US EPA ARCHIVE DOCUMENT

C34401 NAled (Dibrom) 11/16/79

TD1S0030 DATA EVALUATION RECORD PAGE 1 OF

CASE GS0018 COUMAPHOS A - (10/16/79) PM 410 11/16/79

CHEM 036501 O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1

BRANCH EEB DISC 35 TOPIC 05250047

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 05009242 CONTENT CAT 01

Sanders, H.O. (1969) Toxicity of Pesticides to the Crustacean~Gammarus lacustris‡~. Washington, D.C.: U.S. Bureau of Sport Fisheries and Wildlife. (U.S. Bureau of Sport Fisheries and Wildlife technical paper 25)

SUBST. CLASS = S.

OTHER SUBJECT DESCRIPTORS
PRIM: EEB -40-05054547
SEC: EEB -40-15000047

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

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ORG:
LOC/TEL:

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APPROVED BY:
TITLE:
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LOC/TEL:

SEE COUMAPHOS
FOR COMPLETE REVIEW

SIGNATURE: DATE:

1

Table 3.--Estimated LC_{50} values and confidence limits (p=.05) for several technical grade organophosphate insecticides to the scud, *Gammarus lacustris*, in bioassays conducted at 70° F. (continued)

Insecticide	P,P'DDT reference at 24-Hrs.	LC_{50}, micrograms per liter 24-Hr.	48-Hr.	96-Hr.
Trichlorofon (Dylox (R))	5.2	92(68- 125)	60(39- 91)	40(26- 60)
EPN	5.7	100(64- 155)	34(26- 50)	15(13- 19)
Disulfoton (Di-Syston (R))	5.2	110(81- 148)	70(52- 94)	52(49- 58)
Naled (Dibrom (R))	4.7	240(170- 340)	160(110- 230)	110(80-155)
V-C 13 (R)	5.7	430(260- 710)	200(145- 276)	56(40- 78)
Phosdrin (R)	4.9	650(460- 920)	310(225- 428)	130(100-170)
Oxydemeton-methyl (Meta-Systox (R))	5.4	750(650- 860)	700(610- 800)	190(170-210)
Diazinon	4.5	800(690- 930)	500(400- 620)	200(150-280)
Dioxathion (Delnav (R))	5.7	830(500-1,300)	690(390- 1,200)	270(150-513)
Dimethoate	4.7	900(670-1,200)	400(250- 630)	200(150-270)
Abate (R)	5.4	960(580-1,600)	640(480- 860)	82(31-110)
Bidrin (R)	5.4	2,200(1,500-3,300)	790(580- 1,100)	540(400-730)

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Table 4.--Estimated LC_{50} values and confidence limits (p=.05) of several herbicides, fungicides

CASE GS0018 COUMAPHOS A = (10/16/79) PM 410 11/16/79

CHEM 036501 O,O-Diethyl O-(3-chloro-4-methyl-2-oxo-2H-1

BRANCH EEB DISC 35 TOPIC 05250047

FORMULATION 00 = ACTIVE INGREDIENT

FICHE/MASTER ID 05009242 CONTENT CAT 01

Sanders, H.O. (1969) Toxicity of Pesticides to the Crustacean"Gammarus lacustris#". Washington, D.C.: U.S. Bureau of Sport Fisheries and Wildlife. (U.S. Bureau of Sport Fisheries and Wildlife technical paper 25)

SUBST. CLASS = S.

OTHER SUBJECT DESCRIPTORS
PRIM: EEB -40-05054547
SEC: EEB -40-15000047

DIRECT RVW TIME = ' (MH) START-DATE Feb. 4, 1980 END DATE Feb. 25-80

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LOC/TEL:

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1. Chemical: Coumaphos

2. Formulation: Technical (97.0 a.i.)

3. Citation: Sanders, H.O. (1969) Toxicity of Pesticide to the Crustacean (Gammarus lacustrist) paper No. 25, Fiche/Master ID 05009242, product name Coumaphos Pesticide, U.S. Bureau of Sport Fisheries and Wildlife.

