TDMS DATA EVALUATION RECORD PAGE 1 OF 9-17-82

CASE GS ___ Dimethoate PM ___ ~~9/9/82~~

CHEM 035001 Dimethoate

BRANCH EEB DISC ___

FORMULATION Technical

FICHE/MASTER ID FEODIM04

CITATION:

Schafer, E.W., Jr. 1982. Letter with attached bird toxicity test results. USFWS, Denver WRC, Denver, CO.

SUBST. CLASS=

OTHER SUBJECT DESCRIPTORS
PRIM:

DIRECT REVIEW TIME= 12 hr. (MH) START DATE 9/8/82 END DATE 9/9/82

REVIEWED BY: James D. Felkel
TITLE: Wildlife Biologist
ORG: Ecological Effects Branch, Hazard Evaluation Division
LOC./TEL: Crystal Mall #2, Rm. 1112, 557-3113

SIGNATURE: James D. Felkel DATE: 9/17/82

APPROVED BY:
TITLE:
ORG:
LOC/TEL:

SIGNATURE: DATE:

1

DATA EVALUATION RECORD

1. Chemical: Dimethoate (Shaughnessy # 035001)

2. Formulation: Technical - material received 11/61-% a.i. not cited (personal communication - 9/13/82).

3. Citation: 1) Schafer, E.W., Jr. 1982. Letter with attached bird toxicity test results. USFWS, Denver WRC, Denver, CO.
2) Schafer, E.W., 1972. The acute oral toxicity of 369 pesticidal, pharmaceutical and other chemicals to wild birds. Toxicology and Applied Pharmacology 21:315-330 (MRID#00020560)

4. Reviewed by: James D. Felkel, Wildlife Biologist
Ecological Effects Branch
Hazard Evaluation Division (TS-769)

5. Date Reviewed: September 9, 1982

6. Test Type: Avian acute oral LD_{50}

A. Test Species: 1) Red-winged blackbird 2) Starling

7. Reported Results:

Two tests with red-winged blackbirds indicate LD_{50} values of 8.8 mg/kg and 17.8 mg/kg. The starling test indicates in LD_{50} of 32 mg/kg.

8. Reviewer's Conclusions:

The studies are considered scientifically sound and indicate that dimethoate is highly to very highly toxic to the species tested. While approximate LD_{50} values of 17.8 mg/kg and 32 mg/kg are confirmed for the 3/73 red-winged blackbird test and starling test, respectively, an LD_{50} with 95% confidence interval could be confirmed only for the red-winged blackbird study dated 5/11/62 [5.4 (2.2-20.3) mg/kg, using probit analysis]. The tests individually do not fully meet the intent of proposed subpart E guidelines, 7/10/78 (see Reviewer's Evaluation).

Methods Reported

Wild-trapped birds preconditioned to captivity were dosed by gavage with solutions of dimethoate in propylene glycol. LD_{50} values were calculated by the method of Thompson (1948), Thompson and Weil (1952) and Weil (1952).

In the red-winged blackbird test dated 5/11/62, all birds were males, fasted for 4 hours before testing. In the starling test dated 5/11/62, both males and females, fasted for 4 hours, were used.

Results Reported

See attached pages.

Reviewer's Evaluation

Test methods used are roughly consistent with proposed guidelines (7/10/78). However, discrepancies include: 1) the species tested are not waterfowl or upland game birds, 2) concurrent controls are not cited, 3) fast period is shorter than specified, 4) most environmental conditions are not reported, and 5)numbers of birds tested per level are generally 2, well below the specified 10.

A check of statistics reveals that an LD_{50} with 95% confidence limits (other than 0 and + infinity) can be confirmed only for the red-winged blackbird test dated 5/11/62 [5.4 (2.2 - 20.3) mg/kg, using probit analysis]. See attached computer print-out.

Repellency information submitted for the red-winged blackbird indicates that a 50% repellency level is ot reached with this species until a level of 0.16-0.562% (1600-5620 ppm) is reached in the treated seed diet. It thus appears that a majority of these birds would not reject a lethal dose (under the conditions described), as is indicated in E. Schafer's 8/26/82 cover letter, if they continue to accept treated food at the levels described even as a lethal dose is approached. It should be noted, however, that a quantity of food sufficient to product a lethal dose was not generally provided in the repellency studies (only 25 rice grains were used). Thus, if birds were to become increasingly repellent as a lethal dose is approached (e.g., become nauseous), a lethal dose might not be consumed. The data do not address this issue.

Conclusions

1. Category: Supplemental

2. Rationale: See Reviewer's Analysis

3. Repairability: No individual test could be considered to fully meet the intent of proposed guidelines (7/10/78).

References

Thompson, W. 1948. Use of moving averages and interpolation to estimate median effective dose. Bacteriol. Rev. 11:115-145.

