SEPT 20 1983

DYNAMAC
CORPORATION

ALDICARB

TASK 1: REVIEW AND EVALUATION OF INDIVIDUAL STUDIES

Contract No. 68-01-6679

Final Report

September 20, 1983

SUBMITTED TO:

Environmental Protection Agency
Arlington, Virginia 22202

SUBMITTED BY:

Dynamac Corporation
Enviro Control Division
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

ALDICARB

Table of Contents

Study

1 Andrawes, N., and R. Meeker. 1976. Hydrolysis of Temik aldicarb pesticide in aqueous buffer solutions: Project No. 111A13, File No. 22263.

2 Andrawes, N., and R. Meeker. 1976. Hydrolysis of aldicarb sulfoxide in aqueous buffer solutions: Project No. 111A13, File No. 22326.

3 Lykins, H., and R. Meeker. 1971. Aldicarb pesticide: stability of aldicarb in water: Project No. 111A13, File No. 16060.

4 Bartley, W., and D. Heywood. 1965. Metabolism studies: hydrolytic stability of UC 21149: 855-31101-7073.

5 Williams, F. 1966. Letter sent to J.T. Adams, R.C. Back, D.F. Braun, et al. dated June 2, 1966: human exposure study in the field application of Temik 10 G on cotton.

6 Spiegel, M.H., and R.A. Conway. 1982. Hydrolysis studies of aldicarb, aldicarb sulfoxide, and aldicarb sulfone: Project III.

7 Stephen, J., and J. Durden. 1969. A study of the decomposition of Temik, Temik sulfoxide and Temik sulfone in water at 100°: Project No. 111A28, File No. 11815.

8 Lykins, H. 1969. Temik insecticide: the effect of temperature and pH on the stability of Temik, Temik sulfoxide and Temik sulfone in water: Project No. 111A13.

9 Andrawes, N.R., and G.C. Holsing. 1976. Hydrolysis of UC-21865 sulfocarb pesticide in aqueous buffer solutions: Project No. 111A14.

10 Andrawes, N., and R. Meeker. 1976. Photochemical transformation of aldicarb: Project No. 111A13, File No. 22335.

11 Andrawes, N., and R. Meeker. 1976. Photostability of aldicarb sulfoxide: Project No. 111A13, File No. 22325.

12 Bromilow, R.H. 1973. Breakdown and fate of oximecarbamate nematicides in crops and soils.

13 Smith, F.F., J.C. Maitlen, and L.M. McDonough. 1978. Report of residue analysis: PCY-68-11.

14 Borash, A.J. 1966. Insecticide, Temik: Relative soil persistence of sulfide, sulfoxide, and sulfone: Status Report 855-31107-8157.

Table of Contents Continued

Study	
15	Coppedge, J.R. 1967. Fate of 2-methyl-2-(methylthio)propionaldehyde(methylcarbamoyl)oxime (Temik) in plants and soil.
	Coppedge, J.R., and D.A. Lindquist. 19??. Preliminary studies on the fate of radiolabeled Union Carbide 21149 in soil and cotton plants.
	Coppedge, J.R., D.A. Lindquist, D.L. Bull, and H.W. Dorough. 1966? A report on 2-methy-12-(methylthio)propionaldehyde O (methylcarbamoyl)oxime (Temik) in cotton plants and soil.
	Coppedge, J.R., D.A. Lindquist, D.L. Bull, and H.W. Dorough. 1967. Fate of 2-methy-12-(methylthio)propionaldehyde O (methylcarbamoyl)oxime (Temik) in cotton plants and soil.
16	Richey, F., and H. Moorefield. 1972. Temik--aldicarb pesticide: metabolism by soils: laboratory studies: Project No. 111A12, File No. 17507.
17	Foschi, S., A. Cesari, I. Ponti, P.G. Bentivogli, and A. Bencivelli. 1970. Investigation into degradation and vertical movement of agricultural chemicals in soil.
18	Hirsh, D.H., K.P. Sheets, and G.C. Holsing. 1976. Sulfocarb: fate in aerobic and anaerobic soils.
19	Quraishi, M. 1972. Edaphic and water relationships of aldicarb and its metabolites.
20	Sheets, K., D. Hirsh, and R. Meeker. 1976. Temik aldicarb pesticide: metabolism of aldicarb in anaerobic Muskingum silt loam soil: Project No. 111A13, File No. 22196.
21	Romine, R.R., C.B. Halstead, C.E. Gibson, and L.K. Payne. 1968. Temik insecticide: leaching characteristics of Temik 10 G in soils: Project No. 111A13.
22	Richey, F.A., Jr., and W.J. Bartley. 1972. Temik aldicarb pesticide: water leaching of aldicarb, aldicarb sulfoxide, aldicarb sulfone and internal standard chloride ion in columns of four soil types: Project No. 111A12.
23	Bull, D., J. Coppedge, and R. Ridgway. 19??. Fate of Temik in soil with special reference to chemical changes, movement, and volatilization.
	Bull, D.L., R.A. Stokes, J.R. Coppedge, and R.L. Ridgway. 1970. Further studies of the fate of aldicarb in soil.

Table of Contents Continued

Study	
	Coppedge, J., D. Bull, and R. Ridgway. 1977. Movement and persistence of aldicarb in certain soils.
24	Richey, F.A., Jr., and H.H. Moorefield. 1972. Temik--aldicarb pesticide: upward movement of aldicarb through soil during water evaporation: Project No. 111A12.
25	Metcalf, R.L., and J.R. Sanborn. 1975. Illinois natural history survey bulletin: pesticides and environmental quality in Illinois: Volume 31, Article 9.
26	Clarkson, V., B. Rowe, R. Romine, and W.H. Hensley. 1968. Temik insecticide: field evaluation of the persistence and movement of Temik and its carbmate metabolites in soil: File No. 10485.
	Union Carbide Corp. 1968. Residue studies of Temik.
27	Leistra, M., J. Smelt, and T. Lexmond. 1976. Conversion and leaching of aldicarb in soil columns.
28	Kearby, W., C. Ercegovich, and M. Bliss. 1970. Residue studies on aldicarb in soil and scotch pine.
29	Andrawes, N., W. Bagley, and R. Herrett. 1971. Fate and carryover properties of Temik aldicarb pesticide 2-methyl-2-(methylthio)-propionaldehyde O-(methylcarbamoyl)oxime in soil.
	Andrawes, N., W. Bagley, and R. Herrett. 1968. Temik metabolism: Fate of C^{14}-Temik in cultivated soil: File No. 9218.
	Andrawes, N., W. Bagley, and R. Herrett. 1968. Temik metabolism: degradation and carry-over properties of...(Temik) in soil: File No. 10494.
30	Union Carbide Corporation. 1965. Residue data: UC 211491.
31	Hirsh, D., K. Sheets, and G. Holsing. 1977. Aldicarb subsequent crop residues: File No. 23520.
32	Romine, R.R., and R.L. Meeker. 1972. Temik aldicarb pesticide: leaching of aldicarb into sandy soil with irrigation of a Temik treated sugar beet field: UCC Project Report No. 17079.
33	Union Carbide Corp. 1971. Magnitude of the residues: aldicarb.
34	Union Carbide Corp. 1969. Soil: decline of aldicarb.

Table of Contents Continued

Study	
35	Woodham, D., R. Edwards, R. Reeves, and R.L. Schutzmann. 1973. Total toxic aldicarb residues in soil, cottonseed, and cotton lint following a soil treatment with the insecticide on the Texas high plains.
36	Back, P.C. 1979. Temik aldicarb pesticide: the Long Island water situation.
	Union Carbide Agricultural Products Company, Incorporated. 1981. Monitoring aldicarb residues in soil and water, 1980.
	Union Carbide Agricultural Products Company, Incorporated. 1982. Monitoring aldicarb residues in soil and water, 1981.
37	Union Carbide Corp. 1973. Residues: Temik 10 G and Temik 15 G.
38	Gunther, F.A., G.E. Carman, R.C. Baines, and W.E. Westlake. 1975. Aldicarb (Temik) residues in oranges, orange leaves, and soil after soil application in an orange grove.
39	Bull, D.L. 1968. Metabolism of UC-21149 (2-methyl-2-(methythio)-propionaldehyde o-(methylcarbamoyl)oxime) in cotton plants and soil in the field.
40	Union Carbide Corp. 1970. Temik 10 G aldicarb pesticide: nature and magnitude of residues in certain ornamental plants, greenhouse soils and water.
41	Ivie, D.A. 1981. Letter sent to Donald Stubbs dated Oct. 28, 1981 concerning the use of aldicarb to control citrus nematodes in grapefruit orchards.
42	Clarkson, V., and M. Meigen. 1968. Temik insecticide: the persistence of Temik in an agricultural soil as indicated by field and laboratory bioassay: File No. 10490.
43	Clarkson, V., B. Rowe, and R. Romine. 1968. Temik insecticide: field evaluation of the persistence of Temik and its carbamate metabolites in pond water and their effect on pond fauna: File No. 10491.
44	Union Carbide Corp. 1983. Temik aldicarb pesticide residues in Florida.

(TDR03B) DATA EVALUATION RECORD

CASE GS0140 ALDICARB STUDY 1 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102065 CONTENT CAT 01
Andrawes, N., and R. Meeker. 1976. Hydrolysis of Temik aldicarb pesticide in aqueous buffer solutions: Project No. 111A13, File No. 22263. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL: 096671-D.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 4, 1983

APPROVED BY:
TITLE:
ORG:
TEL: .

SIGNATURE: DATE:

CONCLUSIONS:

Degradation - Hydrolysis

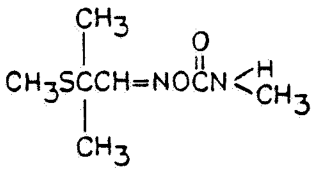
1. This study is scientifically valid.

2. [^{14}C]Aldicarb, at 10 ppm and 25 C, is stable to hydrolysis in sterile aqueous solutions buffered at pH 5 and 7 over a 28-day period. At pH 9, aldicarb degrades fairly rapidly with ~24% hydrolyzed over a 28-day period. Aldicarb oxime, the major degradation product at pH 9, accounted for 19.7% of the recovered radioactivity after 28 days.

3. This study fulfills EPA Data Requirements for Registering Pesticides (1983) by providing data on the hydrolysis of aldicarb at pH 5, 7, and 9 at 25 C and by identifying aldicarb oxime as a major degradate at pH 9.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}CH{=}NO\overset{\overset{O}{\|}}{C}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Hydrolysis was studied using S-methyl [^{14}C]aldicarb (Mallinckrodt Nuclear, specific activity 5.1 mCi/mM, radiochemical purity 99.4%) which was diluted with nonlabeled aldicarb (Union Carbide Corp., test substance uncharacterized) to yield a specific activity of 1.85 mCi/mM. Clark and Lub's buffer solutions were used: pH 5, 238.6 ml 0.1 N NaOH and 500 ml 0.1 M $KHC_8H_4O_4$; pH 7, 296.4 ml 0.1 N NaOH and 500 ml 0.1 M KH_2PO_4; and pH 9, 213.0 ml 0.1 N NaOH and 500 ml 0.1 M H_3BO_3. The solutions were diluted to 1000 ml with distilled water and pH values were measured using a pH meter and adjusted with 1 N NaOH or 1 N HCl. The solutions were sterilized by autoclaving at 242 F for 30 minutes, cooled, and treated with aldicarb at 10 ppm. The solutions were maintained aerobically in darkness at 25 C. Sterility was maintained in all preparations. Duplicate samples were taken at 0 and 4 hours, and at 1, 3, 7, 21, and 28 days. Samples were extracted five times with chloroform:acetonitrile (1:1). The extracts were combined, dried over sodium sulfate, filtered, and concentrated. These fractions and standards were analyzed by using two-dimensional TLC. The solvent systems used were diethyl ether:hexane (2:1) and 20% acetone followed by methylene chloride: acetonitrile (3:1) in the second dimension. Radioactive spots on the TLC plates were located by autoradiography, scraped off, and then quantified by using LSC. Nonlabeled standards were located by UV light, iodine vapor, or spraying with 1% potassium permanganate. Samples were radioassayed by LSC at various stages of the extraction process and no loss of radioactivity was detected.

REPORTED RESULTS:

Aldicarb was stable over the 28-day test period at pH 5 and 7, but degraded with pseudo-first order kinetics and a calculated half-life of 76.7 days in the pH 9 buffer. Aldicarb oxime was the major degradate (Table 1). The increase of aldicarb sulfoxide was assumed to be an artifact of the analytical procedure.

DISCUSSION:

The limit of detection was not given.

Table 1. Hydrolysis of [^{14}C]aldicarb in an aqueous buffer solution at pH 9.

Component	Percentage of the recovered radioactivity at various time intervals (days)					
	0	3	7	14	21	28
Aldicarb	98.1	96.1	92.5	91.6	75.1	76.2
Aldicarb oxime	--[a]	0.6	6.9	6.5	22.5	19.7
Aldicarb nitrile	0.8	0.2	--	0.9	1.2	1.8
Aldicarb sulfoxide	1.0	2.8	0.3	0.6	0.5	0.8
Aldicarb sulfoxide oxime	--	0.1	--	0.3	0.5	0.8
Impurity[c]	T[b]	T	T	T	T	0.5
Origin of TLC[d]	T	0.1	0.2	T	T	0.2
Water-solubles	T	T	T	T	T	0.1

[a] None detected.

[b] Detectable amounts of <0.1%.

[c] Impurity present in the radiolabeled aldicarb preparation.

[d] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

8

CASE GS0140 ALDICARB STUDY 2 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102066 CONTENT CAT 01
Andrawes, N., and R. Meeker. 1976. Hydrolysis of aldicarb sulfoxide in aqueous buffer solutions: Project No. 111A13, File No. 22326. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL: 096671-E.

SUBST. CLASS = T; CHEM R07518 IS TRANSF. PRODUCT OF CHEM 098301

DIRECT RVW TIME = 6 1/2 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 5, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Degradation - Hydrolysis

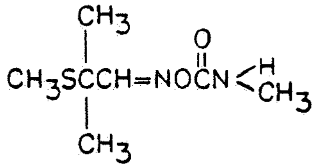
1. This study is scientifically valid.

2. [^{14}C]Aldicarb sulfoxide (a degradate of aldicarb), at 10 ppm and 25 C, is stable in sterile solutions buffered at pH 5 over a 28-day period. At pH 7, aldicarb sulfoxide is relatively stable with <8% hydrolyzed after 28 days; however, at pH 9, aldicarb sulfoxide hydrolyzes rapidly with a half-life of 2.3 days. Aldicarb sulfoxide oxime and aldicarb sulfoxide nitrile were identified as minor degradation products.

3. This study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by providing information on the hydrolysis of aldicarb sulfoxide a degradation product of aldicarb, at pH 5, 7, and 9 at 25 C.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}\begin{smallmatrix}H\\CH_3\end{smallmatrix}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Hydrolysis was studied using S-methyl [^{14}C]aldicarb sulfoxide (Union Carbide Corp., specific activity 6.06 mCi/mM, radiochemical purity >99%) which is a major degradation product of aldicarb. The [^{14}C]aldicarb sulfoxide was diluted with nonlabeled aldicarb sulfoxide (Union Carbide Corp., test substance uncharacterized) to yield a specific activity of 2.42 mCi/mM. Clark and Lub's buffer solutions were used: pH 5, 238.6 ml 0.1 N NaOH and 500 ml 0.1 M $KHC_8H_4O_4$; pH 7, 296.4 ml 0.1 N NaOH and 500 ml 0.1 M KH_2PO_4; and pH 9, 213.0 ml 0.1 N NaOH and 500 ml 0.1 M H_3BO_3. The solutions were diluted to 1000 ml with distilled water and adjusted to the desired pH. The solutions were sterilized by autoclaving at 242 F for 30 minutes, cooled, and treated with aldicarb sulfoxide at 10 ppm. The solutions were maintained aerobically in darkness at 25 C. Sterility was maintained in all preparations. Duplicate samples were taken at 0 and 4 hours, and at 1, 2, 7, 14, 21, and 28 days. Samples were extracted five times with chloroform:acetonitrile (1:1). The extracts were combined, dried over sodium sulfate, filtered, and concentrated. These fractions were analyzed by using two-dimensional TLC. The solvent systems used were ethyl ether: hexane (2:1) and 20% acetone followed by methylene chloride: acetonitrile (3:2) in the second dimension. A second TLC analysis was performed using chloroform:methanol (6:1) followed by 1,4-dioxane:benzene (3:2) in the second dimension. Radioactive spots were located by autoradiography, scraped off, and then quantified by using LSC. Total radioactivity in all samples was measured directly by LSC.