4. Reviewed by: Curtis E. Laird
Aquatic Biologist
EEB/HED
✓ (SS, 1991

5. Date Reviewed: February 4, 1980

6. Test Type: Acute 48-hour LC50 for invertebrate

A. Test Species: Gammarus lacustrist

7. Reported Result: The 48-hour LC50 value for Coumaphos was 0.14 ug/L. See attached table #3 for result of additional active ingredients.

8. Reviewer's Conclusion: The study is scientifically sound and indicates that Coumaphos is highly toxic to Crustacean. See attached table #1 for additional chemicals. Immatured scuds should be used as outlined in the recommended EPA protocol of April 1975. This study does not fulfill registration requirements for an acute aquatic invertebrate.

Material and Methods

Test Procedure

For all other chemicals a 0.1 ml of ethanol/L was used as a solvent based on personal contact with Dr. H.O. Sanders on February 4, 1980.

Bioassay method

Bioassays with the toxicant added to the test medium at the beginning of the test, without aeration, were used to determine pesticide toxicities at various times and temperatures. Assays were conducted in 1-1/2 gallon glass aquariums, each containing 4 liters of test water. The aquariums were submerged in water baths with temperatures at 40°, 50°, 60°, or 70° F., all ± 1 degree. After the medium had attained the test temperature, it was aerated for 10 minutes, and ten 2-month-old (± 5-day) scuds were placed in each aquarium. The toxicant was introduced into each aquarium 2 hours after adding the test organisms.

Stock solutions were prepared by dissolving either the technical grade pesticide in ethanol or the emulsifiable concentrates and wettable powders in deionized water. The volume of ethanol never exceeded 1 milliliter per liter of water.

The approximate range of toxicity of the test chemical was determined by preliminary testing. Then four or five concentrations of the toxicant were prepared within this range. A control was included with each test.

Statistical Analysis

Deaths in each concentration were recorded for the 24-, 48-, and 96-hour exposure periods and the results plotted on logarithmic probability paper. The toxicity of the pesticide was calculated as the Median Lethal Concentration (LC50) 1/ with confidence limits determined by the statistical method of Litchfield and Wilcoxon (1948) for evaluating dose effect experiments.

Also see attached Finney probit analysis print out for Coumaphos only.

Discussion/Results

See attached table #3

Reviewer's Evaluation

A. Test Procedure
The test procedure generally complies with the recommended EPA Protocol with the exception of the life stage tested. Adults scuds were used instead of an early instar.

B. Statistical Analysis

The LC50 value was determine by using Litchfield and Wilcoxon method.

C. Conclusion

1. Category: Supplemental

2. Rationale: This study was reviewed for coumaphos Since the studies were conducted and published by a government facility, we feel they are scientifically sound studies. Several assumptions are made in accepting all values reported in this paper; 1) the protocol described herein was employed for all chemicals. 2) Unlike feeding studies in which food consumption and weight change information is essential to interpreting LC50/LD50 value, no organismal response beside death is essential to assess the LC50 value. Personal contact with Dr. R. Handerson at duluth, minn. On February 7, 1980 indicated mature scuds are less sensitive to pesticides than immature. The study is supplemental rather than core.

Toxicity Category #1

Table 1.--Estimated LC_{50} values and confidence limits (p=.05) for several technical grade insecticides to the scud, *Gammarus lacustris*, in bioassays conducted at 70°F.

