the estimated 21-day LC₅₀ and RI₅₀ as well as the MATC value were 178 (143 to 225) ppb, 220 (154 to 314) ppb and 154 to 314 ppb respectively (see attached computer print-outs). However, the control daphnia produced only 30 young per adult, while healthy colonies would produce 40 young per adult. Therefore, the daphnia used in this study may not have been healthy and resulted in higher toxicity.

D. Conclusion

1. Category: Core
2. Rationale: N/A
3. Repairability: N/A

R.M. Lee 4/13/82
R.M. Lee, Entomologist
Ecological Effects Branch
Hazard Evaluation Division (TS-769)

Harry Craven 4/13/82
Harry Craven, Head, Review Section No. 4
Ecological Effects Branch
Hazard Evaluation Division (TS-769)

Clayton Bushong 4/14/82
Clayton Bushong, Chief
Ecological Effects Branch
Hazard Evaluation Division (TS-769)