TIMS0030 DATA EVALUATION RECORD MULTIPLE PAGE 1 OF

CASE GS0014 ENDOSULFAN PM 11C 08/12/79

CHEM C79401 Endosulfan (hexachlorohexahydromethano

BRANCH EEB DISC 35 TOPIC 05259043

FORMULATION CC - ACTIVE INGREDIENT

FICHE/MASTER ID 05003107 CONTENT CAT C1

Macek, K.J.; Hutchinson, C.; Cope, O.B. (1969) The effects of temperature on the susceptibility of bluegills and rainbow trout to selected pesticides. Bulletin of Environmental Contamination and Toxicology 4(3):174-183.

SUBST. CLASS = S.

OTHER SUBJECT DESCRIPTORS
SEC: EEB -40-05054543

DIRECT RVW TIME = (MH) START-DATE END DATE

REVIEWED BY: Robert K. Hitch
TITLE: Fish and Wildlife Biologist
ORG: EEB/HED
LOC/TEL: (703) 557-3710
SIGNATURE: Robert K. Hitch DATE: 1/15/80

APPROVED BY:
TITLE:
ORG:
LOC/TEL:
SIGNATURE: DATE:

MULtiple
MULTIPLE

aldrin
chlordane
naled
dieldrin
diuron
dursban
endrin
asinphosmethyl
heptachlor
lindane
malathion
methoxychlor
endosulfan
toxaphene
trifluralin

Not retrieved because of duplicates

Data Evaluation Record

1. Chemical: aldrin, chlordane, naled, dieldrin, diuron, dursban, endrin, asinphosmethyl, heptachlor, lindane, malathion, methoxychlor, endosulfan, toxaphene, trifluralin.

2. Formulation: Technical grades of all compounds

3. Citation:

Macek, K.J.; Hutchison, C.; Cope, O.E. 1969. The effects of temperature on the susceptibility of bluegills and rainbow trout to selected pesticides. Bulletin of Environmental Contamination and Toxicology (4(3): 174-183

4. Reviewed by:

R.K. Hitch
Fish and Wildlife Biologist
EEB/HED

5. Date Reviewed: 1/15/80

6. Test type:

Acute static toxicity test with a warmwater fish

7. Reported Results

TL_{50} values (micrograms active ingredient/liter) for rainbow trout (Salmo gairdneri Richardson) tested against indicated pesticides, and ranked by the relative increase in susceptibility (R.I.S.) of the fish to the pesticides over the range of temperatures tested.

Compound	Temperature, °C 1.6	7.2	12.7	R.I.S.
		24 Hours		
Dursban^R	550(480-630)*	110(90-130)	53(45-62)	10.37
Dibrom^R	1300(1100-1500)	620(570-680)	240(210-270)	5.41
Endrin	15(12-18)	5.3(4.6-6.0)	2.8(2.5-3.1)	5.35
Dieldrin	13(9-19)	3.1(2.6-3.6)	3.1(2.7-3.5)	4.19
Thiodan^R	13(11-15)	6.1(5.6-6.6)	3.2(2.9-3.5)	4.15
Aldrin	24(18-31)	8.1(6.7-9.7)	6.8(6.0-77)	3.52
Trifluralin	3.8(270-375)	239(196-267)	98(85-113)	3.24

Guthion[R]	25(22-28)	15(12-18)	13(10-15)	1.92
Heptachlor	17(14-21)	12(10-14)	13(12-14)	1.31
Methoxychlor	55(50-60)	45(41-49)	74(66-82)	0.82
		96 Hours		
Dursban[R]	51(43-60)	15(13-17)	7.1(6.0-8.4)	7.18
Trifluralin	210(182-240)	152(132-175)	42(38-46)	5.00
Endrin	2.5(2.2-2.8)	1.4(1.2-1.6)	1.1(0.9-1.2)	2.27
Dibrom[R]	340(310-370)	220(200-230)	160(150-170)	2.12
Thiodan[R]	2.6(2.3-2.9)	1.7(1.5-1.9)	1.5(1.3-1.7)	2.00
Dieldrin	2.4(2.1-2.7)	1.1(1.0-1.2)	1.4(1.3-1.5)	1.71
Aldrin	3.2(2.3-4.5)	3.3(2.8-3.9)	2.2(2.1-2.3)	1.45
Guthion[R]	6.8(6.1-7.5)	6.2(5.3-7.2)	5.5(4.9-6.1)	1.23
Heptachlor	7.7(6.5-9.1)	7.0(6.4-7.6)	7.3(6.9-7.6)	1.05
Methoxychlor	30(28-3.2)	42(38-45)	62(57-67)	0.48

* 95% confidence interval in parentheses

TL_{50} values (micrograms active ingredient/liter) for bluegills (Lepomis macrochirus Rafinesque) tested against the indicated pesticides, and ranked by the relative increase in susceptibility (R.I.S.) of the fish to the pesticides over the range of temperatures tested.