Insecticide	p,p'DDT reference at 24-Hrs.	LC_{50}, micrograms per liter 24-Hr.	48-Hr.	96-Hr.	Fulfill Registration Requirement
Chlorinated Hydrocarbons					
Vht Methoxychlor	4.7	2.9(2.2-3.9)	1.3(0.87-1.9)	0.8 (0.56-1.1)	NO
~~DDT~~	4.7	4.7(3.2-7.0)	2.1(1.1 -3.1)	1.0 (0.68-1.5)	
~~TDE (DDD)~~	4.5	5.6(3.5-8.8)	1.8(1.1 -2.9)	0.64(0.35-1.2)	
~~Endrin~~	4.9	6.4(4.6-8.9)	4.7(3.3 -6.6)	3.0 (2.0 -4.5)	
~~Lindane~~	4.7	120(83-173)	88(57-136)	48(35- 65)	
Vht ~~Heptachlor~~	4.7	150(94-240)	100(84-118)	29(18- 48)	
Chlordan	5.2	160(120-220)	80(62-102)	26(21- 30)	NO
Vht ~~Toxaphene~~	5.2	180(112-288)	70(36-135)	26(24- 28)	
Aramite (R)	4.7	350(250-500)	100(60-160)	60(43- 84)	NO
ht Tetradifon	5.0	370(280-500)	140(100-200)	110(80-150)	NO
ht Dilan (R)	5.7	800(680-920)	600(520-680)	350(300-400)	NO
~~Dieldrin~~	4.9	1,400(1,000- 1,800)	1,000(760- 1,300)	460(370-570)	
~~Aldrin~~	5.2	45,000(30,000-67,500)	12,000(8,500-16,800)	9,800(7,200-13,200)	
Methylcarbamates					
Vht Matacil (R)	4.9	39(30- 51)	29(... .3)	12(8-17)	NO
Vht Carbaryl	4.7	40(32- 49)	22(16-30)	16(12-19)	NO
Vht Baygon (R)	4.9	66(54- 79)	50(40-62)	34(29-39)	NO
Vht Zectran (R)	4.7	86(61-120)	76(63-91)	46(34-62)	NO
Botanicals					
Vht Pyrethrum	5.3	28(20-39)	18(14-24)	12(8-17)	NO
Vht Allethrin	5.3	38(30-49)	20(14-28)	11(8-15)	NO
mt Rotenone	5.0	6,000(5,000-7,200)	3,500(2,900-4,300)	2,600(2,100-3,200)	NO

VHt = very highly toxic
ht = highly toxic
mT = moderate Toxic

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Table 3.--Estimated LC_{50} values and confidence limits (p=.05) for several technical grade organophosphate insecticides to the scud, *Gammarus lacustris*, in bioassays conducted at 70°F.

Insecticide	P,P'DDT reference at 24-Hr.	LC_{50}, micrograms per liter 24-Hr.	48-Hr.	96-Hr.	Toxicity Category	Fulfill Registration Requirement
Coumaphos (Co-Ral)(R)	4.7	0.32 (0.18- 0.58)	0.14 (0.082- 0.24)	0.074 (0.059- 0.092)	Vht	NO
Cuthion (R)	6.1	0.56 (0.39- 0.81)	0.25 (0.19 - 0.35)	0.15 (0.11 - 0.20)	Vht	NO
Dursban (R)	4.7	0.76 (0.47- 1.2)	0.40 (0.32 - 0.49)	0.11 (0.071- 0.17)	Vht	NO
Dichlorvos (DDVP)	4.5	2.0 (1.5 - 2.7)	1.0 (0.66 - 1.5)	0.50 (0.37 - 0.68)	Vht	NO
Malathion	4.9	3.8 (3.5 - 4.1)	1.8 (1.3 - 2.4)	1.0 (0.55 - 1.5)	Vht	NO
Ethion	6.1	5.6 (3.9 - 8.1)	3.2 (2.3 - 4.5)	1.8 (1.3 - 2.4)	Vht	NO
Phosphamidon	4.7	8.4 (6.7 -11)	3.8 (2.2 - 6.7)	2.8 (1.8 - 4.9)	Vht	ND
Endosulfan (Thiodan)(R)	4.2	9.2 (6.8 -12)	6.4 (5.0 - 8.2)	5.8 (4.1 - 8.1)	Vht	NO
Parathion	4.7	12 (7.8 -18)	6.0 (2.7 - 9.7)	3.5 (2.6 - 4.8)	Vht	NO
Fenthion	5.2	15 (12 -20)	11 (8.0 -15)	8.4 (5.0 -12)	Vht	NO
Phorate (Thimet)(R)	5.7	24 (15 -38)	14 (9.0 -21)	9.0 (5.1 -13)	Vht	NO
Shell 4072	5.4	27 (19 -38)	13 (10 -16)	9.8 (8.6 -11)	Vht	NO
Carbophenothion (Trithion)(R)	5.7	45 (30 -62)	28 (20 -36)	5.2 (4.1 - 6.5)	Vht	NO
Ciodrin	5.7	49 (36 -67)	29 (21 -41)	15 (14 -20)	Vht	NO
Methyl Carbophenothion	5.7	50 (33 -75)	32 (22 -46)	11 (8.0 -15)	Vht	NO
TEPP	5.2	74 (57 -96)	52 (30 -90)	39 (27 -56)	Vht	NO

