MRID ____
(not located in OPP/W)

DATA EVALUATION RECORD

SN: 053501

1. CHEMICAL: Methyl parathion - O,O-dimethyl O-P-nitrophenyl phosphorothioate

2. TEST MATERIAL: Technical - 80 % Active Ingredient.

3. STUDY/ACTION TYPE: Fish Early Life-stage.

   Species Tested: Fathead minnow (Pimephales promelas).

4. STUDY IDENTIFICATION: Jarvinen, A.W. & D.K. Tanner. Toxicity of Selected Controlled Release and Corresponding Unformulated Technical Grade Pesticides to the Fathead Minnow (Pimephales promelas). Prepared by: U.S EPA, Environmental Research Lab, Duluth, MN. Submitted by: A/S Cheminova, PO Box 9, DK-7620 Lemvig, Denmark.

5. REVIEWED BY:

   Michael B. Camardese, Biologist
   Ecological Effects Branch
   Hazard Evaluation Division

   Signature: Michael B. Camardese
   Date: 12/17/98

6. APPROVED BY:

   Douglas J. Urban, Head, Section 3
   Ecological Effects Branch
   Hazard Evaluation Division

   Signature: Douglas J. Urban
   Date: 12/19/98

7. CONCLUSIONS: This study was found to be scientifically sound but only two replicates were used in the study and according to the SEP for Fish Early Life Cycle the minimum is 4 per treatment level. Despite the fact that the guidelines weren't adhered to as strtictly as would be desirable, this study is classified as core. The information generated will be useful for doing a risk assessment. The testing lab did not attempt to design the study for registration purposes but the registrant was able to utilize the results to attempt to fulfill the requirements for registration. This study fulfills the guideline requirement for a **Fish Early Life Cycle.** **FUTURE SUBMISSIONS WILL NEED TO FOLLOW THE GUIDELINES IN ORDER TO BE CONSIDERED TO SUPPORT REGISTRATION.**

8. RECOMMENDATION: N/A

9. BACKGROUND: This data was part of a package submitted in response to registration standard.

10. DISCUSSION OF INDIVIDUAL STUDIES OR TESTS: N/A

11. METHODS AND MATERIALS: [1]

Species. Pimephales promelas

Size. Fathead minnow eggs less than 24 hrs old were randomly assigned to embryo cups.

Fish source. Environmental Research Laboratory-Duluth Fish Culture Unit, Duluth, MN.

Fish holding period. Test organisms were held until hatching.

Food withholding. [1]

Test vessel. [1]

Construction:

Loading:

Test water.

Temperature: Was maintained at 25 ± 1.5 C, and was checked daily in all test chambers.

Water source and chemistry: Sand-filtered Lake Superior water sterilized with ultraviolet light and warmed to approximately 25 C by a coiled stainless steel heat exchanger located in a stainless headbox.

Aeration: This was accomplished by using a method similar to that described by Benoit et al. (in press).

Solvent. N/A

Controls. There were two groups of controls.

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[1]In general, the procedures followed in the embryo larval tests followed those of the Environmental Research Laboratory-Duluth(1979).

TABLE 1

GROWTH AND SURVIVAL OF FATHEAD MINNOWS EXPOSED TO METHYL PARATHION (TECHNICAL) OR PENNCAP-M FOR 32 DAYS

Toxicant	*Measured water concentration (mg litre^{-1} ± SD)*[a]	*Number of surviving fish*	*Mean weight (mg ± 1 SD)*	*Survival (%)*
Methyl parathion (technical)	Control (ND)[b]	30	83·9 ± 17·4	100
	0·31 ± 0·09	30	74·6 ± 17·7	100
	0·38 ± 0·13	30	65·8 ± 23·7[c]	100
	0·59 ± 0·23	28	66·4 ± 28·1[c]	93·3
	0·86 ± 0·36	9	53·9 ± 32·4[c]	30·5
	1·55 ± 0·55	0	0[c]	0[c]
Penncap-M	Control (ND)	30	85·6 ± 20·0	100
	0·23 ± 0·04	29	81·0 ± 18·7	100
	0·38 ± 0·09	30	74·9 ± 21·5	100
	0·59 ± 0·22	30	73·2 ± 14·5[c]	100
	0·77 ± 0·24	14	67·4 ± 21·0[c]	46·7
	1·23 ± 0·38	0	0[c]	0[c]

[a] Per cent spike recovery, 97·4 ± 11·2, $n = 5$.
[b] Not detectable, <0·001 mg litre^{-1}.
[c] Values significantly different from the control.