REPORTED RESULTS:

Aldicarb sulfoxide was stable over the 28-day period at pH 5, with only 1% degradation. At pH 7 and 9, aldicarb sulfoxide degraded with half-lives of 350 and 2.3 days, respectively (Tables 1 and 2). The major degradation products were aldicarb sulfoxide oxime and aldicarb sulfoxide nitrile. In the pH 9 solution, the unidentified water solubles reached 10.0% of the recovered radioactivity. Total radioactivity in the test solutions decreased by $\leq$4% over the test period.

DISCUSSION:

The limit of detection was not given.

Table 1. Hydrolysis of [^{14}C]aldicarb sulfoxide in an aqueous buffer solution at pH 7.

Component	Percentage of the recovered radioactivity at various time intervals (days)					
	0	1	7	14	21	28
Aldicarb sulfoxide	97.3	96.3	93.8	93.7	93.1	92.0
Aldicarb sulfoxide oxime	1.9	2.9	4.9	4.5	4.4	3.6
Aldicarb sulfoxide nitrile	0.5	0.6	1.0	1.4	2.1	3.1
Origin of TLC[a]	T[b]	T	0.1	T	T	0.1
Water-solubles	0.2	0.2	0.2	0.4	0.4	1.3

[a] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

[b] Detectable amounts of <0.1%.

11

Table 2. Hydrolysis of [^{14}C]aldicarb sulfoxide in an aqueous buffer solution at pH 9.

	Percentage of the recovered radioactivity at various time intervals (days)					
Component	0	4 hours	1 day	2 days	7 days	14 days
Aldicarb sulfoxide	98.1	92.6	78.8	56.5	11.8	10.6
Aldicarb sulfoxide oxime	T[a]	4.7	13.8	24.8	59.2	49.0
Aldicarb sulfoxide nitrile	0.5	1.8	6.2	16.7	23.6	29.8
Origin of TLC[b]	0.1	T	0.2	1.0	1.2	0.6
Water-solubles	1.3	1.0	1.0	1.0	4.2	10.0

[a] Detectable amounts of <0.1%.

[b] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 3 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102048 CONTENT CAT 01
Lykins, H., and R. Meeker. 1971. Aldicarb pesticide: stability of aldicarb in water: Project No. 111A13, File No. 16060. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096670-C.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 6, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Degradation - Hydrolysis

This portion of the study cannot be validated because the analytical method for determining aldicarb residues was not presented. Additionally, this portion of the study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because it was not stated that the distilled water samples were sterile, no attempt was made to identify degradation products, and the test substance was uncharacterized.

Degradation - Photodegradation in Water

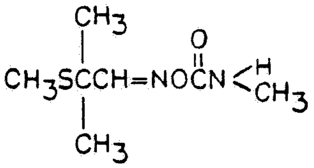
This portion of the study cannot be validated because the analytical method for determining aldicarb residues was not presented. Additionally, this portion of the study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the experiment was not conducted using sterile distilled or deionized water, no attempt was made to identify degradation products, and the test substance was uncharacterized.

Metabolism - Aerobic Aquatic

This portion of the study cannot be validated because the analytical method for determining aldicarb residues was not presented. Additionally, this portion of the study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the patterns of formation and decline of degradation products were not addressed and the test substance was uncharacterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}CH{=}NO\overset{\overset{O}{\|}}{C}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Union Carbide Corp., test substance uncharacterized) was applied at 0.5 ppm to the following test samples: distilled water adjusted to pH 6.0, 7.0, and 8.0; pond (pH 7.1) and lake (pH 7.0) water; pond and lake water with sediment added; and pond water exposed to UV light (Table 1). The volume and incubation temperatures were 2500 ml and 25 C, respectively, for the distilled water samples, but were not reported for the other samples. The nonirradiated samples were kept in darkness. The irradiated sample was exposed to a Westinghouse 275 watt UV sunlamp for 8 hours per day. Duplicate water samples were taken for analysis (method unspecified) at 0, 5, 10, 15, 20, 25, and 30 days posttreatment. Sediment samples were collected 20 days after treatment, dried, and analyzed for aldicarb residues (method unspecified).

REPORTED RESULTS:

Aldicarb residues were relatively stable in distilled water at pH 6.0, 7.0, and 8.0 with ~85-90% of day 0 aldicarb residues remaining after 30 days (Table 1).

The decline of aldicarb residues was similar (~20% loss in 30 days) in both UV irradiated and nonirradiated pond water samples.

Aldicarb residues were relatively stable in pond and lake water samples incubated without sediment with 82-100% of day 0 aldicarb residues remaining after 30 days. However, aldicarb residues dissipated rapidly with a half-life of 5-6 days in pond and lake water samples incubated with sediment. Sediment analyzed from the pond water sample contained aldicarb residues at ≤0.01 ppm after 20 days.

DISCUSSION:

These experiments cannot be assessed due to a lack of detailed materials, analytical methods, and experimental conditions.

Table 1. Stability of aldicarb residues (ppm) in water.

	Total days exposed						
	0	5	10	15	20	25	30
Distilled water at pH 6.0	0.50	0.47	0.45	0.44	0.45	0.45	0.45
Distilled water at pH 7.0	0.52	0.45	0.49	0.46	0.46	0.44	0.44
Distilled water at pH 8.0	0.51	0.46	0.48	0.43	0.43	0.39	0.44
Pond water[a] and UV light (Clayton, North Carolina)	0.43	0.43	0.32	0.33	0.33	0.27	0.33
Pond water (Clayton, North Carolina)	0.51	0.47	0.57	0.45	0.40	0.36	0.42
Pond water and sediment (Clayton, North Carolina)	0.44	0.24	0.10	0.06	0.02	--[b]	--
Summersville lake water[c] (West Virginia)	0.50	0.50	0.48	0.49	0.48	0.50	0.50
Summersville lake water and sediment (West Virginia)	0.47	0.29	0.16	0.11	0.06	0.03	--

[a] pH 7.1.

[b] Not determined.

[c] pH 7.0.

CASE GS0140 ALDICARB STUDY 4 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102072 CONTENT CAT 01
Bartley, W., and D. Heywood. 1965. Metabolism studies: hydrolytic stability of UC 21149: 855-31101-7073. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-R.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 1/2 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 7, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

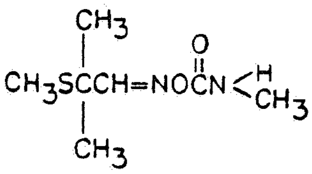
CONCLUSION:

Degradation - Hydrolysis

This study cannot be validated because it was not stated to have been conducted in darkness. Additionally, this study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because sterile buffered solutions at pH 5, 7, and 9 were not used and the analytical method used for determining aldicarb residues is nonquantitative.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\underset{CH_3}{\overset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N<^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Five samples were treated with 0.26-0.27 g of aldicarb (Union Carbide Corp., recrystallized twice, m.p. 100-101 C). Sample No. 1 contained 10 ml of diethyl ether, 2 ml of distilled water, and 10 drops of triethylamine; Sample No. 2 contained 2 ml of dimethylformamide, 1 ml of water, and 10 drops of triethylamine; Sample No. 3 contained 10 ml diethyl ether and 1 ml 1 M KOH; Sample No. 4 contained diethyl ether and water; and Sample No. 5 contained dimethylformamide and water. The samples were incubated for 4 days at room temperature. Ten microliter samples were then spotted onto silica gel TLC plates which were developed in diethyl ether:benzene (3:1). The spots were located by exposure to iodine vapors or spraying with potassium dichromate. Results were reported as the relative spot intensity on the TLC plates.

REPORTED RESULTS:

Aldicarb TLC spots were intense in samples 2, 4, and 5 and were moderate in samples 1 and 3. Aldicarb oxime was found to be intense in sample 3 and moderate in sample 2. Intensive unknown spots were in samples 1, 2, and 5. These results demonstrate that the strong base in sample 3 caused the greatest conversion to the aldicarb oxime. No further attempt was made to identify the unknowns separated by TLC.

DISCUSSION:

1. It was not stated that the samples were sterile and maintained in the dark.

2. The samples were not extracted and a precise method of quantitating the aldicarb residues was not used.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 5 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 101530

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00080705 CONTENT CAT 01
Williams, F. 1966. Letter sent to J.T. Adams, R.C. Back, D.F. Braun, et al. dated June 2, 1966: human exposure study in the field application of Temik 10 G on cotton. Unpublished study received Mar. 2, 1967 under 7F0573; submitted by Union Carbide Corp., Charleston, W. Va.; CDL:090072-M.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: TOX -55-0515010505 TOX -35-05150001
SEC: TOX -35-05200001

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: R. Doyle and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: R. Doyle DATE: Feb. 9, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

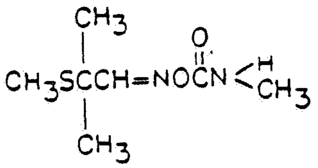
CONCLUSION:

Exposure

This study could not be evaluated because the methods were not sufficiently described. In addition, procedures and protocols were inadequate to assess the potential exposure to aldicarb and errors were made in calculating exposure levels (as determined from the raw data provided).

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$

2-Methyl-2-(methylthio)propionaldenyde
0-(methylcarbamoyl)oxime

Three 2-acre plots when planted with cotton were simultaneously fertilized (granular 5-10-10) and treated with aldicarb (Temik, 10% G, Union Carbide Corp.) at 0, 0.5, and 1.0 lb ai/A. An additional area (6 rows, 450 feet long) was treated at 10 lb ai/A. Aldicarb was applied into the seed furrow with a tractor-mounted granular applicator. The furrow was closed mechanically immediately after the granules were dropped into the furrow. Rows were at 42-inch spacings and the soil in the plots was predominantly Norfolk sandy loam. The maximum application rate permitted by the applicator was 5.0 lb ai/A, therefore, two runs through the 10 lb ai/A area were required. All applications were made on May 9, 1966. The day was overcast at 70 F, with winds of 2-4 mph in the morning and 4-? mph in the afternoon (copy partially illegible). The soil had been treated with trifluralin (Treflan, 0.62 lb ai/A) and rototilled 4 days prior to application.

Three workers participated in the aldicarb application, which included opening the aldicarb box, loading and calibrating the applicator, driving the tractor, and observing the application. Workers were exposed for ~5 hours. A portable air sampler (operating at 7 l/min, trapping efficiency not reported) was worn by each worker. Air intake for the samples was in the breathing zone and a Whatman No. 41 filter paper was the trapping medium. A separate sampler was operated for 5.5 hours in the building where the aldicarb was stored. Portable air samples were also operated adjacent to application operations; including opening the aldicarb box and pouring the aldicarb into the applicator. An air sampler was attached to the applicator and operated when applying aldicarb at 10 lb ai/A.

All workers wore rubber gloves and coveralls. Two of the workers wore combination goggle and respiratory protection. Blood samples were taken from each worker prior to the experiment and shortly after completing the application. The blood was analyzed for cholinesterase activity by measuring the pH change resulting from the enzyme induced hydrolysis of acetylcholine to acetic acid. A normal level of cholinesterase activity results in a change of 0.44 to 0.88 pH units in this test procedure.

Urine samples were collected from each worker before, during, and within 2 hours after aldicarb application. The urine was tested for aldicarb sulfoxide. The method of analysis was not given. All workers were examined superficially by a physician at the completion of the study.

REPORTED RESULTS:

Aldicarb was not detected in any air samples except in the samples attached to the applicator (0.009 mg/m^3 reported as 0.06 mg/m^3). Recoveries from all other samples were below the detection limit. Errors were apparent in aldicarb recovery data but insufficient data were available to correct the data. Cholinesterase activity was normal in all workers before and after the study (pH change 0.52-0.58 units). The apparent aldicarb sulfoxide levels in urine were below 0.07 μg/ml. Workers did not display pin-point pupils of the eyes during or after aldicarb application.

DISCUSSION:

1. Analytical methods for aldicarb and aldicarb sulfoxide were not given. From the information available, the method used to quantify aldicarb sulfoxide was not specific.

2. Numerous mistakes in calculating the aldicarb concentration per unit volume of air were apparent.

3. This study lacked replication and did not include controls. No data on the test subjects (workers) such as age, general state of health, etc. were given.

4. Dermal exposure was not addressed.

5. Trapping efficiencies for the portable air samples were not reported.

CASE GS0140 ALDICARB STUDY 6 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00096547 CONTENT CAT 01

Spiegel, M.H., and R.A. Conway. 1982. Hydrolysis studies of aldicarb, aldicarb sulfoxide, and aldicarb sulfone: Project III. Unpublished study received Mar. 9, 1982 under 264-330; submitted by Union Carbide Agricultural Products Co., Inc., Ambler, Pa.; CDL: 246960-E.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 8, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

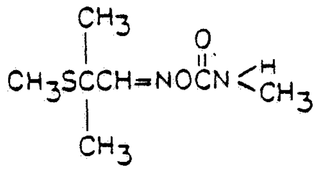
CONCLUSION:

Degradation - Hydrolysis

This study cannot be validated because the analytical method for determination of residues was not given. Additionally, this study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because degradation products were not identified, the temperature was not maintained at 25 C, and the test substances were not characterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$CH_3S\underset{CH_3}{\overset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N<\genfrac{}{}{0pt}{}{H}{CH_3}$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb, aldicarb sulfoxide, and aldicarb sulfone (Union Carbide Corp., test substances uncharacterized) were applied at 10 ppm to previously sterilized (autoclaved at ~120 C for 1 hour) buffer solutions adjusted to pH 5.5, 7.5, and 8.5. The three buffer solutions were prepared as follows: pH 5.5, 0.01 M sodium acetate adjusted with acetic acid; pH 7.5, 35 ml of 0.067 M NaH_2PO_4 and 100 ml of 0.067 M K_2HPO_4 and 10-fold dilution; and pH 8.5, 0.025 M $Na_2B_2O_4$ adjusted with acetic acid. The treated buffer solutions were thoroughly mixed, covered to maintain dark conditions, and incubated in constant temperature baths at 5 and 15 C. Samples were withdrawn for analysis on days 0, 6, 14, 28, 40, 61, 83, 139, 186, and 278 posttreatment.

REPORTED RESULTS:

The hydrolytic half-lives of aldicarb, aldicarb sulfoxide, and aldicarb sulfone are reported in Table 1.

DISCUSSION:

1. Degradates of the applied compounds (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) were not identified.

2. The analytical method and the sampling protocol were not described.

Table 1. Half-lives of aldicarb, aldicarb sulfoxide, and aldicarb sulfone.

Temperature (C)	pH	Half-lives (days)		
		Aldicarb	Aldicarb sulfoxide	Aldicarb sulfone
5	5.5	4620	800	930
	7.5	1957	645	630
	8.5	1394	65	35
15	5.5	3223	440	450
	7.5	1904	364	125
	8.5	172	11	3

CASE GS0140 ALDICARB STUDY 7 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102057 CONTENT CAT 01

Stephen, J., and J. Durden. 1969. A study of the decomposition of Temik, Temik sulfoxide and Temik sulfone in water at 100°: Project No. 111A28, File No. 11815. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096670-Q.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 30, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

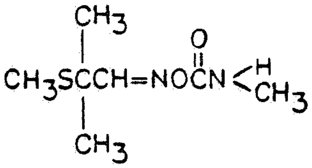
CONCLUSION:

Degradation - Hydrolysis

This study is scientifically invalid because it was not carried out in darkness. Additionally, this study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because aqueous solutions buffered at pH 5, 7, and 9 at ~25 C were not used.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Hydrolysis was studied using separate aqueous solutions (distilled water) of aldicarb, aldicarb sulfone, or aldicarb sulfoxide (test substances uncharacterized, Union Carbide Corp.) at 2.9, 9.1, and 9.1%, respectively. The water temperature was kept at 100 C. Samples (10 ml) were collected at appropriate intervals for a period of up to 6 hours. Samples were extracted with a 1:1 chloroform:acetonitrile mixture twice and the organic phase was evaporated to dryness. The residue was dissolved in 20 ml of chloroform and the intensity of the carbamate carbonyl absorption was measured using IR. Degradates were isolated by TLC and identified comparing the IR spectra with those of known standards. Visualization of TLC spots was by UV light or iodine vapor.

REPORTED RESULTS:

Aldicarb had a half-life of 78 minutes and completely hydrolyzed after 5 hours. The major degradate was aldicarb oxime with two minor degradates, one of which was identified as 1,3-dimethylurea.