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Toxicity Category

Vht = very highly toxic

Table 3.--Estimated LC_{50} values and confidence limits (p=.05) for several technical grade organophosphate insecticides to the scud, Gammarus lacustris, in bioassays conducted at 70° F. (continued)

Toxicity Category	Insecticide	P,P'DDT reference at 24-Hrs.	LC50, micrograms per liter 24-Hr.	48-Hr.	96-Hr.	Fulfill Registration Requirements
Vht	Trichlorofon (Dylox (R))	5.2	92(68- 125)	60(39- 91)	40(26- 60)	NO
Vht	EPN	5.7	100(64- 155)	34(26- 50)	15(13- 19)	NO
Vht	Disulfoton (Di-Syston (R))	5.2	110(81- 148)	70(52- 94)	52(49- 55)	NO
ht	Naled (Dibrom (R))	4.7	240(170- 340)	160(110- 230)	110(80-155)	NO
Vht	V-C 13 (R)	5.7	430(260- 710)	200(145- 276)	56(40- 78)	NO
ht	Phosdrin (R)	4.9	650(460- 920)	310(225- 428)	130(100-170)	NO
ht	Oxydemeton-methyl (Meta-Systox (R))	5.4	750(650- 860)	700(610- 800)	190(170-210)	NO
ht	Diazinon	4.5	800(690- 930)	500(400- 620)	200(150-280)	NO
ht	Dioxathion (Delnav (R))	5.7	830(500-1,300)	690(390- 1,200)	270(150-513)	NO
ht	Dimethoate	4.7	900(670-1,200)	400(250- 630)	200(150-270)	NO
Vht	Abate (R)	5.4	960(580-1,600)	640(480- 860)	82(31-110)	NO
ht	Bidrin (R)	5.4	2,200(1,500-3,300)	790(580- 1,100)	540(400-730)	NO

Vht= very highly toxic
mt= moderate toxic
ht= highly toxic

Table 4.--Estimated LC... values and confidence limits (p=.05) of several herbicides [illegible]

Table 4.--Estimated LC_{50} values and confidence limits (p=.05) of several herbicides, fungicides, and a defoliant to the scud, Gammarus lacustris, in bioassays conducted at 70°F.