Thompson, W. and Weil, C. 1952. On the construction of tables for moving average interpolation. Biometrics 8:51-54.

Weil, C. 1952. Tables for convenient calculation of median effective dose (LD_{50} or ED_{50}) and instructions in their use. Biometrics 8:249-263.

FELKEL DIMETHOATE RED-WINGED BLACKBIRD ACUTE ORAL LD50 5/11/62

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
25	2	2	100	25
15	2	2	100	25
8.8	2	1	50	75
5	4	1	25	31.25
2.8	4	2	50	68.75
1.56	2	0	0	25
0.88	2	0	0	25

THE BINOMIAL TEST SHOWS THAT 0 AND +INFINITY 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 8.8

RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

SPAN	G	LC50	95 PERCENT CONFIDENCE LIMITS	
6	0.6586732	5.449602	1.739085	22.37063

RESULTS CALCULATED USING THE PROBIT METHOD

ITERATIONS	G	H	GOODNESS OF FIT PROBABILITY
8	0.664552	1	0.6447437

SLOPE = 2.543669
95 PERCENT CONFIDENCE LIMITS = 0.4700684 AND 4.617269

LC50 = 5.405053
95 PERCENT CONFIDENCE LIMITS = 2.163646 AND 20.33105

LC10 = 1.712068
95 PERCENT CONFIDENCE LIMITS = 0.01353585 AND 3.428246

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FELKEL DIMETHOATE RWBB 3/73 ACUTE ORAL LD50

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
31.6	2	2	100	25
17.8	2	1	50	75
10	2	0	0	25

THE BINOMIAL TEST SHOWS THAT 0 AND +INFINITY 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 17.8

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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FELKEL DIMETHOATE STARLING ACUTE ORAL LD50

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CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
50	2	2	100	25
40	2	2	100	25
32	2	1	50	75
25	2	0	0	25
18	4	0	0	6.25

THE BINOMIAL TEST SHOWS THAT 0 AND +INFINITY 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 32

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

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United States Department of the Interior
FISH AND WILDLIFE SERVICE
DENVER WILDLIFE RESEARCH CENTER
BUILDING 16, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

B4.5P

26 August 1982

Mr. James D. Felkel
U. S. Environmental Protection Agency
Wildlife Biologist
Ecological Effects Branch/
Hazard Evaluation Division
Washington, D. C. 80225

Dear Jim,

As per our telecon of August 26 enclosed are a number of original data sheets covering our avian toxicology studies with Dimethoate. Also enclosed are a couple of reprints that describe the methodology used in some detail. You will note some discrepency between tests conducted in the early 60's and those in the early 70's. These differences (2 to 3X), I believe, are due primarily to differences in personnel conducting the tests, less refined and accurate equipment in the early tests, and, perhaps some slight differences in the way the tests were conducted. The figures will, however, give you a good ball park estimate of activity range. I would consider dimethoate moderately to highly toxic to the bird species tested, and only moderately repellent. I have also enclosed a table from a paper I hope to present at the upcoming SETAC meeting combining toxicity and repellency into a factor that estimates acute avian hazards (separates well accepted toxicants from poorly accepted ones). This factor for dimethoate, 6.55, indicates to me a well accepted toxicant (ie, birds will readily accept an acutely lethal dose). This factor was calculated using the lowest estimate of toxicity and the highest estimate of repellency. The lowest estimate (6.6 mg/kg in the 369 chemical publication) is a printing error and should be 8.8. With respect to the two Tucker studies you referred to in your August 20 letter, I suggest you also follow my suggestion made during our August 26 conversation, and contact Rick Hudson. As I indicated, the DWRC is attempting to get these records back from Rick, but I suspect that the process might be long and involved.

Let me know if I can provide any more help.

Sincerely yours,

Edward W. Schafer, Jr.
Leader, Chemical Development Project
Section of Bird Damage Control

Enclosures

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WRoo

File: B(C11.1.1)

BIRD TOXICITY STUDY RESULTS

421

Chemical: [redacted] (Dimethoate) Structure:

Species: [redacted]

Dosing Method: Stomach-tubed propylene glycol solution of toxicant to [redacted]-hour fasted birds. All birds used were males.

Dosage (Mg/kg)	Paralysis: No. Birds	Paralysis: Induction (Min.)	Paralysis: Duration (Min.)	Mortality	Time of Death	Emesis: No. Birds	Emesis: Time (Min.)	Remarks
0.63	0/2	---	---	0/2	---	1/2	4	
1.56	0/2	---	---	0/2	---	1/2	3	
2.0	---	---	---	2/4	>3<19 Hr. >68<90"	0/4	---	
5.0	---	---	---	1/4	68 Hrs.	0/2	---	
8.0	---	---	---	1/2	41 "	0/2	---	
15.0	---	---	---	2/2	>2<16 Hr.	0/2	---	
25.0	---	---	---	2/2	>75<91 " >90<115"	0/2	---	

Comments:

The approximate acute oral LD_{50} is 8.8 mg/kg. This indicates it is about 25 times more toxic to redwings than rats.