Aldicarb sulfoxide had a half-life of 20 minutes and completely degraded after 105 minutes. The major degradate was 2-methyl-2-methylsulfinyl propionitrile. Minor products were 2-methyl-2-methylsulfinyl propionaldehyde oxime, 1,3-dimethylurea and two unidentified compounds.

Aldicarb sulfone had a half-life of 48 minutes and the degradation was incomplete after 7 hours. The major degradate was 2-methyl-2-methylsulfonyl propionaldehyde oxime. Minor degradates were 2-methyl-2-methylsulfonyl priopionitrile, 1,3-dimethylurea and four unknowns.

DISCUSSION:

Hydrolysis cannot be evaluated because the experiment was not conducted in darkness and water characteristics including pH were not reported. Also, 100 C is not an environmentally relevant temperature; the stated purpose of the experiment was to evaluate the degradation of aldicarb, that would occur when cooking food containing aldicarb residues.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 8 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102011 CONTENT CAT 01

Lykins, H. 1969. Temik insecticide: the effect of temperature and pH on the stability of Temik, Temik sulfoxide and Temik sulfone in water: Project No. 111A13. Unpublished study received June 25, 1973 under 3F1414; submitted by Union Carbide Corp., Washington, D.C.; CDL:093776-G.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 29, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

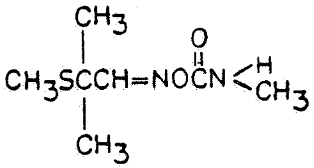
CONCLUSION:

Degradation - Hydrolysis

This study cannot be validated because it was not carried out in darkness and the analytical method was not described. Additionally, this study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test solutions were not maintained at 25 C.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Hydrolysis was studied at 80 and 100 C using separate solutions of aldicarb, aldicarb sulfone, or aldicarb sulfoxide (test substances uncharacterized, Union Carbide Corp.) at pH 6, 7, and 8. Distilled water was adjusted to the desired pH using potassium dihydrogenphosphate and sodium hydroxide. The solutions initially contained 9 µg of the test substance; the volume of the solutions was not given. The aqueous media was heated to the appropriate temperature in a 500 ml Erlenmeyer flask equipped with a water condenser. The test substance was added and the mixture was heated for up to 16 hours (Table 1). The solution was cooled and analysed immediately by a modified thin juice procedure of UC 21149-III-SBF (not described).

REPORTED RESULTS:

Hydrolysis half-lives for aldicarb, aldicarb sulfoxide, and aldicarb sulfone are reported in Table 1.

DISCUSSION:

1. This study cannot be validated because the experiment was not conducted in darkness and the analytical method employed was not described. A temperature of 80 or 100 C does not represent environmental conditions.

2. Residue levels were reported only in total micrograms. The volumes of the test solutions were not given; therefore, the concentrations could not be calculated.

3. Degradates were not identified.

Table 1. Hydrolysis of aldicarb at 80 and 100 C.

		80 C		100 C	
Test substance	pH	Half-life (min)	Test period (min)	Half-life (min)	Test period (min)
Aldicarb	6	1140	960	115	180
	7	205	960	54	180
	8	49	960	7	180
Aldicarb sulfoxide	6	80	180	20	60
	7	45	180	8	60
	8	3.1	180	0.5	60
Aldicarb sulfone	6	120	360	50	60
	7	15	360	<1.0	60
	8	1.5	360	<0.5	60

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS0140 ALDICARB STUDY 9 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00053377 CONTENT CAT 01
Andrawes, N.R., and G.C. Holsing. 1976. Hydrolysis of UC-21865 sulfocarb pesticide in aqueous buffer solutions: Project No. 111A14. Unpublished study received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-Q.

SUBST. CLASS = T; CHEM 110801 IS TRANSF. PRODUCT OF CHEM 098301

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Mar. 28, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

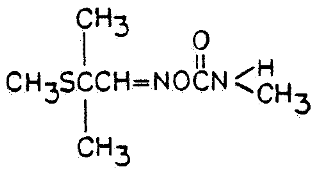
CONCLUSION:

Degradation - Hydrolysis

This study is scientifically invalid because it was not carried out in darkness. If this study had been conducted in darkness, it would have partially fulfilled EPA Data Requirements for Registering Pesticides (1983) by providing hydrolysis data for aldicarb sulfone.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N<^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

S-methyl or tert-labeled [^{14}C]aldicarb sulfone (specific activities 6.06 and 3.9 mCi/mM, respectively, radiochemical purity >99%, Union Carbide Corp.), a degradate of aldicarb, was diluted with nonlabeled aldicarb sulfone (Union Carbide Corp., test substance uncharacterized) to yield a specific activity of 3.0 mCi/mM. Clark and Lub's aqueous buffer solutions were used: pH 5, 238.6 ml of 0.1 N NaOH and 500 ml 0.1 M $KHC_8H_4O_4$; pH 7, 296.4 ml of 0.1 N NaOH and 500 ml 0.1 M KH_2PH_4; and pH 9, 213.0 ml 0.1 N NaOH and 500 ml 0.1 M H_3BO_3. These solutions were diluted to 1000 ml and adjusted to the appropriate pH with 1 N NaOH or 1 N HCl. The solutions were placed in 50 or 350 ml heavy-walled bottles which were vented (through glass wool to prevent contamination by microorganisms) to maintain atmospheric pressure. The bottles were then sterilized in an autoclave. With the buffer temperatures at either 5 or 25 C, [^{14}C]aldicarb sulfone (in 70% ethanol) was injected into the buffer solution to yield a final concentration of 10.0 ppm. Duplicate 5 ml samples were taken at appropriate intervals over the 21-28 day test period. Samples were extracted five times with 5 ml of chloroform:acetonitrile (1:1). The organic fractions were combined, dried over sodium sulfate, filtered, and concentrated. The extracts were analyzed by two dimensional TLC. The solvent systems used were diethyl ether:hexane:acetone (10:5:4) and methylene chloride:acetonitrile (3:1). The radioactive spots were located by autoradiography and the radioactivity was determined quantitatively by LSC. Nonlabeled standards were located by UV light, iodine vapor, or 1% potassium permanganate. Water solubles of the pH 9 buffer at 25 C were analyzed by TLC using acetone:methanol:formic acid (80:15:10) as the eluant. Total radioactivity was monitored at various stages of the extraction process by using LSC; no loss of radioactivity was encountered.

REPORTED RESULTS:

Aldicarb sulfone was relatively stable at pH 5 and 25 C, but degraded with half-lives of 81.3 and 0.9 days at pH 7 and 9, respectively. At pH 9 and 5 C, the half-life was calculated to be 31.4 days (Tables 1 and 2). The hydrolysis appears to follow pseudo-first order kinetics. Aldicarb sulfone oxime, aldicarb sulfone nitrile, 2-hydroxy isobutyraldehyde oxime, and methane sulfonic acid were the major degradation products. Aldicarb sulfone oxime degraded rapidly under alkaline conditions (half-life of <2 days at pH 9) and aldicarb sulfone nitrile had a moderate rate of degradation (half-life of 19.7 days at pH 9). Chemical names for all products are presented in Table 3. To further identify the reaction mechanism, supporting experiments showed that 2-hydroxy isobutyraldehyde oxime was a major degradate of tert-[^{14}C]aldicarb sulfone and also a degradate of sulfocarb oxime (which was dissolved in 1.0 N KOH and heated to 100 C). It was concluded that methane sulfonic acid (the largest degradate at pH 9 and 25 C) was formed as a result of decomposition of aldicarb sulfone oxime.

DISCUSSION:

1. Hydrolysis cannot be assessed because the experiment was not carried out in darkness.

2. The study made references to some experiments using tert-labeled [^{14}C]-aldicarb sulfone that were not fully reported.

Table 1. Percent of the recovered radioactivity of s-methyl [^{14}C]aldicarb sulfone aqueous buffer solutions at 25 C.

	pH 5 solution						pH 7 solution					
	Days after treatment						Days after treatment					
Component	0	3	7	14	21	28	0	3	7	14	21	28
Aldicarb sulfone	99.0	98.7	98.4	97.8	98.2	97.8	99.0	97.0	92.4	86.7	80.6	78.0
Aldicarb sulfone oxime	--[a]	0.1	0.1	--	0.3	0.5	0.3	1.9	4.3	7.7	9.9	11.4
Aldicarb sulfone nitrile	--	0.4	0.5	1.4	0.6	1.1	0.3	0.4	2.5	2.7	2.5	1.1
Aldicarb sulfone aldehyde	--	0.4	0.5	0.4	0.4	0.5	--	0.4	0.3	0.4	0.4	0.2
Unknowns	0.7	0.3	0.3	0.1	0.2	--	--	--	--	--	--	--
Origin of TLC[b]	0.1	T[c]	T	T	0.1	T	0.1	0.1	T	T	T	T
Water solubles	0.3	0.2	0.1	0.1	0.1	0.2	0.2	0.3	0.5	2.4	6.6	9.4
PPM [^{14}C]sulfocarb equivalents	10.00	9.89	9.85	9.91	9.99	9.54	10.00	10.00	9.93	9.85	9.92	9.3

[a] --; None detected.

[b] Radioactivity remaining at the point of application of the organic extracts to the thin-layer plates.

[c] T; Trace.

Table 2. Percent of the recovered radioactivity of s-methyl [^{14}C]aldicarb sulfone in aqueous buffer solutions at pH 9.

Component	Solutions at 25 C							Solutions at 5 C			
	Days after treatment							Days after treatment			
	0	0.6	1	3	7	14	21	7	14	21	28
Aldicarb sulfone	99.1	89.6	44.7	9.1	--[a]	--	--	78.6	68.7	61.1	49.4
Aldicarb sulfone oxime	0.2	1.8	10.7	3.0	--	--	--	8.7	11.0	9.8	10.8
Aldicarb sulfone nitrile	0.3	1.4	8.1	17.9	21.9	19.2	13.4	3.9	5.6	4.9	12.2
Aldicarb sulfone aldehyde	--	4.5	0.9	0.5	0.6	0.6	0.7	1.0	0.4	0.3	0.4
Aldicarb sulfone amide	--	--	--	--	0.5	2.4	5.6	--	--	--	--
Unknowns	--	--	0.2	0.1	0.1	0.2	--	1.6	1.6	1.4	2.5
Origin of TLC[b]	0.1	0.2	0.1	T[c]	0.3	0.3	1.0	0.2	0.1	0.1	0.3
Water solubles	--	--	--	--	--	--	--	6.0	12.8	22.5	24.4
Aldicarb sulfone acid	0.2[d]	2.5[d]	2.7	5.2	7.1	4.6	4.3	--	--	--	--
Methane sulfonic acid			32.6	64.2	69.5	72.8	74.8	--	--	--	--
[^{14}C]Sulfocarb equivalents (ppm)	10.00	10.00	9.92	9.86	9.78	9.73	9.80	10.00	10.00	10.00	10.00

[a] --; None detected.

[b] Radioactivity remaining at the point of application of the organic extracts to the thin-layer plates.

[c] T; Trace.

[d] Aldicarb sulfone acid and methane sulfonic acid combined for analysis.

Table 3. Chemical names and the corresponding abbreviations of aldicarb sulfone and its hydrolysis products.

Chemical names	Abbreviations
2-Methyl-2-(methylsulfonyl)propionaldehyde O-(methylcarbamoyl)oxime	Aldicarb sulfone
2-Methyl-2-(methylsulfonyl)propionaldehyde oxime	Aldicarb sulfone oxime
2-Methyl-2-(methylsulfonyl)propionitrile	Aldicarb sulfone nitrile
2-Methyl-2-(methylsulfonyl)propionamide	Aldicarb sulfone amide
2-Methyl-2-(methylsulfonyl)propionaldehyde	Aldicarb sulfone aldehyde
2-Hydroxy isobutyraldehyde oxime	--[a]
2-Methyl-2-(methylsulfonyl)propionic acid	Aldicarb sulfone acid
Methane sulfonic acid	--

[a] --; Abbreviations not used.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS0140 ALDICARB STUDY 10 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102067 CONTENT CAT 01
Andrawes, N., and R. Meeker. 1976. Photochemical transformation of aldicarb: Project No. 111A13, File No. 22335. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-F.

SUBST. CLASS = S.

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Apr. 1, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

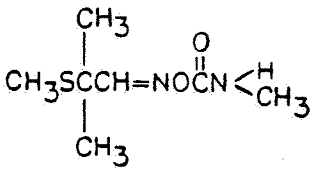
CONCLUSION:

Degradation - Photodegradation in Water

This study is scientifically invalid because precautions were not taken during the test to minimize and/or account for the loss of [^{14}C]aldicarb residues through volatilization ($\leq$33% of the applied radioactivity unaccounted for). Additionally, this study would not satisfy EPA Data Requirements for Registering Pesticides (1983) because the test was not conducted long enough to establish the pattern of decline of aldicarb.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

S-methyl [^{14}C]aldicarb (Mallinckrodt Nuclear, specific activity 5.1 mCi/mM, radiochemical purity 95%) was mixed with nonlabeled aldicarb (Union Carbide Corp., test substance uncharacterized) to yield a specific activity of 0.7 mCi/mM. This mixture was used to fortify a pH 5 buffer (Clark and Lubs buffer, Handbook of Chemistry) at 5 ppm. A solution with 2% acetone as a photosensitizer was also used. The solutions were tested in a water jacketed reaction vessel equipped with a condenser. A water jacketed immersion well containing the UV lamp was placed inside the reaction vessel. Construction was of borosilicate glass. A high pressure, quartz, mercury-vapor, 200-watt Hanovia immersion lamp was used. The wavelength distribution was as follows: 0.86 watts (303 nm), 2.3 watts (313 nm), 0.36 watts (334 nm), and 3.1 watts (366 nm). The borosilicate glass does not transmit light of wavelength less than ~300 nm. Temperature was maintained at 20-25 C under aerobic conditions. Duplicate 10 ml samples were taken daily. Samples were extracted five times with a chloroform:acetonitrile (1:1, v:v) solution. The organic fractions were combined, dried over sodium sulfate, filtered and concentrated. These fractions and standards were analyzed by two-dimensional silica gel TLC with diethyl ether-n-hexane (2:1) plus 20% acetone and methylene chloride:acetonitrile (3:1) in one combination and chloroform:methanol (6:1) and 1,4-dioxane-benzene (3:2) in another combination. Radioactive zones were located by autoradiography and were assayed by using LSC. Degradate identification was based on two dimensional TLC in at least four solvent systems as described by Bartley, et al. (1970. J. Agric. Food Chem. 18:446). Samples were radioassayed by using LSC at various stages of the extraction procedure, and no loss of radioactivity was detected.

REPORTED RESULTS:

Aldicarb degraded rapidly from days 0 to 2 and slowly from days 2 to 7 when exposed to UV light (Tables 1 and 2). After 7 days, 52.7 and 64.8% of the aldicarb initially applied remained as the parent compound in the nonphotosensitized and photosensitized solutions, respectively. Respective values for aldicarb sulfoxide were 7.5 and 11.2%, while other degradates accounted for <2.6%. Lost radioactivity accounted for 28.0 and 6.1% in the nonphotosensitized and photosensitized solutions, respectively. This was reportedly due to volatility; however, it was not positively identified as such. Aldicarb was stable in the dark controls (Table 3). The half-life of aldicarb was calculated to range from 8 to 12 days.

DISCUSSION:

1. Loss of radioactivity was attributed to volatility; however, the volatile fraction was not trapped and characterized. In addition, to assess photodegradation, volatility losses should be minimized.

2. The intensity of the UV radiation compared to natural sunlight was not reported.

Table 1. Photolysis of [^{14}C]aldicarb in pH 5 buffer solution.

Products	Percentage of the applied radioactivity[a] at indicated days posttreatment						
	0	1	2	3	5	6	7
Aldicarb	95.7	80.4	71.6	67.6	52.2	55.9	52.7
Aldicarb sulfoxide	2.0	3.1	4.2	5.8	5.5	6.4	7.5
Aldicarb sulfoxide nitrile	ND[b]	ND	ND	ND	ND	ND	0.3
Aldicarb sulfone nitrile	1.1	1.3	1.5	1.3	0.7	0.8	0.8
Aldicarb sulfone alcohol	0.5	0.4	0.4	0.3	0.3	0.7	0.4
Origin of TLC[c]	0.7	0.6	0.8	0.3	0.4	0.2	0.5
Water-solubles	1.0	5.7	7.0	8.4	8.1	8.7	9.9
Unaccounted for[d]	ND	8.3	14.4	16.4	32.7	28.0	28.0

[a] Average of two determinations.

[b] ND; none detected.

[c] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

[d] Reportedly lost as volatiles.