Pesticide 1/	p,p'-DDT reference at 24-Hrs.	LC_{50}, micrograms per liter		
		24-Hr.	48-Hr.	96-Hr.
DEF(R) (Tech. defoliant)	5.8	360(270- 480)	230(210- 250)	100(78- 150)
Diuron (Tech. herbicide)	5.3	700(590- 830)	380(290- 500)	160(130- 190)
2,4-D, (BEE) (E.C. herbicide)	5.6	1,400(1,100- 1,800)	760(510- 1,100)	440(310- 620)
Hydrothol 191 (Tech. herbicide)	5.6	2,000(1,600- 2,700)	1,000(620- 1,600)	500(370- 670)
2,4-D, (PGBE) (E.C. herbicide)	5.0	2,100(1,700- 2,500)	1,800(1,400- 2,300)	1,600(1,200-2,100)
Difolitan (W.P. fungicide)	5.6	2,200(1,700- 2,800)	1,300(1,000- 1,600)	800(500-1,300)
Korax (W.P. fungicide)	5.8	2,800(1,100- 3,800)	1,100(780- 1,500)	660(460- 890)
Dichlone (W.P. herbicide)	5.4	3,200(1,900- 5,400)	2,300(1,600- 2,800)	1,100(800-1,500)
2,4-D, (IOE) (W.P. herbicide)	4.9	6,800(4,800- 9,700)	4,600(2,900- 7,300)	2,400(1,900-4,800)
Dead-X, 95% Naphtha (E.C. herbicide)	5.4	7,000(5,600- 8,800)	3,600(2,600- 5,400)	840(520-1,300)
Vernolate (E.C. herbicide)	4.9	8,400(7,700- 9,200)	5,000(3,700- 6,800)	1,800(1,100-2,900)
Trifluralin (E.C. herbicide)	5.3	8,800(6,600-12,000)	5,600(4,200- 7,400)	2,200(1,400-3,400)
Molinate (Tech. herbicide)	4.9	9,800(6,900-14,000)	7,600(6,100- 9,500)	4,500(3,500-5,800)
Dicamba (W.P. herbicide)	4.7	10,000(6,700-15,000)	5,800(3,600- 9,300)	3,[illegible]00(3,100-4,900)
Sodium azide (Tech. herbicide)	5.6	14,000(13,000-15,000)	9,000(6,700-12,000)	5,000(3,700-6,800)
Potassium azide (Tech. herbicide)	5.6	15,000(11,000-18,000)	10,000(8,800-11,000)	6,400(4,600-8,900)
Dichlobenil (W.P. herbicide)	5.3	16,000(14,000-18,000)	15,000(12,000-21,000)	11,000(8,000-15,000)
Dexon(R) (Tech. fungicide)	5.1	18,000(11,000-29,000)	6,000(4,400- 8,200)	3,700(2,700- 5,000)
I2C (Tech. herbicide)	4.9	20,000(18,000-22,000)	16,000(14,000-21,000)	10,000(8,500-12,000)
Fenac (Sod. salt)(W.P. herbicide)	5.1	22,000(20,000-24,000)	18,000(20,000-24,000)	12,000(9,500-14,500)
Simazine (W.P. herbicide)	6.1	30,000(26,000-35,000)	21,000(16,500-24,000)	13,000(11,400-15,000)
Paraquat (E.C. herbicide)	5.3	38,000(29,000-49,000)	18,000(12,000-26,000)	11,000(8,000-15,000)
Picloram (E.C. herbicide)	5.1	50,000(35,000-71,000)	48,000(34,000-67,000)	27,000(20,000-37,000)
Dipotassium salt of Endothal (E.C. herbicide)	4.2	No apparent effect	---------	96-Hr. exposure at 100,000
2,4-D (dimethylamine salt) (E.C. herbicide)	5.8	" " "	"	" " "

1/ Notations following the name of pesticide refer to form and use. Abbreviations Tech., W. P., and E. C. refer to technical, wettable powder, and emulsifiable concentrate, respectively.

various salts or esters of 2,4-D best illustrate this point. The butoxyethanol ester was the most toxic herbicide (1,400 µg/l), followed by the propylene glycolbutyl ether ester (2,[illegible]00 µg/l), and the iso-octyl ester (6,800 µg/l). The dimethylamine salt killed no scuds in a 96-hour exposure to 100,000 µg/l.

Relative toxicities

DISCUSSION Section

Results of exposing scuds to various concentrations of chlorinated hydrocarbon, methylcarbamate, and botanical insecticides are presented in table 2. The most toxic ~~and the~~ least toxic insecticides in this ~~group~~ are chlorinated hydrocarbon types. Methoxychlor was the most toxic, producing an LC_{50} value of 2.9 µg/l after a 24-hour exposure. The least toxic was aldrin, which killed half the scuds at 45,000 µg/l in 24 hours. Methylcarbamate insecticides were intermediate in toxicity. The 24-hour LC_{50} values ranged from 39 µg/l for Matacil to 86 µg/l for Zectran. The 24-hour LC_{50} values of the botanicals, ranged from 28 µg/l for a pyrethrum formulation to 6,000 µg/l for a rotenone formulation.

Scuds are slightly more sensitive to organophosphate insecticides than to the chlorinated insecticides (table 3). Coumaphos was the most toxic of all insecticides tested, having a 24-hour LC_{50} value of 0.32 µg/l. Bidrin, the least toxic organophosphate insecticide, produced a 24-hour LC_{50} of 2,200 µg/l.

The LC_{50} values of a defoliant, some herbicides, and some fungicides are shown in table 4. DEF, a defoliant, was the most toxic in this group, having a 24-hour LC_{50} of 360 µg/l. Herbicides were generally less toxic to scuds than most insecticides. The 24-hour LC_{50} value for diuron was 700 µg/l. No apparent effect was seen after a 96-hour exposure of 100,000 µg/l to the dipotassium salt of endothal and dimethylamine salt of 2,4-D.

The range in toxicity was greater in different salts and esters of the same basic structure than in herbicides having dissimilar structures. The 24-hour LC_{50} values for