Recommend that acceptance of treated bait by redwings be investigated.

Also investigate possibility of using systemic properties of dimethoate for control of damage to lettuce seedlings by English sparrows, house finch, and horned larks.

Investigator: D. Cunningham, R. Starr, T. DeCino

Date: May 11, 1962

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WRcs

File: B(C11.1.1)

BIRD TOXICANT STUDY RESULTS

422

Chemical: ~~EBC-1323~~ (Dimethoate) Structure:

Species: Starling

Dosing Method: Stomach-tubed propylene glycol solution of toxicant to 4-hour fasted birds

Dosage (Mg/kg)	Paralysis			Mortality	Time of Death	Emesis		Remarks
	No. Birds	Induction (Min.)	Duration (Min.)			No. Birds	Time (Min.)	
13	0/4	---	---	0/4	---	0/4	---	All females
25	0/2	---	---	0/2	---	0/2	---	Both males
32	2/2	55, 57	---	1/2	>3<16 Hr.	0/2	---	Both males
40	2/2	>3 Hr.	---	2/2	>3<16 Hr.	0/2	---	One female, one male
50	2/2	30	---	2/2	>2<16 Hr.	0/2	---	Both females

Comments:

The acute oral LD_{50} is 32 mg/kg. This indicates that it is 8 times more toxic to starlings than to rats.

Recommend that at present no further testing be conducted for starling control with this material.

Investigator: D. Cunningham, R. Starr, T. DeCino

Date: May 11, 1962

TOXICITY TEST

DRC NO. 1323

24 hour fasted

Dimethoate

DATE	SPECIES	ROUTE	CARRIER	DOSAGE (Mg/kg)	MORTALITY	TIME OF DEATH	REMARKS
3/73	RWBB	Oral	P.Glycol	31.6	2/2	>4<18 hrs	
				17.8	1/2	2 days	
				10.0	0/2	-	

Results	LD_{50} mg/kg	95% C.L.
Red-winged Blackbird	17.8	NC

CONCENTRATION-REPELLENT EFFECT EXPERIMENTS (R_{50} TEST)

~~422~~ 423

Test Animal: Redwinged Blackbird Test No.: 30

Code No. : DEK-1323 Date: Dec. 20, 1961

Compound : Dimethoate (Technical)

Source : American Cyanamide

Formulation: Acetone solvent

Description of Test: Twenty-five treated seeds were exposed with an individually-caged test animal for a 16- to 18-hour test period (3 p.m. to 8 a.m.). No other food was available during the test. Ten animals were treated at each concentration shown below. An animal was considered repelled when 13 or more treated seeds were uneaten. Concentration-repellent effect determinations were adapted from the method of Litchfield and Wilcoxon (J. Pharm. & Exp. Therap., 96(2): 99-113, 1949) for dose-effect measurements.

Percent Concentration on 100 g. hulled Calif. rice	Number Repelled / Number Tested
0.06	2/10
0.1	2/9
0.13	6/10
0.32	7/10
0.56	9/10

Remarks:

R_{50}: 0.16% R_{80}: 0.40%

Error Factor: 1.6 R_{90}: 0.62%

Confidence Limit*(95%): 0.1 - 0.26% R_{98}: -----

Slope of Line: 2.87

Investigator: Brunton, Cunningham, Starr

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REPELLENCY TEST DRC NO. 1323

Dimethoate

ate	Species	Route	Carrier	Treatment level (%)	No. repelled / No. tested	Average seed consumption (%)	Mortality	Remarks
3/73	RWBB	Oral	Rice	1.000	4/5	40.8	1/5	
				0.316	1/5	70.4	0/5	

Results	R_{50}	95% C.L.
Red-winged Blackbird	0.562%	0.328-0.966

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LABORATORY GERMINATION STUDIES

Test No. 11 DRC No. 1323

Chemical Dimethoate Source

Seed white wheat

Formulation 100 g. wheat treated with 1% 1323 in acetone. Control seeds acetone treated

Date Prepared June 25, 62

No. Seeds Treated 100 treated 100 control Date Placed in Germination* 3:30 pm June 25, 62

Chemical	No. Seeds Germinated per Unit Time				% Germination	Corrected** % Germination
	24 hrs	48 hrs	72 hrs			
DRC 1323	0/100	0/100	0/100		0	
Control	1/100	91/100	91/100			

Remarks

* Seeds are placed in individual petri dishes containing blotting pads saturated with distilled water. The sealed dishes are placed in a Nasco Cuthbert Germinator and held at constant temperature for a given period of time.