Table 2. Photolysis of [^{14}C]aldicarb in pH 5 buffer solution in the presence of 2% acetone as a photosensitizer.

Products	Percentage of the applied radioactivity[a] at indicated days posttreatment						
	0	1	2	3	5	6	7
Aldicarb	93.8	78.9	73.6	70.9	67.7	64.2	64.8
Aldicarb sulfoxide	2.8	4.9	6.2	8.2	9.7	10.4	11.2
Aldicarb sulfoxide nitrile	0.3	0.2	0.3	0.4	0.3	0.5	0.4
Aldicarb sulfone nitrile	1.2	2.4	2.5	1.9	2.2	2.0	2.6
Aldicarb sulfone alcohol	1.0	0.4	1.1	0.5	0.3	0.6	0.4
Origin of TLC[b]	0.4	0.5	1.1	0.2	0.4	0.1	0.3
Water-solubles	0.6	9.0	10.6	12.4	12.3	14.7	14.1
Unaccounted for[c]	ND[d]	3.6	4.7	5.5	7.1	7.4	6.1

[a] Average of two determinations.

[b] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

[c] Reportedly lost as volatiles.

[d] ND; none detected.

Table 3. [^{14}C]Aldicarb in pH 5 buffer solution in the dark.

Products	Percentage of the applied radioactivity[a] at indicated days posttreatment						
	0	1	2	3	5	6	7
Aldicarb	95.4	95.2	96.0	95.9	95.7	93.7	95.2
Aldicarb sulfoxide	2.1	2.3	1.9	1.5	1.8	3.5	2.3
Aldicarb sulfoxide nitrile	ND[b]	ND	ND	ND	ND	ND	ND
Aldicarb sulfone nitrile	0.6	0.4	0.2	0.5	0.4	0.4	0.5
Aldicarb sulfone alcohol	0.7	0.5	0.6	0.6	0.7	1.0	0.7
Origin of TLC[c]	0.4	0.3	0.6	0.4	0.2	0.5	0.2
Water-solubles	0.9	1.2	0.8	1.1	1.1	1.0	1.2
Unaccounted for[d]	ND	ND	ND	ND	ND	ND	ND

[a] Average of two determinations.

[b] ND; none detected.

[c] Radioactivity remaining at the point of application of the organic extracts to the TLC plates.

[d] Reportedly lost as volatiles.

CASE GS0140 ALDICARB STUDY 11 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05101505 GUIDELINE 40 CFR 163.62-7b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102068 CONTENT CAT 01
Andrawes, N., and R. Meeker. 1976. Photostability of aldicarb sulfoxide: Project No. 111A13, File No. 22325. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-G.

SUBST. CLASS = T; CHEM R07518 IS TRANSF. PRODUCT OF CHEM 098301

DIRECT RVW TIME = 6 (MH) START-DATE END DATE

REVIEWED BY: S. Simko and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: S. Simko T. Opeka DATE: Mar. 31, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Degradation - Photodegradation in Water

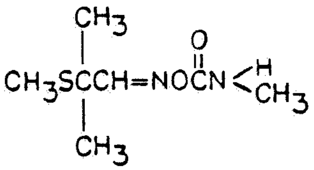
1. This study is scientifically valid.

2. [^{14}C]Aldicarb sulfoxide is relatively stable in water (uncharacterized) when exposed to UV light at 20-25 C with ~93% of the applied ^{14}C remaining as parent compound after 14 days of exposure.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the experiment was not carried out for a sufficient length of time to assess the decline of aldicarb sulfoxide in UV irradiated water and no dark controls were monitored.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$\mathrm{CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}}$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

S-Methyl [^{14}C]aldicarb sulfoxide (Union Carbide Corp., specific activity 6.06 mCi/mM, radiochemical purity >99%), a major degradation product of aldicarb, was diluted with nonlabeled aldicarb sulfoxide (Union Carbide Corp., test substance uncharacterized) to yield a mixture with a specific activity of 0.8 mCi/mM. Aqueous test solutions were treated with [^{14}C]-aldicarb at 5 ppm and incubated at 20-25 C in a water reaction vessel equipped with a condenser. A water jacketed immersion well containing a high pressure, quartz, mercury-vapor, 200-watt Hanovia immersion lamp was placed inside the reaction vessel. The wavelength distribution was as follows: 0.86 watts (303 nm), 2.3 watts (313 nm), 0.36 watts (334 nm) and 3.1 watts (366 nm). The borosilicate glass reaction vessel does not transmit light of a wavelength less than ~300 nm. Duplicate 10 ml samples were taken at 0, 1, 3, 7, and 14 days posttreatment. Samples were extracted five times with chloroform:acetonitrile (1:1, v:v). The organic fractions were combined, dried over sodium sulfate, filtered, and concentrated. These fractions and standards were separated by using two-dimensional TLC with the following two solvent systems: diethyl ether:n-hexane (2:1) plus 20% acetone and methylene chloride:acetonitrile (3:1) in one combination and chloroform:methanol (6:1) and 1,4-dioxane:benzene (3:2) in another combination. Radioactive spots were located by autoradiography and assayed by using LSC. Samples were radioassayed at various stages of the extractions procedure by using LSC, and no loss of radioactivity was detected.

REPORTED RESULTS:

Aldicarb sulfoxide slowly declined from 95.0% of the applied radioactivity on day 0 to 92.7% on day 14 (Table 1). Unidentified water soluble degradates represented a maximum of 5.6% of the applied radioactivity. The total radioactivity remained constant over the test period.

DISCUSSION:

1. The experiment was not conducted long enough to establish the pattern of decline of aldicarb sulfoxide in UV irradiated water.
2. Water characteristics were not reported.
3. Experimental controls maintained in the dark were not run.

Table 1. Photolysis of [^{14}C]aldicarb sulfoxide in aqueous solution exposed to UV light.

Component	Percentage of the applied radioactivity[a] at indicated days posttreatment 0	1	3	7	14
Aldicarb sulfoxide	95.0	97.9	95.6	91.9	92.7
Aldicarb sulfoxide nitrile	2.0	ND[b]	ND	1.7	ND
Water-solubles	1.9	0.9	2.6	2.7	5.6

[a] Average of two determinations.

[b] ND; none detected.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 12 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 90 - FORMULATION NOT IDENTIFIED

FICHE/MASTER ID 00053379 CONTENT CAT 02
Bromilow, R.H. 1973. Breakdown and fate of oximecarbamate nematicides in crops and soils. Ann. Appl. Biol. 75(3):473-479. Also In unpublished submission received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL: 228979-S.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10366010

DIRECT RVW TIME = 6 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: DATE: Feb. 14, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

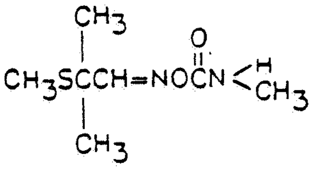
CONCLUSION:

Field Dissipation - Terrestrial

This study is scientifically invalid because sampling intervals were insufficient to establish an aldicarb residue decline curve. This study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test substance was not characterized, sampling methods were not reported, and soil characteristics were incompletely described.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N\begin{matrix}{}^{H}\\{}_{CH_3}\end{matrix}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, test substance uncharacterized, source unspecified) was applied at 16.8 kg ai/ha in a small volume of water (amount unspecified) to a grassland on March 3, 1972. The soil was a sandy loam overlying sandy clay loam and containing 3-4% organic matter near the surface and ~2% organic matter at the root zone. Soil samples were collected in 10-cm increments to a depth of 40 cm on March 14, March 28, and May 2. Cumulative rainfall amounts during the study period are provided in Table 1.

The samples were extracted with acetone:methylene chloride (1:1), separated on a Florisil column, oxidized to aldicarb sulfone, and quantified by using GC. The limit of detection was reported as 0.005 ppm.

REPORTED RESULTS:

Aldicarb was found at 1% of the applied dose at 11 days posttreatment (soil depth unspecified). The amount of aldicarb sulfoxide and aldicarb sulfone detected is shown in Figure 1 and represents 30-40% of the applied dose. Two months following treatment ~98% of the total aldicarb residues (carbamate) were not recoverable.

DISCUSSION:

1. No pretreatment or immediate posttreatment samples were collected for analysis.

2. The test substance was not characterized.

3. The analytical method employed is recommended for use in plant materials; modifications for soil analyses were not described.

4. The test substance was applied in an aqueous solution, a practice not representative of actual use conditions since all registered formulations of aldicarb are granular.

5. There are no registered grassland use sites for aldicarb.

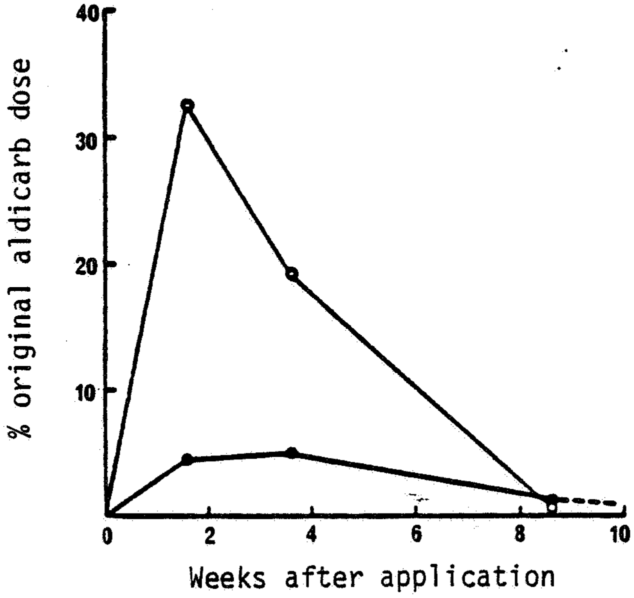


Figure 1. Persistence of the oxidation products of aldicarb in grassland sandy soil ○-○, aldicarb sulfoxide; ●-●, aldicarb sulfone.

Table 1. Concentrations[a] of aldicarb sulfoxide and aldicarb sulfone remaining in the soil during the 8-week test period.

Sampling date	Rainfall[b] (cm)	0-10	10-20	20-30	30-40
March 14, 1972	2.37				
Aldicarb sulfoxide		3.55	0.44	0.11	0.063
Aldicarb sulfone		0.45	0.107	0.032	ND[c]
March 28, 1972	3.27				
Aldicarb sulfoxide		1.78	0.44	0.13	0.087
Aldicarb sulfone		0.47	0.14	0.030	ND
May 2, 1972	9.11				
Aldicarb sulfoxide		0.040	0.022	0.022	ND
Aldicarb sulfone		0.16	ND	ND	ND

[a] ppm of aldicarb sulfone; aldicarb was found only at the first sampling interval (sampling depth unspecified) at 1% of the applied amount.

[b] From the application date on March 3, 1972.

[c] ND; nondetectable; (≤0.02 ppm).

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 13 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 100520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00029989 CONTENT CAT 01
Smith, F.F., J.C. Maitlen, and L.M. McDonough. 1978. Report of residue analysis: PCY-68-11. Unpublished study received June 30, 1978 under 1016-78; prepared in cooperation with U.S. Agricultural Research Service, Entomology Research Div., Pesticide Chemicals Research Branch and others, submitted by Union Carbide Corp., Arlington, Va.; CDL:097162-G.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10494010 SEC: RCBR-25-10494015

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 1, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

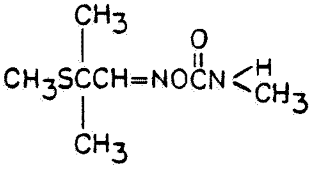
CONCLUSION:

Metabolism - Aerobic Soil

This study is scientifically invalid because the sampling protocol (one sampling interval) was insufficient to confirm the stated application rates or establish decline curves for aldicarb in soil. Additionally, this study would not satisfy EPA Data Requirements for Registering Pesticides (1983) because a technical or purer grade product was not applied, material balance and half-life estimates of the parent compound were not reported, insufficient information was provided regarding characteristics of the test soil and soil incubation conditions, and patterns of formation and decline of degradation products were not addressed.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik 10% G, Union Carbide Corp.) was surface-applied at 10, 20, 40, 80, or 120 lb ai/A to pots of an uncharacterized greenhouse soil in which tomatoes had been planted 73 days previously. The treated soils were covered with 1 inch of a fresh perlite-peat mixture, watered (unspecified amounts), and incubated in a greenhouse under unspecified conditions. Soil samples, consisting of 10 cores taken to the bottom of each pot (depth unspecified), were removed 50 days posttreatment and stored frozen prior to analysis. Soil subsamples of 50 g each were blended with 50-70 g of anhydrous sodium sulfate and 4 ml of distilled methylene chloride. The mixture was filtered through glass wool into a flask of sodium sulfate, shaken, and filtered again through a cotton plug overlain with sodium sulfate. The solution was evaporated to dryness in a water bath at 40 C and the residue was dissolved in 20 ml of acetonitrile. The extracts were quantified by using GC (method of Maitlen et al. 1968. J. Agric. Food Chem. 16:549). Recoveries of aldicarb, aldicarb sulfoxide, and aldicarb sulfone were 60.0-61.0%, 64.7-80.0%, and 74.5-142.0%, respectively, by using this method; the lower limit of detection of all three substances in soil was 0.02 ppm.

REPORTED RESULTS:

Total aldicarb residues in greenhouse soil 50 days posttreatment measured 2.29, 5.77, 9.56, 15.5, and 16.6 ppm from applications of 10, 20, 40, 80, and 120 lb ai/A, respectively. Soil concentrations of aldicarb and aldicarb sulfoxide increased with increasing application rate while levels of aldicarb sulfone were not significantly different at the four highest application rates (Table 1). Aldicarb residues were not detected (<0.02 ppm) in untreated controls.

DISCUSSION:

1. The test substance was a formulated end-use product.

2. Insufficient information was provided regarding characteristics of the test soil and experimental conditions, including soil moisture content and incubation temperatures.

3. Sampling was not conducted immediately posttreatment or at any interval other than 50 days posttreatment.

4. Material balance and half-life estimates of the parent compound in soil, and patterns of formation and decline of degradates, were not reported.

5. Recovery values were quite variable, particularly for aldicarb sulfone.

Table 1. Aldicarb residues in soil 50 days posttreatment.[a]

Application rate (lb ai/A)	Aldicarb residues in soil (ppm)		
	Aldicarb	Aldicarb sulfoxide	Aldicarb sulfone
10	ND[b]	1.90	0.39
20	0.06	4.30	1.41
40	0.12	8.30	1.14
80	0.30	13.44	1.75
120	0.37	14.62	1.64

[a] All values corrected to 100% based on recovery data; average of two replicate soil analyses.

[b] ND = None detected (<0.02 ppm).

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 14 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 01 - TECHNICAL CHEMICAL

FICHE/MASTER ID 00093641 CONTENT CAT 02
Borash, A.J. 1966. Insecticide, Temik: Relative soil persistence of sulfide, sulfoxide, and sulfone: Status Report 855-31107-8157. Unpublished study received Feb. 27, 1967 under 7F0573; submitted by Union Carbide Corp., Charleston, W. Va.; CDL:090741-C.

SUBST. CLASS = S.

DIRECT RVW TIME = 3 1/2 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 1, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

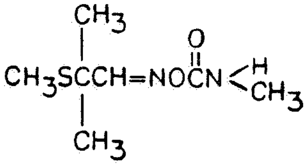
1. This study is scientifically valid.

2. Insecticidal residues dissipate fairly rapidly with half-lives of ~2 weeks in a modified sandy loam soil treated with aldicarb, aldicarb sulfoxide, or aldicarb sulfone at <20 lb/A. At 40 lb/A, respective insecticidal residues were generally more persistent with 96, 84, and 8% control of housefly larvae remaining after 2 weeks.

3. This study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because a nonspecific bioassay method was used; and, insufficient information was provided regarding the purity of the test substances, characteristics of the test soil, and soil moisture content and temperature during the incubation period.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, technical, purity unspecified, source of all test substances is Union Carbide Corp.), aldicarb sulfoxide (UC 21826, technical, purity unspecified), and aldicarb sulfone (UC 21865, technical, purity unspecified), in 9:1 mixtures of water and acetone/Triton solution, were each applied at 1.25, 2.5, 5, 10, 20, and 40 lb/A to 8 oz aliquots of an uncharacterized soil (2:1 Norfolk sandy loam and "UC mix") contained in pint jars. Treated soil samples, maintained under unspecified conditions, were analyzed in duplicate immediately posttreatment and at 1 and 2 weeks posttreatment by using a housefly bioassay. Residual toxicity of the three substances was measured as the percentage of houseflies that did not emerge following the addition of 25 prepupating larvae to the soil samples.