TABLE 2

GROWTH AND SURVIVAL OF FATHEAD MINNOWS EXPOSED TO DURSBAN OR DURSBAN 10 CR FOR 32 DAYS

Toxicant	*Measured water concentration (mg litre^{-1} ± 1 SD)*[a]	*Number of surviving fish*	*Mean weight (mg ± 1 SD)*	*Survival (%)*
Dursban (technical)	Control (TR)[b]	29	147·0 ± 31·4	100
	0·0009 ± 0·0001	30	151·1 ± 32·2	100
	0·0016 ± 0·0004	28	149·1 ± 37·6	100
	0·0032 ± 0·0005	27	123·7 ± 28·7[c]	90
	0·0057 ± 0·0008	25	98·7 ± 29·2[c]	86[c]
	0·0102 ± 0·001	17	84·5 ± 24·0[c]	56·7
Dursban 10 CR	Control (TR)	29	157·2 ± 33·0	100
	0·0007 ± 0·0002	30	158·1 ± 32·4	100
	0·0013 ± 0·0002	28	152·9 ± 40·8	96·7
	0·0022 ± 0·0004	27	148·0 ± 31·9	90
	0·0048 ± 0·0007	18	107·4 ± 26·4[c]	61·2
	0·0086 ± 0·0008	17	82·5 ± 30·6[c]	56·7

[a] Per cent spike recovery, 90·4 ± 3·8, $n = 7$.
[b] Trace (0·00007–0·0001 mg litre^{-1}).
[c] Values significantly different from the control.

technical grade is between 0·0016 and 0·0032 mg litre^{-1} whereas that for the encapsulated formulation is between 0·0022 and 0·0048 mg litre^{-1}. Although no statistically significant effects occurred at lower concentrations of either compound, the fish exposed to water concentrations lower than those where growth effects occurred exhibited unquantifiable behavioural changes when confronted with

Number of fish/concentration. 15 fish per concentration.

Toxic signs. None reported.

Statistical analysis. One way ANOVA (p=0.05) was applied to survival, embryo hatchability, and growth data to determine pesticide effect. Dunnett's procedure (Steel & Torrie) was used to compare treatment with control means.

12. REPORTED RESULTS: (Excerpted from study).

Results of the 32-day embryo-larval study with methyl parathion and Penncap-M (Table 1) indicate that growth (weight) was a more sensitive parameter than survival. The lower chronic values (highest tested concentration not causing any adverse effect statistically different from the control at the 95% level) for the technical grade and encapsulated formulation are 0·31 and 0·38 mg litre^{-1}, respectively. The upper chronic values (lowest tested concentration causing an adverse effect statistically different from the control at the 95% level) for these same compounds are 0·38 and 0·59 mg litre^{-1}, respectively. The 'no effect' concentration for technical grade methyl parathion is between 0·31 and 0·38 mg litre^{-1} and that for Penncap-M between 0·38 and 0·59 mg litre^{-1}.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES: (Excerpted from study).

Methyl parathion and Penncap-M

Water solubilities observed for methyl parathion and Penncap-M are slightly higher than those observed by others. According to the US Environmental Protection Agency (1975), the solubility in water at 25°C is 55·60 mg litre^{-1} and Smith *et al.* (1978) stated that it was 50 mg litre^{-1}. In the present study solubility was about 76 mg litre^{-1}. The difference might be due to different water characteristics or perhaps because the saturators warmed the solutions to about 35°C. Both compounds rapidly entered solution, most probably because the outside walls of the capsules are coated with technical grade methyl parathion which helps to prevent loss of methyl parathion from the encapsulated formulation during storage (Anon., 1976). This excess coating of technical grade methyl parathion could also help explain the similar half-lives observed for the two compounds.

Static studies indicated increased toxicity with time for both compounds. The technical grade was more toxic than the encapsulated formulation and this was probably caused by a difference in the ratio of breakdown products to parent compound. The encapsulated solution should have a higher amount of parent compound present at any given time, and the degradation products are generally considered more toxic than methyl parathion itself (US Environmental Protection Agency, 1975). The primary breakdown product observed for both compounds was

13. (cont'd).

p-nitrophenol, which is the probable cause of the yellow coloration of the saturator solutions (Smith *et al.*, 1978). Only a trace of methyl paraoxon was identified. Initial static 96-h LC_{50} values were lower than those from flow-through 96-h tests, possibly because the stock solutions had aged for 1 week before the static tests were conducted, whereas the flow-through studies were conducted about 3 days after the saturators were started. The encapsulated formulation was 45–60% less toxic than the technical grade in static tests, but only 22% less toxic in the flow-through acute tests, probably because there was less build up of degradation products in the flow-through tests. Some 96-h LC_{50} values for methyl parathion and fathead minnows from the literature are 10·4 mg litre^{-1} (Henderson & Pickering, 1958), 8·0 mg litre^{-1} (Pickering *et al.*, 1962) and 8·9 mg litre^{-1} (Macek & McAllister, 1970). These values are slightly greater than in the present study. This difference, however, could easily be caused by fathead minnow variability, different test water characteristics, or the fact that in this study newly hatched larvae were exposed, whereas in the other studies older fish were tested.