** Corrected to 100% control germination.

$$\text{Corrected \%} = \frac{100\%}{\%\ \text{control}} \times \%\ \text{treated.}$$

Table No. 2 Acute Oral Toxicity and Repellency of 998 Chemicals to Redwinged Blackbirds, Starlings and Coturnix Quail.

DRC No.	Name	Registry Number (CAS)	Redwinged Blackbird LD_{50} (mg/kg) (1,2,5)	Redwinged Blackbird R_{50} (%)(5)	R_{50} (mg/kg) (3)	Hazard Factor (4)	Starling LD_{50} (mg/kg)	Coturnix LD_{50} (mg/kg)
5533	Busulfan	55981	56.2	+1.00	+76.9	+ 1.37	-	316-750(g)
2622	Tetraethylammonium chloride	56348	-	+1.00	-	-	-	-
874	Tributyltin oxide	56359	+ (30.0)	0.316	24.3	- 0.810	-	-
1150	Parathion	56382	2.37(a,b,c,e)	0.133	10.2	4.31	5.62(a,c,e)	4.22(c)
1324	Coumaphos	56724	1.78-3.60(a,b,c)	0.002-0.020	1.53	0.864	75.0-316(a,c)	13.3(c)
4258	Chlorobutanol	57158	+ 100(a,e)	+1.00	-	-	-	-
3894	Strychnine	57249	-	0.030	-	-	-	-
151	Pentobarbital sodium	57330	75.0(a,e)	-	-	-	+ 100-+665(a,e)	237(f)
1305	Meprobamate	57534	-	-	-	-	+ 127(e)	-
5591	9,10-Dimethyl-1,2-benzanthracene	57976	+ 100	+1.00	-	-	-	+ 316(f)
630	Caffine	58082	316	0.180	13.9	0.044	500-+500(e)	-
6619	Menadione	58275	+ 316	+1.00	-	-	-	-
88	DID 47	58366	23.7(a)	0.089	6.85	0.289	-	-
3843	Perphenazine	58399	31.6(a,e)	+1.00	+76.9	+ 2.43	100(a,e)	-
1309	Promazine	58402	-	-	-	-	+ 325-+335(a,e)	-
1134	Theophylline	58559	-	0.316	-	-	-	-
4009	Lindane	58899	75.0(a)	0.121	9.31	0.124	100(a)	-
6367	Bromodeoxyuridine	59143	+ 100	+1.00	-	-	-	+ 100 -
3328	4-Chloro-m-cresol	59507	+(113)	+1.00	-	-	-	-
6609	Vitamin B	59676	+1000	+1.00	-	-	+1000	+1000
5552	Dopa	59927	100	+0.316	+24.3	- 0.234	-	-
3394	Acetamide	60355	+(101)	+1.00	-	-	-	-
4007	Strychnine sulfate	60413	6.00(e)	-	-	-	- 5.00(a)	-
1323	Dimethoate	60515	~~6.60-17.8~~(a)	0.160-0.562	43.2	4.9 ~~6.55~~	31.6(a)	-
164	Dieldrin	60571	17.8(c)	-	-	-	237(c)	56.2(c)
6415	Phlorizin	60811	+ 100	+1.00	-	-	-	-
1314	Mepazine	60899	-	-	-	-	- 183-200(e)	-
3847	Dibucaine HCl	61121	42.2(a,e)	+1.00	+76.9	+ 1.82	100(a)	-
6312	Amitrole	61825	+ 100	+1.00	-	-	-	+ 316(m)
2609	Aniline	62533	562	+1.00	+76.9	+ 0.137	+1000	750
1328	Dichlorvos	62737	13.3-17.8(a,c)	0.488	37.5	2.82	11.0-42.2(a,c)	23.7(c)
4008	Compound 1080	62748	4.22	-	-	-	2.37	-
3853	Benzquinamide	63127	100(a,e)	+1.00	+76.9	+ 0.769	+ 100(a,e)	-
1330	Carbaryl	63252	56.2-+150(a)	0.120-0.210	16.2	0.287	-	-
1302	Hercules AC-5727	64006	3.20-10.0(a,d,e)	0.020	1.54	0.481	17.0(a,d,e)	-
3581	Formic acid	64186	+(111)	+1.00	-	-	-	-
3841	Mebutamate	64551	100(a,e)	+1.00	+76.9	+ 0.769	+ 100(a,e)	-
[illegible]	Colchicine	64868	- 31.6	0.284	21.8	+ 0.690	-	42.2-64.7(f)