REPORTED RESULTS:

The relative toxicity of aldicarb and aldicarb sulfoxide to housefly larvae was not significantly different at any application rate in soils sampled immediately posttreatment; however, a six-fold increase in the concentration of aldicarb sulfone was required to produce equal relative toxicity (Table 1). Soil levels of all three substances declined with a half-life of 1-2 weeks in the test soil.

DISCUSSION:

1. Insufficient information was provided regarding the purity of the test substances, characteristics of the test soil, and experimental conditions, including soil moisture content and incubation temperatures.

2. Sampling was conducted at an insufficient number of intervals to clearly establish residue decline curves.

3. Due to inherent limitations of the bioassay method, a materials balance could not be provided and degradates could not be identified or quantitated in any of the treated soils.

Table 1. Levels of aldicarb, aldicarb sulfoxide, and aldicarb sulfone in a modified sandy loam soil expressed as % mortality of housefly larvae.

Test substance	Application rate (lb/A)	Percent control of housefly larvae[a]		
		0 day	1 week	2 weeks
Aldicarb	40	100	100	96
	20	100	100	64
	10	100	92	35
	5	98	61	2
	2.5	50	53	0
	1.25	42	17	4
Aldicarb sulfoxide	40	100	100	84
	20	100	100	55
	10	85	94	23
	5	71	51	7
	2.5	62	49	2
	1.25	35	21	4
Aldicarb sulfone	40	100	100	8
	20	53	51	6
	10	46	40	2
	5	23	22	8
	2.5	14	9	12
	1.25	0	10	8

[a] Data are averages of two replicates of 25 larvae.

CASE GS0140 ALDICARB STUDY 15 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00093642 CONTENT CAT 01
Coppedge, J.R. 1967. Fate of 2-methyl-2-(methylthio)propionaldehyde-(methylcarbamoyl)-oxime (Temik) in plants and soil. Master's thesis, Texas A & M Univ. Unpublished study received Feb. 27, 1967 under 7F0573; submitted by Union Carbide Corp., Charleston, W.Va.; CDL:090741-D.

FICHE/MASTER ID 00080820 CONTENT CAT 01
Coppedge, J.R., and D.A. Lindquist. 19??. Preliminary studies on the fate of radio-labeled Union Carbide 21149 in soil and cotton plants. U.S. Agricultural Research Service, Entomology Research Div.; unpublished study; CDL:09525-T.

FICHE/MASTER ID 00093640 CONTENT CAT 01
Coppedge, J.R., D.A. Lindquist, D.L. Bull, and H.W. Dorough. 1966? A report on 2-methyl-2-(methylthio)propionaldehyde O (methylcarbamoyl)oxime (Temik) in cotton plants and soil. Unpublished study received Feb. 27, 1967 under 7F0573; prepared by Texas A & M Univ., Agricultural Experiment Station, Entomology Research Div., submitted by Union Carbide Corp., Charleston, W.Va.; CDL:090741-B.

FICHE/MASTER ID 00053366 CONTENT CAT 01
Coppedge, J.R., D.A. Lindquist, D.L. Bull, and H.W. Dorough. 1967. Fate of 2-methyl-2-(methylthio)propionaldehyde O (methylcarbamoyl)oxime (Temik) in cotton plants and soil. J. Agric. Food Chem. 15(5):902-910. Also In unpublished submission received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL: 228979-F.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-20-1510 EFF -10-0528007
SEC: RCBR-20-1515 RCBR-20-150505

DIRECT RVW TIME = 9 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 9, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

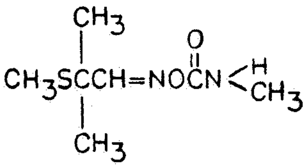
1. This study is scientifically valid.

2. Aldicarb is degraded rapidly with half-lives of 9, 7, and 12 days in clay, silt loam, and sand soils, respectively. The major degradates were aldicarb sulfoxide and aldicarb sulfone representing a maximum of 41-62 and 6-13% of the applied radioactivity, respectively, in the three soils tested. Aldicarb sulfoxide nitrile, aldicarb sulfoxide oxime, and aldicarb oxime were identified as minor degradates representing a maximum of 0.8, 4.3, and 0.2% of the applied radioactivity, respectively. The soils were treated with $[^{35}S]$aldicarb at 20 ppm and incubated at 25-28 C and 0.33 bar moisture in the dark for 12 weeks. A greenhouse study (incubation conditions unspecified) yielded similar results.

3. This study fulfills EPA Data Requirements for Registering Pesticides (1983) by showing that aldicarb degrades rapidly in clay, silt loam, and sand soils, and by identifying and establishing rates of formation and decline of aldicarb degradates.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

$[^{35}S]$Aldicarb (Temik, >95% pure, specific activity 4.9 mCi/mM, Union Carbide Corp.) in 50 µl of water was added at 20 ppm to 10-g samples of clay, silt loam, and sand soils (Table 1) that had been previously adjusted to 0.33 bar moisture equivalent. Soil samples were incubated in darkness at 25-28 C. At intervals of 1, 2, 4, 6, 9, and 12 weeks, three replicate samples of each soil were removed. $[^{35}S]$Aldicarb was also applied at 17 mg/gallon of soil to 1-gallon cans of an uncharacterized potting soil (2:1 mixture of Lufkin sandy loam and peat moss), planted with cotton, and maintained in the greenhouse, to simulate a sidedress treatment. The cans were surface-watered once weekly and subirrigated the remainder of the time to prevent leaching losses.

Four soil cores (0.5 inches in diameter and 5-6 inches deep) were removed from each can at intervals of 1, 2, 3, 4, and 6 weeks.

Soil samples were extracted twice with a 1:1 (v:v) mixture of acetone and 95% ethanol on a mechanical shaker for 1 hour. Solvent was evaporated and the extracts were centrifuged. The supernatant was evaporated under a vacuum at 40 C and quantified by using TLC and autoradiography followed by LSC. Unextracted residues were quantified by digestion with nitric acid and hydrogen peroxide followed by LSC. Approximately 100% recovery of applied radioactivity was obtained from each sample.

REPORTED RESULTS:

[^{35}S]Aldicarb was degraded under aerobic conditions with a half-life of 9 days in Houston clay soil (Table 2), 7 days in Norwood silt loam (Table 3), and 12 days in Lakeland fine sand (Table 4). By week 4 posttreatment, 6.1, 0.3, and 27.2% of the applied radioactivity was detected as aldicarb in the clay, silt loam, and sand soils, respectively; respective levels at 12 weeks posttreatment were 0.7, 0.4, and 3.6%. The degradate aldicarb sulfoxide was detected in greater amounts than aldicarb or other degradates after 2-4 weeks of incubation.

Similar degradates were identified in samples of greenhouse soil receiving sidedress treatments of [^{35}S]aldicarb as in the soils incubated under controlled conditions in the laboratory. Aldicarb degradation occurred at a greater rate in the greenhouse than in the laboratory due to the enhancing effect of higher temperatures and moisture on microbial populations and the lack of experimental control over leaching, volatilization, and adsorption to soil organic matter (Table 5).

DISCUSSION:

1. The extractant used to isolate [^{35}S] from soil, 1:1 ethanol:acetone, was later shown to be less effective than 1:1 acetone:methanol followed by 1:1 chloroform:acetonitrile, and its use was therefore discontinued in subsequent experiments.

2. Greenhouse incubation conditions were not reported.

3. The test soil reported to be a Norwood silty clay loam is a silt loam according to the USDA soil texture classification system.

Table 1. Soil characteristics.

Soil type	Mechanical analysis (%) Sand	Silt	Clay	pH	Organic matter (%)	Moisture[a] (%)
Houston clay	4.4	40.1	55.5	8.0	4.2	23.5
Norwood silt loam[b]	23.9	53.5	22.6	8.0	1.0	21.4
Lakeland fine sand	92.0	6.0	2.0	6.3	0.4	3.4

[a] At 0.33 bar moisture equivalent.

[b] Reported as a silty clay loam soil; see Discussion No. 3.

Table 2. The degradation of [^{35}S]aldicarb in Houston clay soil.[a]

Component	Percent of applied at indicated weeks after treatment					
	1	2	4	6	9	12
Aldicarb	57.3	31.5	6.1	1.1	0.8	0.7
Aldicarb sulfoxide	31.5	41.1	35.3	23.3	16.0	9.5
Aldicarb sulfone	4.3	3.4	3.8	6.2	4.8	4.8
Aldicarb sulfoxide nitrile	0	0	0.2	0.2	0	0
Aldicarb oxime	0.2	0.2	0	0	0	0
Aldicarb sulfoxide oxime	3.8	4.3	3.4	3.1	1.5	0.8
Unknown 1	0.8	0.9	0.8	1.9	1.8	2.3
Unknown 3	1.7	2.4	2.1	1.7	0.8	0.6
Unknown 5	0	0	0.2	0.2	0	0
Unknown 6	0	0	0.2	0	0.1	0.1
Unknown 7	0.4	0.1	0	0	0	0
Residue[b]	0	16.1	47.9	62.3	74.2	81.2

[a] Average of duplicate chromatograms of triplicate samples.

[b] Nitric acid digestion of extracted soil.

Table 3. The degradation of [^{35}S]aldicarb in Norwood silt loam soil.[a]

Component	Percent of applied at indicated weeks after treatment					
	1	2	4	6	9	12
Aldicarb	53.1	18.3	0.3	0.51	0.5	0.4
Aldicarb sulfoxide	41.5	61.6	51.2	37.3	30.0	25.0
Aldicarb sulfone	1.2	2.1	4.9	6.4	6.8	6.3
Aldicarb sulfoxide nitrile	0	0.8	0.1	0.2	0	0
Aldicarb sulfoxide oxime	1.9	2.8	2.1	3.2	1.0	1.0
Unknown 1	0.8	0.9	0.3	0.4	0.4	0.5
Unknown 3	1.6	4.1	5.2	7.6	4.7	5.1
Unknown 5	0	0.7	0.1	0.2	0	0
Unknown 6	0	0	0.3	0	0.1	0.1
Unknown 7	0	0	0	0	0.1	0
Residue[b]	0	8.7	35.5	44.2	56.4	61.6

[a] Average of duplicate chromatograms of triplicate samples.

[b] Nitric acid digestion of extracted soil.

Table 4. The degradation of [^{35}S]aldicarb in Lakeland fine sand soil.[a]

Component	Percent of applied at indicated weeks after treatment					
	1	2	4	6	9	12
Aldicarb	65.1	54.7	27.2	2.9	6.0	3.6
Aldicarb sulfoxide	27.5	33.8	40.7	55.5	51.3	49.8
Aldicarb sulfone	3.9	3.8	5.7	11.6	8.0	13.4
Aldicarb sulfoxide nitrile	0	0	0.2	0	0.1	0
Aldicarb oxime	0.1	0	0	0	0	0
Aldicarb sulfoxide oxime	1.5	0	0	0	0	0.6
Unknown 1	0.7	0.9	0.8	0.8	1.2	3.3
Unknown 3	1.0	1.0	1.7	3.1	2.1	5.0
Unknown 5	0	0	0.2	0	0	0
Unknown 6	0	0	0	0	0.1	0.2
Unknown 7	0.2	0.4	0.1	0	0.1	0.1
Residue[b]	0	5.4	23.4	26.1	31.1	24.0

[a] Average of duplicate chromatograms of triplicate samples.

[b] Nitric acid digestion of extracted soil.

Table 5. The degradation of [^{35}S]aldicarb in soil following side-dress application to cotton plants in the greenhouse.

Component	Aldicarb-equivalents extracted from soil at indicated weeks after treatment (ppm)[a]				
	1	2	3	4	6
Aldicarb	0.49	0.12	0.02	T	0
Aldicarb sulfoxide	1.63	0.86	0.22	0.08	0.01
Aldicarb sulfone	0.05	0.12	0.08	0.06	0.03
Aldicarb sulfoxide nitrile	0.07	0.08	0	T	0
Aldicarb sulfoxide oxime	0.11	0.25	0.01	0	T
Unknown 1	0.09	0.05	0.01	0.02	T
Unknown 6	0.02	0.01	0	T	0
Unknown 7	0	0	T	0	0
Total	2.47	1.48	0.33	0.17	0.05

[a] Dry weight; T = trace amounts. All results are expressed as average of duplicate chromatograms of duplicate samples.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS0140 ALDICARB STUDY 16 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050520

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102051 CONTENT CAT 01
Richey, F., and H. Moorefield. 1972. Temik--aldicarb pesticide: metabolism by soils: laboratory studies: Project No. 111A12, File No. 17507. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL: 096670-H.

SUBST. CLASS = S.

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE M. Pete T. Opeka DATE: Feb. 7, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

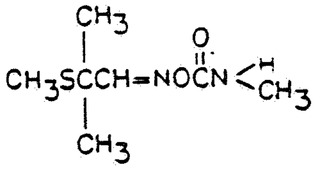
1. This study is scientifically valid.
2. [^{14}C]Aldicarb was degraded rapidly with a half-life of <15 days in sandy loam, loamy sand, and sand soils (incubation conditions unspecified). The major identified degradates were aldicarb sulfoxide and aldicarb sulfone reaching peak concentrations within $\sim$1 month after treatment. Half-lives based on decline from peak concentrations ranged from 1 to 3 weeks. Evolved $^{14}CO_2$ accounted for the majority of the applied radioactivity over the test periods and was greatest in soils treated with N-methyl-labeled [^{14}C]aldicarb (as compared to S-methyl- or tertiary-labeled [^{14}C]aldicarb).

3. This study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by identifying aldicarb sulfoxide, aldicarb sulfone, and CO_2 as degradates of aldicarb in aerobic soil. This study does not fulfill data requirements for degradation rate information because insufficient information was provided regarding the type, purity, and specific activity of the test substances, and the conditions of soil incubation, including temperature.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S}\underset{\mathrm{CH_3}}{\overset{\mathrm{CH_3}}{\mathrm{C}}}\mathrm{CH{=}NO}\overset{\mathrm{O}}{\overset{\|}{\mathrm{C}}}\mathrm{N}{<}\begin{smallmatrix}\mathrm{H}\\ \mathrm{CH_3}\end{smallmatrix}$$

2-Methyl-2-(methylthio)propionaldenyde
O-(methylcarbamoyl)oxime

S-Methyl-, N-methyl-, or tertiary-labeled [^{14}C]aldicarb (Temik, Union Carbide Corp., purity unspecified) in acetone was either mixed with an aqueous solution of nonradiolabeled aldicarb and applied directly to test soils (Table 1) or mixed with the appropriate amount of nonradiolabeled aldicarb and deposited on [redacted] prior to treatment. The soils were passed through a 2 mm sieve, placed in glass columns (2.5 inches internal diameter) having perforated, screen-lined bottom caps, and saturated with distilled water before treatment at 5 lb ai/A. The treated soils were covered with untreated soil which in turn was saturated with water. The columns were placed in a metabolism chamber connected to a series of traps and a gas washing bottle (Table 2). Soils were removed at the end of each experiment (12 to 75 days) and extracted consecutively with 1:1 mixtures of acetone and methanol, methylene chloride and acetonitrile, ethanol and water, and water alone. Soil extracts and column eluates were shaken in acetone and partitioned with methylene chloride. The aqueous portion was reextracted twice with methylene chloride. The acetonitrile:methylene chloride extracts were combined, dried over anhydrous sodium sulfate, and filtered. Aliquots of the aqueous and organic fractions were quantified by using two-dimensional TLC and autoradiography followed by LSC. The TLC solvent systems used were ether:hexane:acetone (2:1:1, v:v) and methylene chloride:acetonitrile (3:2, v:v). The contents of the traps and washing bottle were assayed periodically and volatile radioactivity was identified as $^{14}CO_2$ by precipitating the radioactivity from solution using barium hydroxide. The extracted soil samples were air dried and oxidized using potassium dichromate in a mixture of sulfuric and phosphoric acids to determine unextractable ^{14}C. Evolved $^{14}CO_2$ was passed in nitrogen gas through hydrochloric acid and into a 2:1 mixture of Cellosolve and ethanolamine.