Embryo-larval results also demonstrated slightly greater toxicity (19–35%) for the technical grade. Here again, it was probably related to the amount of degradation products present. The half-lives for both compounds were similar; however, the encapsulated formulation persisted about 27 days longer. Smith *et al.* (1978) demonstrated that the half-life for methyl parathion will vary from 8 to 38 days, depending upon sunlight during the various seasons of the year. They also calculated a half-life of 89 days for methyl parathion in aqueous solution at 25 °C and below pH 8.

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

A. Test Procedure. The SEP Guidelines require a minimum of 20 embryos per replicate cup with 4 replicates per concentration. This study used only 15 per cup and only two replicates per concentration.

B. Statistical Analysis. Based on the measured concentrations the growth parameter appears to be a more sensitive indicator of effect than survival. The 'no-effect' level (NOEL) is between 0.31 and 0.38 mg/l whereas the NOEL for survival was between 0.38 and 0.59 mg/l. There is no discrepancy between reported values and calculated ones.

C. Results/Discussion. This study supplies useful information regarding the effect of methyl parathion on fish larvae. The estimated half-life in Lake Superior waters is 18 days with a >90% loss in 43 days.

D. Adequacy of the Study.

1. Category: Core

2. Rationale: In spite of the fact only 15 animals were treated per level and there were only two replicates per concentrations, both of which are well below the levels established in the SEP criteria, this particular study will satisfy the requirements for core. The testing facility was operating as an independent group and therefore above reproach for failing to adhere to the SEP. A new submission will not significantly alter the data used to make a risk assessment. In the future the registrant should be aware that submissions shoild adhere to the guidelines in order to avoid potential downgrading of the categorization

3. Repairability: N/A

15. COMPLETION OF ONE-LINER Completed 12/3/88

Within (Error)	174	3481.500	20.009
Total	179	17293.394	

Critical F value = 2.29 (0.05,5,120)
Since F > Critical F REJECT Ho:All groups equal

methparalength
File: none Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control=Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	0.00	22.333	22.333		
2	0.31	21.767	21.767	0.491	
3	0.38	20.800	20.800	1.328	
4	0.59	18.400	18.400	3.406	*
5	0.86	5.467	5.467	14.604	*
6	1.55	0.000	0.000	19.337	*

Dunnett table value = 2.55 (2 Tailed Value, P=0.05, df=25,5)

methparalength
File: none Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control=Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	0.00	30			
2	0.31	30	2.945	13.2	0.567
3	0.38	30	2.945	13.2	1.533
4	0.59	30	2.945	13.2	3.933
5	0.86	30	2.945	13.2	16.867
6	1.55	30	2.945	13.2	22.333

methparalength
File: none Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	13811.894	2762.379	138.057
Within (Error)	174	3481.500	20.009	
Total	179	17293.394		

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	0 0 0 0 0 0 1 2 3 4 5 6
1	0.00	83.933	83.933	-
2	0.31	74.567	74.567	. -
3	0.38	65.800	65.800	. . -
4	0.59	61.767	61.767	. . . -
5	0.81	14.767	14.767	* * * * -
6	1.55	0.000	0.000	* * * * . -

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,infinity,6) = 4.030 SE = 285.394

methparaweight
File: weight Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	176530.761	35306.152	69.099
Within (Error)	174	88904.767	510.947	
Total	179	265435.528		

Critical F value = 2.29 (0.05,5,120)
Since F > Critical F REJECT Ho:All groups equal

methparaweight
File: weight Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control=Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	0.00	83.933	83.933		
2	0.31	74.567	74.567	1.605	
3	0.38	65.800	65.800	3.107	*
4	0.59	61.767	61.767	3.798	*
5	0.81	14.767	14.767	11.851	*
6	1.55	0.000	0.000	14.381	*

Dunnett table value = 2.55 (2 Tailed Value, P=0.05, df=25,5)

methparaweight
File: weight Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control=Treatment

	NUM OF	Minimum Sig Diff	% of	DIFFERENCE

12-19-88 EEB FILE

230335 & 233438
RECORD NO.

053501
SHAUGHNESSY NO.

REVIEW NO.

EEB REVIEW

DATE: IN 10-26-88 DATE: OUT 12-19-88

FILE OR REG. NO. 4787-4

PETITION OR EXP. NO.

DATE OF SUBMISSION 8-9-88

DATE RECEIVED BY EFED 10-25-88

RD REQUESTED COMPLETION DATE 11-19-88

EEB ESTIMATED COMPLETION DATE 11-19-88

RD ACTION CODE 660

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

DATA ACCESSION NO(S).

PRODUCT MANAGER (NO.) D. EDWARDS (12)

PRODUCT NAME(S) METHYL PARATHION

COMPANY NAME A/S CHEMINOVA

SUBMISSION PURPOSE SUBMISSION OF AQUATIC TOXICITY DATA IN RESPONSE TO REG. STANDARD

SHAUGHNESSY NO.	CHEMICAL & FORMULATION(S)	% A.I.
053501	METHYL PARATHION	80