Compound	Temperature, °C 12.7	18.3	23.8	R.I.S.
		24 Hours		
Trifluralin	540(460-640)*	360(300-430)	130(110-150)	4.15
Aldrin	36(31-42)	16(14-18)	10(7.8-13)	3.60
Endrin	2.8(2.6-3.0)	1.5(1.3-1.8)	0.8(0.7-1.0)	3.50
Diuron	27,000(25,000-29,000)	17,000(16,000-19,000)	9,700(9,100-10,000)	2.78
Dieldrin	39(34-43)	24(21-27)	15(14-17)	2.60
Chlordane	220(200-240)	170(160-180)	95(83-110)	2.31
Malathion	220(200-240)	140(120-160)	110(97-120)	2.00
Toxaphene	9.7(8.4-11)	6.8(6.2-7.5)	6.6(5.5-7.9)	1.46
Lindane	100(84-120)	100(90-110)	95(86-110)	1.05
Guthion[R]	16(14-18)	16(14-18)	16(15-18)	1.00
Methoxychlor	58(52-64)	67(60-74)	83-77-90)	0.69
		96 Hours		
Trifluralin	190(160-230)	120(100-140)	47(40-55)	4.04
Malathion	120(67-210)	55(51-59)	46(40-52)	2.60
Dieldrin	17(15-19)	14(12-16)	8.8(8.1-9.5)	1.93
Aldrin	7.7(6.8-8.7)	5.8(4.9-6.8)	4.6(4.1-5.1)	1.67
Endrin	0.61(0.54-0.68)	0.41(0.36-0.46)	0.37(0.34-0.40)	1.64

Guthion^{R}	6.9(6.2-7.7)	7.4(6.4-8.6)	4.2(3.8-4.6)	1.64
Diuron	8900(8200-9600)	7600(7000-8200)	5900(5300-6500)	1.50
Lindane	54(51-57)	51(46-57)	37(34-40)	1.45
Toxaphene	3.2(2.8-3.7)	2.6(2.2-3.0)	2.4(2.1-2.7)	1.71
Chlordane	85(77-94)	77(69-86)	77(69-86)	1.10
Methoxychlor	42(40-44)	53(51-55)	75(71-79)	0.56

* 95% confidence interval in parentheses

8. Reviewer's conclusions:

This study is supplemental until the dose - response data at each treatment level is obtained.

Although the study might be upgraded to core with regard to the 96 hr LC_{50} requirement for cold and warmwater fish, these requirements have been previously filled by Beltsville EPA studies. The reviewer did not, therefore request the raw dose-response data.

N.B. 2/24/81
Beltsville EPA studies have been downgraded to "supplemental" - JB 2/5/82 which were downgraded?

Comments regarding this study shown below are from N. Cook's endosulfan reregistration package:

Methodology / Protocol:

The tests were conducted over a period of five years at the Fish-Pesticide Research Laboratory in Denver, Colo. and Columbia, Mo. The susceptibility of the fish to pesticides was measured in terms of the median tolerance limit (TL_{50}*), which is defined as the concentration of the pesticide in water which causes 50 per cent mortality among the test fish under the test conditions. A modification of the method proposed by Litchfield and Wilcoxon (4) was used to calculate the median tolerance limit and its 95% confidence interval. Rather than visually fitting a line to the data plotted on log-probability graph paper as proposed by these authors, the concentrations tested and the observed percent mortalities were converted to logs and probits, respectively, and a linear regression equation was calculated. The median tolerance limits were calculated for 24 and 96 hours of exposure at 1.6°, 7.2° and 12.7°C for rainbow trout, and at 12.7°, 18.3° and 23.8°C for bluegills.

Bioassays were simultaneously conducted at three temperatures in glass jars containing 15 liters of reconstituted water having a concentration of 2.0 mg/L of potassium chloride, 30.0 mg/L of magnesium sulfate, 30.0 mg/L of calcium sulfate, and 48.0 mg/L of sodium bicarbonate. The pH of the test water was 7.1 and the methyl orange alkalinity was 35 ppm. Technical grades of all compounds were used and a fresh stock solutions of each pesticide was prepared in acetone the day of testing. Since test solutions

were not renewed during the test period, the concentrations reported are those at the start of exposure. Groups of test fish ranged in average size from 0.6 to 1.5 grams and were obtained from National Fish Hatcheries. The fish used in testing any one compound were from the same lot and of the same weight and length (± 20%). Fish were conditioned to the test water and temperature for at least 48 hours prior to testing; during this period they were not fed. Test temperatures (± 0.6oC) were maintained by water baths. Twenty fish were tested at each concentration (ten per jar), and the mass/volume ratio never exceeded 1.0 gram of fish per liter of test solution. The control fish were exposed to the highest concentration of the solvent to which fish in the other test solutions were exposed.

Additional Test Results:

As seen in Results section, there was an increase in the susceptibility of fish as temperature increased. One possible mechanism for this is a higher rate of pesticide uptake at higher temperatures than at lower temperatures. Another possibility could be related to an increased level of enzymatic activity at higher temperatures than at lower temperatures. And yet another reason may be that as temperature increases so does animal metabolism.

4/ References:

Litchfield, J.T., and F. Wilcoxon, J.
Pharmacol. Exptl. Therap., 96, 99 (1949).