REPORTED RESULTS:

In the first experiment, S-methyl-labeled [^{14}C]aldicarb degraded more rapidly in a fresh Lufkin sandy loam soil than in a Norfolk loamy sand soil that had been stored dry for 2 years; the half-life of aldicarb was <15 days in both soils. The majority of recovered radioactivity was detected as aldicarb sulfoxide in the dry loamy sand while most radioactivity was associated with evolved $^{14}CO_2$ in the moist sandy loam soil (Table 3). In the second experiment, more volatile radioactivity was recovered from the sandy loam soil treated with N-methyl-labeled [^{14}C]aldicarb than the soils treated with S-methyl- or tertiary-labeled [^{14}C]aldicarb; the recovery of total aldicarb residues was approximately constant for each of the three labels (Table 3). In the third experiment, similar amounts of aldicarb and its degradates were detected in loamy sand soil treated with either S-methyl-, N-methyl-, or tertiary-labeled [^{14}C]aldicarb; however, greater amounts were volatilized from airdried soil treated with the N-methyl label than from moist soils treated with any of the three labels (Table 3). In the fourth experiment, the S-methyl-labeled [^{14}C]aldicarb treatment, terminated 7 days earlier than the other treatments, contained the greatest amounts of aldicarb and aldicarb sulfoxide; residue levels were comparable among the other treatments (Table 3). Levels of noncarbamate degradation products and water-soluble compounds were greater and $^{14}CO_2$ evolution was less in Lakeland fine sand soil than the soils tested in the previous experiments, with the exception of the N-methyl-labeled [^{14}C]aldicarb treatment using air-dried sand (Table 3).

In general, aldicarb sulfoxide and aldicarb sulfone reached maximum concentrations ~1 month posttreatment in the aforementioned experiments. Half-lives based on decline from peak values ranged from 1 to 3 weeks.

DISCUSSION:

1. The test substances were not characterized; therefore, the degradation products cannot be quantified.

2. Soil incubation temperatures and conditions were not stated.

3. Recoveries of [^{14}C]aldicarb and radiolabeled degradates from spiked soils were not reported.

4. The Norfolk soil was reported as a sandy loam; however, according to USDA's textural triangle it is a loamy sand and has been reported as such in this review.

67

Table 1. Soil characteristics.

Soil type	Mechanical analysis (%)			pH	Organic matter (%)
	Sand	Silt	Clay		
Lufkin fine sandy loam	59.7	22.0	17.9	7.1	1.7
Norfolk loamy sand[a]	83.9	8.6	7.5	4.8	1.6
Lakeland fine sand	98.6	1.2	0	4.6	1.3

[a] Reported as a sandy loam. This soil has been stored dry for 2 years.

Table 2. Procedural details for [^{14}C]aldicarb soil metabolism experiments.

Experiment number	Aldicarb application method	Soil thickness above/below aldicarb (inches)	Watering regime	Soil pretreatment and radiolabels used[a]
1	10% [redacted]	1.4/3.6	1 inch/week	NLS stored air dry for 2 years. LFSL stored 15 days then air dried. S-methyl ^{14}C label.
2	10% [redacted]	1.4/3.6	1 inch/week	LFSL stored 40 days then air dried. All three ^{14}C labels.
3	In solution	1/3	Once at 54 days	NLS stored 10 days and used moist with all three ^{14}C labels. NLS stored mosit 10 days then air dried. N-methyl ^{14}C.
4	In solution	1/4	Not watered after initial saturation	LFS used moist after storage for 6 days. All three ^{14}C labels.

[a] NLS - Norfolk loamy sand.
LFSL - Lufkin fine sandy loam.
LFS - Lakeland fine sand.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

Table 3. Distribution of radioactivity (as % of applied [^{14}C]aldicarb) recovered from soils in four metabolism experiments.

Experiment number	Soil	[^{14}C]Aldicarb label position	^{14}C recoveries									Incubating period (days)
				Extractables								
			Volatiles	Aldicarb	Aldicarb sulfoxide	Aldicarb sulfone	Others	Water-solubles	Subtotal	Unextractables	Total	
1	Norfolk loamy sand	S-methyl	7.1	2.4	65.5	5.8	15.8	4.1	93.6	4.3	105.0	63
	Lufkin fine sandy loam	S-methyl	82.8	0.6	4.9	2.4	2.2	0.5	10.6	15.8	109.2	63
2	Lufkin fine sandy loam	S-methyl	42.8	0.7	11.4	8.1	3.4	4.8	28.3	8.4	79.5	75
		N-methyl	60.8	0.8	17.8	10.0	4.4	4.8	31.8	6.9	99.5	75
		Tertiary	45.1	0.5	4.0	5.1	5.3	6.8	27.7	11.8	84.6	75
3	Norfolk loamy sand	S-methyl	22.2	1.4	21.9	22.8	5.3	6.7	58.1	5.5	85.8	69
		N-methyl	35.9	0.3	16.5	21.8	3.8	3.6	46.1	6.1	88.1	69
		N-methyl[a]	53.9	0.12	6.2	12.0	0.9	2.8	22.0	6.8	82.7	69
		Tertiary	21.4	1.86	17.4	20.7	5.6	6.7	52.3	16.4	90.1	69
4	Lakeland fine sand	S-methyl	6.6	1.5	19.3	1.0	25.1	39.2	86.1	3.1	95.8	12
		S-methyl	13.2	0.4	15.4	0.2	22.6	37.2	75.8	3.6	92.6	19
		N-methyl	53.8	0.3	11.7	1.7	2.9	5.1	21.7	11.6	87.1	19
		Tertiary	10.4	0.1	15.0	1.1	21.2	38.3	75.7	5.1	91.2	19

[a] Soil was briefly air dried.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 2

CASE GS0140 ALDICARB STUDY 17 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00096968 CONTENT CAT 02

Foschi, S., A. Cesari, I. Ponti, P.G. Bentivogli, and A. Bencivelli. 1970. Investigation into degradation and vertical movement of agricultural chemicals in soil. A translation of: without title. Notiz. Mal. Piante 82(37):?. Unpublished study received May 30, 1978 under 239-2211; submitted by Chevron Chemical Co., Richmond, Calif.; CDL: 234046-G.

SUBST. CLASS = S.

DIRECT RVW TIME = 2 1/2 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 7, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

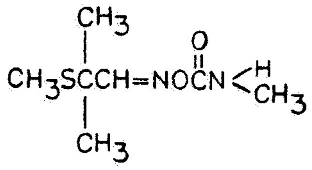
CONCLUSION:

Metabolism - Aerobic Soil

This study cannot be validated because the analytical method was not described and the soil moisture content during incubation was not reported. In addition, this study would not satisfy EPA Data Requirements for Registering Pesticides (1983) because a technical or purer grade test substance was not used and the pattern of formation and decline of degradates was not addressed.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\underset{CH_3}{\overset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, G, purity and source unspecified) was surface-applied at ~2 ppm to a sandy clay loam soil (49% sand, 22% loam, 29% clay, pH 8.0, 1.5% organic matter) in glass containers. The soil samples were incubated at 26 C and 60% relative humidity, with artificial illumination during the day. Samples were removed at 0, 8, 30, and 68 days posttreatment and quantified by using TLC (Foschi et al. 1969. Atti Giornate Fitopatologiche: 19-27).

REPORTED RESULTS:

Aldicarb residues declined from an initial soil concentration of 1.67 ppm, to 0.72, 0.65, and 0.65 ppm by 8, 30, and 68 days posttreatment, respectively.

DISCUSSION:

1. The test substance was not a technical or purer grade product.

2. Soil source and moisture content during incubation were not reported.

3. An insufficient number of soil samples were analyzed to confirm the decline curve obtained; half-life estimates were not provided.

4. No effort was made to identify or to quantitate degradates of aldicarb.

CASE GS0140 ALDICARB STUDY 18 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050520

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00053370 CONTENT CAT 01
Hirsh, D.H., K.P. Sheets, and G.C. Holsing. 1976. Sulfocarb: fate in aerobic and anaerobic soils. Unpublished study received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-J.

SUBST. CLASS = T; CHEM 110801 IS TRANSF. PRODUCT OF CHEM 098301

DIRECT RVW TIME = 13 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 4, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study is scientifically valid.

2. [^{14}C]Aldicarb sulfone (an aldicarb degradate) at ~2.7 ppm was degraded rapidly in aerobic sandy loam, sand, and silt loam soils incubated at 22 ± 2 C. In the sandy loam soil aldicarb sulfone had a half-life of ~1 week. The majority of the applied radioactivity (54-72%) evolved as $^{14}CO_2$ after $\geq$28 days in all three soils. The following degradates were present at maximum concentrations of $\geq$0.01 ppm: aldicarb sulfone alcohol, aldicarb sulfone amide, aldicarb sulfone nitrile, aldicarb sulfone oxime, aldicarb sulfone acid, and aldicarb sulfone aldehyde.

3. This portion of the study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by identifying the aforementioned degradates of aldicarb sulfone in aerobic sandy loam, sand, and silt loam soils and providing a half-life for aldicarb sulfone in a sandy loam soil. However, this portion of the study does not provide half-life data for the sand and silt loam soils because their sampling intervals were insufficient to establish a quantitative decline curve.

Metabolism - Anaerobic Soil

1. This portion of the study is scientifically valid.

2. [^{14}C]Aldicarb sulfone was degraded rapidly in anaerobic silt loam soil incubated at 22 ± 2 C and 75% of field capacity. Levels declined from ~23% of the applied radioactivity at the start of anaerobic conditions to <4% 61 days later. After 61 days of anaerobic incubation, which followed 30 days of aerobic incubation, the majority of radioactivity applied as [^{14}C]-aldicarb sulfone at 2.7 ppm was associated with $^{14}CO_2$ (~58%). The following degradates were present at maximum concentrations of >0.01 ppm: aldicarb sulfone amide (~31% of applied), aldicarb sulfone acid, aldicarb sulfone alcohol, aldicarb sulfone nitrile, and aldicarb sulfone oxime.

3. This portion of the study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by identifying the aforementioned degradates of aldicarb sulfone. However, this portion of the study does not provide half-life data for aldicarb sulfone because the sampling intervals were insufficient to establish a quantitative decline curve. Additionally, the aldicarb sulfone-treated soil samples were incubated aerobically too long prior to establishment of anaerobic conditions (a period of one half-life is recommended).

Mobility - Leaching and Adsorption/Desorption

1. This portion of the study is scientifically valid.

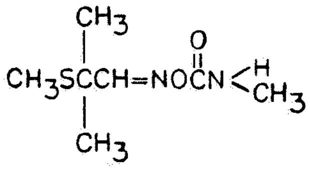
2. [^{14}C]Aldicarb sulfone and its degradates appear to be very mobile and mobile in Lakeland fine sand and Lufkin fine sandy loam soils, respectively. After application of 7-8 inches of water over a period of 7-8 weeks, ~90 and 19% of the applied radioactivity was eluted from the respective 5-inch columns. The majority of the radioactivity in the leachate was associated with aldicarb sulfone; aldicarb sulfone amide, aldicarb sulfone alcohol, aldicarb sulfone oxime, aldicarb sulfone aldehyde, and aldicarb sulfone nitrile represented ≤1.86% of the applied radioactivity.

3. This portion of the study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because the soil columns were neither long enough (5-inch) nor eluted with a sufficient amount of water to fully assess mobility of aldicarb sulfone in soil.

74

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\underset{CH_3}{\overset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\parallel}{C}}N{<}\begin{smallmatrix}H\\ CH_3\end{smallmatrix}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Metabolism - Aerobic and Anaerobic Soil

Portions of sand, sandy loam, and silt loam soils (Table 1) were placed in a greenhouse and planted with beans or beans and ryegrass, and watered to promote growth (growth period unspecified). The soils were air dried and sieved to <2 mm. A solution of $[^{14}C]$aldicarb sulfone (Sulfocarb, UC 21865, 99.4% pure, specific activity 37.3 µCi/mg, Union Carbide Corp.) was prepared by peracetic acid oxidation of $[^{14}C]$aldicarb (specific activity 37.4 µCi/mg, Mallinckrodt Science Products Division) and diluted to the desired specific activity with nonradiolabeled aldicarb sulfone (purified by recrystallization). The aldicarb sulfone was applied at 2.7 ppm, or 4 lb ai/6-inch A, to all test soils.

Lakeland sand and Lufkin sandy loam soils were air dried, and placed in glass columns (2.46 x 6.3 inches inside diameter) with perforated, screen-covered bottoms overlain by ~1 inch of Ottawa fine white sand. The soils were saturated with distilled water, and treated with 1183 µg of aldicarb sulfone, in acetone. The treated soils were covered with ~1 inch of air-dried soil and resaturated. The columns were placed in individual glass metabolism chambers to which a series of traps and scrubbers were attached. The soils were kept saturated by weekly additions of water. Soils were incubated at 22 ± 2 C and sampled at weekly intervals for a period of 8 weeks.

For the study of aerobic and anaerobic metabolism in Muskingum silt loam, the aldicarb sulfone solution was added in four equal increments; treated soils were mixed for 1 hour between each addition. A total of 125 ml of water was added during the last three additions, after which the treated soils were remixed for 24 hours. The soil was packed into an 8-inch pot with screened 1-cm holes in the bottom, watered to 75% of field capacity, and covered with cheesecloth. The soil was aged for 30 days, and watered as required to maintain moisture content. After aging, the soil was divided into five equal portions. Two portions were maintained under aerobic conditions in separate glass columns (5.9 x 20 cm inside diameter) and watered as needed. Two other soil portions were placed in separate quart glass jars; anaerobic conditions were achieved by purging the containers with nitrogen gas and sealing the lids with electrical tape. One column of each treatment was stored for 30 days and the other for 60 days; incubation temperatures were maintained at 22 ± 2 C. The fifth soil portion was analyzed immediately following the initial 30-day aerobic aging period.

Soil samples were extracted three times with acetone:methanol (1:1). The extracts were combined, concentrated under vacuum and partitioned into organic and water soluble fractions using chloroform and acetonitrile. The fractions were then characterized and quantified by using TLC and autoradiography followed by LSC. The contents of traps and scrubbers were assayed three times weekly and volatile radioactivity was identified as CO_2 by precipitating the radioactivity from solution using barium hydroxide. The soils remaining after extraction were air dried and oxidized using potassium dichromate in a mixture of sulfuric and phosphoric acids. Evolved $^{14}CO_2$ was passed in nitrogen gas through a scrubber containing 5% aqueous hydrochloric acid and collected in a scrubber containing ethylene glycol monoethyl ether:ethanolamine (2:1).

Mobility - Leaching and Adsorption/Desorption

Lakeland sand and Lufkin sandy loam soil columns (2.5 x 5 inch) were prepared as described above under soil metabolism, and leached with 75 ml (1-inch) of water per week, for 7 and 8 weeks, respectively. Leachate was collected in Petri dishes situated beneath the columns, and volatiles were trapped as described above. Leachate samples were extracted with acetonitrile followed by chloroform. The aqueous acetonitrile phase was extracted three additional times with chloroform, and the extracts were combined and concentrated. The aqueous and organic phases were quantified by using LSC. The organic phase was characterized by using TLC. Soil samples were extracted and analyzed as described above.

REPORTED RESULTS:

Metabolism - Aerobic and Anaerobic Soil

[^{14}C]Aldicarb sulfone was rapidly degradated to CO_2 and noncarbamate products under both aerobic and anaerobic conditions (Tables 2 and 3). Under aerobic conditions, the half-life of aldicarb sulfone was <1 week in Lufkin sandy loam soil, ~2 weeks in Muskingum silt loam soil, and <1 month in Lakeland fine sand soil. The half-life of aldicarb sulfone in Muskingum silt loam soil under anaerobic conditions was also ~2 weeks. $^{14}CO_2$ comprised the majority of radioactivity after incubation for ≥28 days in both aerobic and anaerobic soils; unextractable radioactivity did not measure >5% in any of the test soils (Table 2 and 3).

Mobility - Leaching and Adsorption/Desorption

Approximately 90% of the 2.1 ppm of [^{14}C]aldicarb sulfone applied to a column of Lakeland fine sand soil and leached with 1 inch of water per week for 7 weeks, was recovered in leachate samples (Table 4). In Lufkin fine sandy loam, 19% of the 2.7 ppm of [^{14}C]aldicarb sulfone applied was recovered following an 8-week leaching period at the same rate. Approximately 2% of the applied radioactivity in the Lakeland fine sand soil column was volatilized as $^{14}CO_2$. In the Lufkin sandy loam soil column, 66% of the applied radioactivity was recovered as $^{14}CO_2$.

DISCUSSION:

Metabolism - Aerobic and Anaerobic Soil

1. One test soil could not be confirmed to be a silt loam soil because the reported particle size analysis added up to only 71%.
2. Insufficient sampling was conducted to clearly establish decline curves for the parent compound in the sand and silt loam soils.

Mobility - Leaching and Adsorption/Desorption

1. The soil columns used in this study were not long enough (2.5 x 5 inches).
2. The quantification of the test substance in segments of the soil column was not performed.

Table 1. Soil characteristics.

Soil type	Sand (%)	Silt (%)	Clay (%)	pH	CEC (meq/100 g)	Organic matter (%)	Moisture content (%) (0.33 bar)
Lakeland fine sand	96	3	1	6.7	1.3	0.7	2.7
Lufkin fine sandy loam	56	35	9	7.3	3.4	1.2	1.4
Muskingum silt loam	9	42	20	5.4	5.6	1.3	20.5

Table 2. The degradation of [^{14}C]aldicarb sulfone in aerobic Lakeland fine sand and Lufkin sandy loam soils.

Component	Lakeland fine sand	Lufkin sandy loam			
	Incubation period (days)				
	70	4	7	14	28
Aldicarb sulfone	8.4	69.6	24.7	6.7	0.4
Aldicarb sulfone alcohol	0.1	3.0	24.3	10.5	--[b]
Aldicarb sulfone amide	0.4	4.1	26.8	32.2	16.9
Aldicarb sulfone nitrile	0.2	2.8	8.9	0.5	--
Aldicarb sulfone oxime	0.3	3.5	2.1	0.7	--
Aldicarb sulfone methyol	0.1	--	--	--	--
Methane sulfonic acid[c]	--	2.9	1.0	29.6	20.4
Unknowns	0.4	0.5	--	0.3	0.2
Unhydrolyzed conjugates	0.3	0.5	0.7	0.4	0.5
Unextracted (%)[a]	4.9	1.0	0.4	2.7	3.7

[a] Percent of ^{14}C applied.

[b] Not reported.

[c] Tentatively identified.

Table 3. The degradation of [^{14}C]aldicarb sulfone in aerobic and anaerobic Muskingum silt loam soil.

	Aerobic			Aerobic/ Anaerobic	
	Incubation period (days)				
Component[a]	30	59	91	30/29	30/61
CO_2	15.5	65.9	66.9	56.6	57.7
Aldicarb sulfone	22.6	3.2	4.4	1.9	3.2
Aldicarb sulfone acid	7.8	0.9	0.9	5.2	2.5
Aldicarb sulfone alcohol	12.4	2.4	2.5	1.0	0.6
Aldicarb sulfone amide	29.8	24.9	22.4	31.0	31.1
Aldicarb sulfone nitrile	4.0	--[b]	0.1	0.6	0.8
Aldicarb sulfone oxime	0.4	--	0.2	--	0.4
Aldicarb sulfone aldehyde	0.4	--	--	--	--
Unknown	4.1	1.9	1.8	2.2	2.4
Unextracted (%)	3.0	0.8	0.8	1.5	1.3

[a] Percent of ^{14}C applied.

[b] None detected.

Table 4. Leaching of [^{14}C]aldicarb sulfone residues in Lakeland fine sand and Lufkin sandy loam.[a]

Time (days)	Percent of applied radioactivity in leachate	
	Lakeland fine sand	Lufkin sandy loam
7	0.01	1.93
14	21.86	5.65
21	38.32	8.39
28	20.38	2.65
35	6.73	0.37
42	1.66	0.05
49	0.65	0
56	--	0
70	--	--
TOTAL	89.61	19.04

[a] The 5-inch soil columns were treated with [^{14}C]aldicarb sulfone at 4 lb ai/6-inch A.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS0140 ALDICARB STUDY 19 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 0505

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102050 CONTENT CAT 01
Quraishi, M. 1972. Edaphic and water relationships of aldicarb and its metabolites. Can. Entomol. 104(Aug):1191-1196. Also In unpublished submission received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096670-E.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS SEC: EFB -30-050520 EFB -30-050525

DIRECT RVW TIME = 13 (MH) START-DATE END DATE

REVIEWED BY: C. Rodgers and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: C. Rodgers T. Opeka DATE: Jan. 28, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study is scientifically valid.

2. Aldicarb residues, as determined colorimetrically, dissipated fairly rapidly with half-lives of ~2, 3, and 5 weeks in samples of clay loam soil treated with aldicarb at 5, 20, and 50 ppm, respectively. Soil temperature varied from 23 to 32 C over the course of the study.

3. This portion of the study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because aldicarb residues were not characterized, complete characteristics of the test soil were not reported, a materials balance was not provided, treated soils were not maintained at a constant temperature, and soil moisture content was not specified.

Metabolism - Aerobic Aquatic

This portion of the study is scientifically invalid because the sampling protocols were inappropriate to assess the decline of aldicarb residues in water. In addition, this portion of the study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because sediment was not incubated with the aldicarb-treated water, aldicarb residues were not characterized, the test samples were not maintained at a constant temperature, a materials balance was not conducted, and water characteristics were not provided.

Mobility - Leaching and Adsorption/Desorption

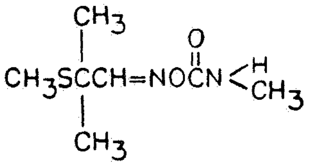
1. This portion of the study is scientifically valid.

2. Aldicarb residues are mobile in clay soil columns (25 cm height) with ~9.2 mg of aldicarb residues recovered in the first 450 ml of leachate following an initial application of aldicarb at 12 mg/column.

3. This portion of the study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because aldicarb residues and the test soil were not characterized, and the test soil was not analyzed for aldicarb.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

Metabolism - Aerobic Soil

Aldicarb (98.45% pure, Union Carbide Corp.) was applied at 5, 20, and 50 ppm in 10 ml of water to 100 g samples of a clay loam soil (pH 6.8-7.2, additional characteristics unspecified) from potato fields in the Red River Valley, North Dakota. The treated soils were uniformly mixed in 250-ml flasks which were subsequently capped with cotton plugs. Control flasks containing 100 g of soil were prepared using 10 ml of water only. The flasks were maintained within the range of 23 to 32 C for periods of 10 to 13 weeks. After the first 10 ml of water had evaporated from the soils, further water losses were replaced daily using distilled water.

Three flasks of each treatment were removed randomly and analyzed at weekly intervals. Soil samples were extracted with a mixture of chloroform and acetone (4:1, v:v). The extracts were hydrolyzed by using 0.1 N NaOH and 1 N HCl, and oxidized with iodine. Sulfanilic acid was added to form the corresponding diazonium compound, which was further treated with 1-naphthylamine for color development and quantified colorimetrically. Recoveries ranged from 92 to 98% in spiked soil samples by using this method. A standard calibration curve was generated from chloroform solutions of aldicarb which were processed in the same manner as the experimental extracts.

Metabolism - Aerobic Aquatic

Rain overflow and seepage water (characteristics unspecified) collected from ditches near untreated fields were treated with aldicarb (analytical grade, 98.45% pure, Union Carbide Corp.) at 100 ppm. Four enamel containers (16 liter capacity) were filled with 4 liter aliquots of the treated water, exposed to sunlight during the day, and stored indoors during the night at 16-20 C. Total exposure to sunlight was 507.5 hours over ~11 months. Water samples were drawn at approximately weekly intervals, and extracted and analyzed using the methods described in the aerobic soil metabolism portion of this study. After each sample had been drawn, water was added to maintain the volume at 4 liters. Spiked water samples consistently gave recovery values over 100%; experimental results were corrected accordingly.

Mobility - Leaching and Adsorption/Desorption

Triplicate chromatographic columns (60 cm length x 2.5 cm diameter) were filled with air-dried, powdered clay to a depth of 25 cm. An aqueous solution of aldicarb (analytical grade, 98.45% pure, Union Carbide Corp.) was added until the column soil appeared moist. The amount of aldicarb added to each column, calculated from the volume of solution added, was ~12 mg (average of 3 columns). Two hours following the application of aldicarb, water was leached through the columns. The first 1500 ml of leachate were collected in 15 ml aliquots by using an automatic fraction collector, combined into groups of 5 and stored at -40 C prior to colorimetric quantification using the same method described in the aerobic soil metabolism portion of this study.

REPORTED RESULTS:

Metabolism - Aerobic Soil

Aldicarb residues decreased to <0.05 ppm within 5 weeks after application of aldicarb at 5 ppm. At the higher application rates (20 and 50 ppm), aldicarb residues persisted >10 weeks; however, the residues had half-lives of 3 and 5 weeks, respectively (Table 1).

Metabolism - Aerobic Aquatic

Total aldicarb residues in field water samples declined from 81 ppm on day 0 to a concentration of 0.37 ppm after 11 months. The half-life of aldicarb residues was ~8 months.

Mobility - Leaching and Adsorption/Desorption

The majority of aldicarb was recovered in the first 450 ml of leachate; total recovery of aldicarb in 450 ml of leachate averaged (three columns) 9.2 mg (initial application was ~12 mg/column).

DISCUSSION:

Metabolism - Aerobic Soil

1. The test soil was not fully characterized.
2. Treated soils were not maintained at a constant temperature, and soil moisture content was not specified.
3. The colorimetric method employed was not specific for aldicarb and its degradates; therefore degradates were not identified or quantitated.

Metabolism - Aerobic Aquatic

1. Aldicarb residues were not differentiated or quantified.
2. Aquatic metabolism was studied only in water (characteristics unspecified) and not sediment as well.
3. The test samples were not maintained at a constant temperature.
4. A materials balance was not conducted.
5. The sampling protocols were inappropriate and insufficiently described. The protocol of replacing the sample volumes at each sampling interval may have reduced the concentration of aldicarb residues in solution by dilution.

Mobility - Leaching and Adsorption/Desorption

1. The test soil was not fully characterized.
2. The volume of aldicarb solution added to the columns (prior to elution) and the amount of soil in the columns were not reported.
3. The soil columns were not segmented and analyzed to quantify the test substance remaining in the soil.

4. The method of analysis was nonspecific and could not differentiate between aldicarb and its degradates.

Table 1. The concentration (ppm) of aldicarb residues in a clay loam treated at 5, 20, and 50 ppm, at various time intervals.

Sampling interval (weeks)	Application rate (ppm)		
	5	20	50
0	4.6	19.0	49.0
1	2.5	15.0	36.0[a]
2	1.7	12.0	34.0
3	0.5	9.0	32.0
4	0.7	6.0	27.0
5	0.4	4.2	25.0
6	ND[b]	3.4	15.0
7	ND	1.9	7.0
8	ND	1.7	4.5
9	ND	0.8	1.5
10	ND	1.3	2.5

[a] Time interval in this case was 11 days.

[b] ND, nondetectable (<0.05 ppm).

(TDR03B) DATA EVALUATION RECORD

CASE GS0140 ALDICARB STUDY 20 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 05052010 GUIDELINE 40 CFR 163.62-8b/c

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102054 CONTENT CAT 01

Sheets, K., D. Hirsh, and R. Meeker. 1976. Temik aldicarb pesticide: metabolism of aldicarb in anaerobic Muskingum silt loam soil: Project No. 111A13, File No. 22196. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, Va.; CDL:096670-M.

SUBST. CLASS = S.

DIRECT RVW TIME = 6 (MH) START-DATE END DATE

REVIEWED BY: M. Peterson and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: M. Pete T. Opeka DATE: Feb. 3, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study is scientifically valid.

2. Aldicarb was degraded within 60 days in aerobic silt loam soil incubated at 22 C and at 75% of field capacity. By day 90, the majority of radioactivity applied as [^{14}C]aldicarb at 2.7 ppm was associated with evolved CO$_2$ (65.5%). The following degradates were present at maximum concentrations of >0.01 ppm: aldicarb sulfoxide, aldicarb sulfoxide acid, aldicarb sulfoxide alcohol, aldicarb sulfoxide amide, aldicarb sulfoxide nitrile, aldicarb sulfone acid, aldicarb sulfone alcohol, aldicarb sulfone amide, aldicarb sulfone nitrile, and methane sulfonic acid.

3. This portion of the study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by identifying the aforementioned degradates of aldicarb. However, this portion of the study does not fulfill the data requirements because the sampling intervals were insufficient to establish a quantitative decline curve and half-life value for aldicarb and establish the pattern of formation and decline of degradates.

Metabolism - Anaerobic Soil

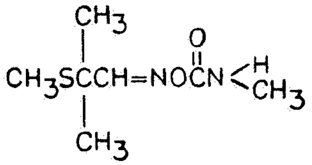
1. This portion of the study is scientifically valid.

2. Aldicarb was degraded within 60 days in anaerobic silt loam soil incubated at 22 C and at 75% of field capacity. After 60 days of anaerobic incubation which followed 30 days of aerobic incubation, the majority of radioactivity applied as [^{14}C]aldicarb at 2.7 ppm was associated with evolved CO_2 (76.9%). The following degradates were present at maximum concentrations of >0.01 ppm: aldicarb sulfoxide acid, aldicarb sulfoxide alcohol, aldicarb sulfoxide amide, aldicarb sulfoxide oxime, aldicarb sulfone, aldicarb sulfone acid, aldicarb sulfone alcohol, aldicarb sulfone amide, and methane sulfonic acid.

3. This portion of the study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by identifying the aforementioned degradates of aldicarb. However, this portion of the study does not fulfill the data requirements because the sampling intervals were insufficient to establish a quantitative decline curve and half-life value for aldicarb and establish the pattern of formation and decline of degradates. Additionally, the aldicarb-treated soil samples were incubated aerobically too long prior to establishment of anaerobic conditions (a period of one half-life is recommended).

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

A 2227-g portion of Muskingum silt loam soil (9.0% sand, 42% silt, 20% clay, pH 5.4, CEC 5.6 meq/100 g, 1.3% organic matter) was placed in a greenhouse and planted with beans and ryegrass (growth period unspecified). The soil was then allowed to air dry for 48 hours and passed through a 2-mm screen. A solution of [^{14}C]aldicarb (99.7% pure, specific activity 37.4 µCi/mg, Mallinckrodt Science Products Division) in distilled water was added to the soil at 2.7 ppm in four equal aliquots; treated soils were mixed for 1 hour between each addition. A total of 125 ml of water was added during the last three additions, after which the treated soils were remixed for 24 hours. The soil was packed into an 8-inch pot with screened 1-cm holes in the bottom, watered to 75% of field capacity, and covered with cheesecloth. The soil was aged for 30 days at 22 ± 2 C, and watered as required to maintain moisture content. After aging, the soil was divided into five equal portions. Two portions were maintained under aerobic conditions in separate glass columns (5.9 x 20 cm internal diameter) and watered as needed. Two other soil portions were placed in separate quart glass jars; anaerobic conditions were achieved by purging the containers with nitrogen gas and sealing the lids with electrical tape. One column of each treatment was stored for 30 days and the other for 60 days; incubation temperatures were maintained at 22 ± 2 C. The fifth soil portion was analyzed immediately following the initial 30-day aerobic aging period.

At the end of their respective incubations, the soil portions were extracted three times with a 1:1 mixture of acetone:methanol. The extracts were concentrated under vacuum and partitioned into organic and water-soluble fractions using chloroform and acetonitrile. The fractions were then separated by using TLC and autoradiography, and quantified by using LSC. The soils remaining after extraction were air dried and oxidized using potassium dichromate in a mixture of sulfuric and phosphoric acids. Evolved $^{14}CO_2$ was passed in nitrogen gas through a scrubber containing 5% aqueous hydrochloric acid and collected in a scrubber containing a 2:1 mixture of ethylene glycol monoethyl ether and ethanolamine.

REPORTED RESULTS:

Aldicarb and its carbamate degradates were degraded to noncarbamate degradates more rapidly under anaerobic than aerobic conditions; total residues in soil were 33% lower under anaerobic than aerobic conditions following 60 days of incubation (Table 1). All degradates except for aldicarb sulfoxide (aldicarb sulfoxide was not detected in soil under anaerobic incubation) were identified in both soils. After 30 days of aging in aerobic soil, >95% of the 2.7 ppm of [^{14}C]aldicarb originally applied was degraded to noncarbamate degradates and to CO_2. In the following 60 days, carbamate residues decreased to 0.01 ppm under anaerobic conditions and to 0.08 ppm under aerobic conditions. Unextracted ^{14}C residues in soil after 60 days accounted for 9.2 and 6.7% of the applied ^{14}C under anaerobic and aerobic conditions, respectively. The majority of radioactivity following degradation of the test substance was identified as CO_2 in both anaerobic and aerobic soils.

DISCUSSION:

1. The test soil could not be confirmed to be a silt loam soil because the stated mechanical analysis added up to only 71%.

2. Insufficient sampling was conducted to clearly establish decline curves of the parent compound and rates of formation and decline of degradates in the test soil; half-life estimates of the parent compound were not reported.

3. The method of quantifying evolved $^{14}CO_2$ from unextracted soil residues was not reported, but was assumed to be via LSC.

Table 1. The degradation of [^{14}C]aldicarb in aerobic and anaerobic Muskingum silt loam soil.

Components (%)[a]	Aerobic			Aerobic/ Anaerobic	
	Incubation period (days)				
	30	60	90	30/30	50/60
CO_2	31.9	58.3	65.5	65.3	76.9
Aldicarb	1.7	--[b]	--	0.2	--
Aldicarb sulfoxide	2.2	0.1	1.8	--	--
Aldicarb sulfoxide acid	37.4	8.8	8.5	5.0	2.2
Aldicarb sulfoxide alcohol	--	--	--	1.3	--
Aldicarb sulfoxide amide	5.8	5.8	6.0	1.3	1.7
Aldicarb sulfoxide nitrile	1.0	--	--	0.2	--
Aldicarb sulfoxide oxime	0.5	--	--	0.4	--
Aldicarb sulfone	0.4	1.5	1.1	0.2	0.5
Aldicarb sulfone acid	3.7	0.2	0.4	1.8	0.2
Aldicarb sulfone alcohol	0.5	--	--	0.5	0.3
Aldicarb sulfone amide	1.4	3.2	4.0	2.4	0.3
Aldicarb sulfone nitrile	3.1	--	0.2	0.2	0.1
Aldicarb sulfone oxime	--	--	0.1	--	0.05
Methane sulfonic acid	0.3	0.6	0.2	0.3	0.8
Origin[c]	1.5	9.3	5.4	8.4	7.2
Unknowns	1.2	0.3	0.1	3.9	0.55
Unextracted (%)	7.4	11.8	6.7	8.6	9.2

[a] Percent of ^{14}C applied.

[b] None detected.

[c] Principally aldicarb sulfoxide acid and aldicarb sulfone acid.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 7

CASE GS0140 ALDICARB STUDY 21 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00053385 CONTENT CAT 01
Romine, R.R., C.B. Halstead, C.E. Gibson, and L.K. Payne. 1968. Temik insecticide: leaching characteristics of Temik 10 G in soils: Project No. 111A13. Unpublished study received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-Z.

SUBST. CLASS = S.

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: K. Ellis and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: K. Elli T. Opeka DATE: Feb. 1, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

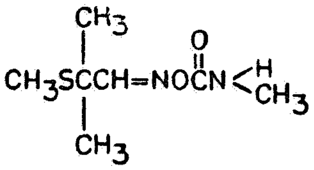
1. This study is scientifically valid.

2. Aldicarb residues (carbamate) are mobile in sandy loam and muck soils, leaching 6 inches in soil columns eluted with 1 and 3 inches of water, respectively.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because a nonspecific colorimetric method was used, the soil columns were too short (7 inches), the test substance was not a technical grade or purer, and the test soils were uncharacterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

A 6-inch diameter polyethylene jug with the bottom cut out was inverted and holes (3/16-inch) were drilled in the cap to allow drainage. A glass wool plug was placed in the neck of the jug and small glass beads were added. Six inches of untreated Norfolk sandy loam (North Carolina, characteristics unspecified) was added, followed by 1-inch of soil treated with 88,200 µg of aldicarb (Temik, 10% G, Union Carbide Corp.). An additional inch of untreated soil was added to the top of the column. An identical column was prepared using a Michigan muck soil (80% organic matter, other characteristics unspecified).

The columns were leached with 1 inch of water per week using a nebulizer. Norfolk sandy loam was leached for 64 days and Michigan muck was leached for 79 days. Leachate samples were extracted with chloroform, and evaporated under vacuum at 40 C with a stream of nitrogen. The residue was dissolved in a mixture of acetonitrile, isopropanol, and chloroform before being poured on a column of alumina. Eluates were collected and evaporated as before and total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) were determined colorimetrically. Average recoveries from samples fortified with aldicarb, aldicarb sulfoxide, and aldicarb sulfone were 88.1, 86.9, and 81.9%, respectively.

The soil in the columns was divided into 1-inch segments and analyzed colorimetrically to determine total carbamate residues. Prior to colorimetric analysis, the soil samples (100 g) were extracted with a solution of 20% acetone in chloroform (v:v), shaken, filtered, and vacuum dried. After repeating the extraction process, the samples were refiltered and evaporated to ~5-10 ml. The remaining residue was dissolved in acetone, mixed with a coagulation solution, and vacuum filtered. Acetonitrile and chloroform were added and the samples were evaporated under a stream of nitrogen. The dry residue was dissolved in chloroform and transferred to an alumina column. Eluates were collected, evaporated under vacuum, and diluted with chloroform. Samples were heated (hot tap water), evaporated by a nitrogen stream, and digested in a water bath after the addition of sodium hydroxide and hydrochloric acid. Samples were extracted with chloroform after the addition of sulfanilic acid, iodine solution, potassium acetate solution, sodium thiosulfate, and 1-napthylamine.

REPORTED RESULTS:

After leaching with 8 and 11 inches of water, 0.14% and 0.81% of the applied aldicarb was leached from the sandy loam and Michigan muck soil columns, respectively (Tables 1 and 2). The distribution of aldicarb residues in the sandy loam soil column was greatest in the 1- to 2-inch layer (application point) and decreased in amount down to the 7- to 8-inch layer (Table 3). Only 0.10% of the aldicarb applied in the 1- to 2-inch layer of sandy loam soil remained in the soil column after 72 days. In the Michigan muck soil the majority of the applied aldicarb was found in the 2- to 3-inch layer, which was directly below the layer of treated soil, and then decreased in amount to the column bottom (Table 4). Of the total amount of aldicarb applied to the muck soil, only 2% remained after 72 days.

DISCUSSION:

1. The large losses of aldicarb in the sandy loam (99.76% loss) and muck soil (97.19% loss) by the end of the study period prohibit the complete assessment of aldicarb mobility in these soils. These losses may indicate extensive degradation to noncarbamate products and/or volatilization. However, this study provides useful preliminary data indicating that aldicarb residues (uncharacterized) are mobile in sandy loam and muck soils.

2. A nonspecific colorimetric method was used.

3. The test substance was a formulated product, test soils were not completely characterized, and the soil columns were of an inadequate length.

Table 1. Analysis of leachate from aldicarb treated sandy loam soil.

Days after treatment	Cumulative inches of water applied	Leachate collected (ml)	Total carbamates in leachate (μg)
15	1	370	3.7
22	2	317	30.1
29	3	303	29.0
36	4	271	16.3
43	5	276	10.4
50	6	237	10.1
57	7	263	11.8
64	8	266	10.7
		Total μg in leachate	122.1
		μg incorporated into soil	88,200
Percentage of applied carbamate leached in 64 days			0.14

Table 2. Analysis of leachate from aldicarb-treated Michigan muck soil.

Days after treatment	Cumulative inches of water applied	Leachate collected (ml)	Total carbamates in leachate (µg)
6	1	219	ND[a]
13	2	230	ND
20	3	240	2.4
27	4	231	16.8
34	5	234	41.7
41	6	246	86.1
48	7	224	124.3
55	8	221	114.6
62	9	206	119.5
72	10	188	65.8
79	11	240	119.0
		Total µg in leachate	690.2
		µg incorporated into soil	85,280
Percentage of applied carbamate leached in 79 days			0.81

[a] None detected.

Table 3. Analysis of Norfolk sandy loam soil column for aldicarb residues after leaching.

Column arrangement	Layer analyzed[a] (inches)	Dry weight of layer (g)	Total carbamates in layer (μg)
Untreated soil	0-1	540	6.8
Aldicarb treated soil	1-2	509	13.5
Untreated soil	2-3	574	12.6
	3-4	568	13.1
	4-5	539	13.2
	5-6	528	11.1
	6-7	552	11.3
	7-8	289	6.1
		Total μg in soil	87.7
		μg incorporated into soil	88,200
Percentage of applied carbamate remaining in days			0.10

[a] After 72 days.

Table 4. Analysis of Michigan muck soil column for aldicarb residues after leaching.

Column arrangement	Layer analyzed[a] (inches)	Dry weight of layer (g)	Total carbamates in layer (μg)
Untreated soil	0-1	263	18.4
Aldicarb treated soil	1-2	277	256.0
Untreated soil	2-3	240	398.0
	3-4	231	317.5
	4-5	294	264.2
	5-6	293	202.0
	6-7	249	106.0
	7-8	231	176.8
		Total μg in soil	1738.9
		μg incorporated into soil	85,280
Percentage of applied carbamate remaining in days			2.0

[a] After 87 days.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 5

CASE GS0140 ALDICARB STUDY 22 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00053380 CONTENT CAT 01
Richey, F.A., Jr., and W.J. Bartley. 1972. Temik aldicarb pesticide: water leaching of aldicarb, aldicarb sulfoxide, aldicarb sulfone and internal standard chloride ion in columns of four soil types: Project No. 111A12. Unpublished study received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-U.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: L. Lewis T. Opeka DATE: Jan. 28, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

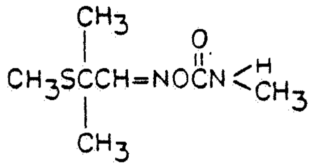
1. This study is scientifically valid.

2. Aldicarb, aldicarb sulfoxide, and aldicarb sulfone are mobile in sandy loam, sandy clay loam, and fine sand soil. Aldicarb is also mobile in muck soils. After applying 1 inch of water, 50% of the applied radioactivity leached 2.1-2.6 inches in columns of sandy clay loam, sandy loam, and fine sand soils. In muck soil, 50% of the applied [^{14}C]aldicarb (only compound tested in muck soil) leached 0.3 inches upon elution with 1-inch of water.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test substances were not fully characterized, application rates were not reported, and the soil columns were too short (6 inches).

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}{}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Lakeland fine sand, Norfolk sandy loam, Georgia sandy clay loam, and Michigan muck soil samples (Table 1) were air dried, sieved to <2 mm, and packed 6 inches deep into soil columns (1-inch inside diameter). The soil columns were saturated with water, and S-methyl [^{14}C]aldicarb, S-methyl [^{14}C]aldicarb sulfoxide, or S-methyl [^{14}C]aldicarb sulfone (1 x 10^6 dpm each, other characteristics unspecified) were applied on the soil surface. The soil columns were leached at a rate that constantly flooded the soil surface and eluted 1 drop every 3-4 seconds, which was collected as 4-6 ml fractions. Each fraction was weighed before withdrawing a 1 ml portion to mix with 10 ml of scintillation mixture (xylene:dioxane:Cellosolve) which was then radioassayed. Recovery values ranged from 94 to 100%.

REPORTED RESULTS:

Aldicarb, aldicarb sulfoxide, and aldicarb sulfone, were readily mobile in the soils tested under extensive flooding conditions (Table 2). Aldicarb and its degradates leached through the columns at approximately the same rate in a given soil type. The rate of movement for 50% of the applied aldicarb, aldicarb sulfoxide, and aldicarb sulfone (inches moved/inch applied water) is presented in Table 3.

DISCUSSION:

1. The test substances were not fully characterized and their application rates were not reported.

2. Soil columns were too short (6 inches).

Table 1. Soil characteristics.

Soil type	Organic matter (%)	Sand (%)	Silt (%)	Clay (%)	pH
Lakeland fine sand	1.3	97.5	1.2	0	4.6
Norfolk sandy loam	1.6	82.6	8.5	7.4	4.8
Georgia sandy clay loam	4.0	56.3	10.9	28.9	5.6
Michigan muck	56.8	12.1	21.9	9.3	6.2

Table 2. Parent recovery of applied radioactivity in leachate fractions during the leaching of aldicarb, aldicarb sulfoxide, and aldicarb sulfone from 6-inch soil columns.[a]

Test substance	Soil type	Leachate fraction (inches of water)										
		0-1.5	1.5-2	2-2.5	2.5-3	3-3.5	3.5-4	4-4.5	4.5-5	5-6	6-8	8-end
Aldicarb	Fine sand	0	0	21	36	20	8	3	3	4	3	2
	Sandy loam	0	8	46	26	10	4	2	2	1	1	--
	Sandy clay loam	0	10	43	34	10	3	--	--	--	--	--
Aldicarb sulfoxide	Fine sand	0	0	32	50	14	2	1	1	--	--	--
	Sandy clay loam	0	17	48	25	9	2	1	--	--	--	--
Aldicarb sulfone	Fine sand	0	0	45	47	4	1	1	1	1	1	--
	Sandy clay loam	0	18	54	24	4	--	--	--	--	--	--

[a] Normalized to total 100%.

Table 3. Leaching of aldicarb, aldicarb sulfoxide, and aldicarb sulfone in soils.

Test substance	Soil type	Rate of movement of 50% of applied chemical through soil (inches moved/inch applied water)
Aldicarb	Fine sand	2.1
	Sandy loam	2.4
	Sandy clay loam	2.4
	Muck	0.3
Aldicarb sulfoxide	Fine sand	2.2
	Sandy clay loam	2.5
Aldicarb sulfone	Fine sand	2.3
	Sandy clay loam	2.6

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 16

CASE GS0140 ALDICARB STUDY 23 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00101934 CONTENT CAT 01

Bull, D., J. Coppedge, and R. Ridgway. 19??. Fate of Temik in soil with special reference to chemical changes, movement, and volatilization. U.S. Agricultural Research Service, Entomology Research Div., Cotton Insects Systemic Chemicals Investigations; unpublished study; CDL:091372-J.

FICHE/MASTER ID 00035365 CONTENT CAT 02

Bull, D.L., R.A. Stokes, J.R. Coppedge, and R.L. Ridgway. 1970. Further studies of the fate of aldicarb in soil. J. Econ. Entomol. 63(4):1283-1289. Also In unpublished submission received July 26, 1971 under 1F1008; submitted by Union Carbide Corp., Washington, D.C.; CDL:091747-C.

FICHE/MASTER ID 00102071 CONTENT CAT 01

Coppedge, J., D. Bull, and R. Ridgway. 1977. Movement and persistence of aldicarb in certain soils. Arch. Environ. Contam. Toxicol. 5(2):129-141. Also In unpublished submission received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-P.

SUBST. CLASS = S.

DIRECT RVW TIME = 11 1/2 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: L Lewis T. Opeka DATE: Feb. 7, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study is scientifically valid.

2. [^{14}C]Aldicarb degrades slowly (half-lives >56 days) in four dry soils (pure sand, fine sandy loam, clay, and muck), in sand at 50 and 100% of field capacity, and in fine sandy loam at 50% of field capacity. Degradation rates in-

crease in fine sandy loam, clay, and muck soils with an increase in moisture content up to field capacity (half-lives <1 to 28 days). Soil pH (6, 7, or 8) had no appreciable effect on the rate of degradation. Aldicarb sulfoxide, aldicarb sulfone, aldicarb sulfoxide oxime, aldicarb sulfone oxime, aldicarb sulfoxide nitrile, and aldicarb sulfone nitrile were identified as degradates.

3. This portion of the study partially fulfills EPA Data Requirements for Registering Pesticides (1983) by providing half-life estimates for aldicarb in sand, fine sandy loam, clay, and muck soils, and by identifying several aldicarb degradates.

Mobility - Leaching and Adsorption/Desorption

This portion of the study is scientifically invalid because the experimental design was inadequate to assess the mobility of aldicarb in soil. In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the soil columns used were of insufficient length, and, in experiment 4, a method was used that is not one of the three recommended by EPA for use in assessing pesticide mobility in soil.

Mobility - Laboratory Volatility

This portion of the study is scientifically invalid because a large portion of the applied radioactivity was not recovered by the end of the test period (Experiments 1-4) and volatiles were not trapped, precluding any accurate quantitative assessment of aldicarb volatility from soil (Experiment 5). In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test substance was not a typical end-use product, and volatility was not expressed as $\mu g/cm^2/hour$.

Field Dissipation - Terrestrial

1. This portion of the study is scientifically valid.

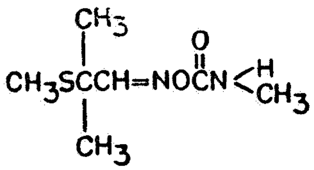
2. Total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) dissipate rapidly from sandy, sandy loam, and fine sandy loam soils, with half-lives of 1, 4, and 7 days, respectively. Concentrations of $[^{35}S]$-aldicarb in soil samples taken 5-cm above and below the treated soil were ≤ 0.55 ppm.

3. This portion of the study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test substance was not a typical end-use product and soil samples were not taken in increments to a depth >15 cm and/or to a depth sufficient to define the extent of leaching.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{\overset{\textstyle CH_3}{|}}{\underset{\underset{\textstyle CH_3}{|}}{C}}CH{=}NO\overset{\overset{\textstyle O}{\|}}{C}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Metabolism - Aerobic Soil

Pure sand, Lufkin fine sandy loam, Houston clay, and muck soils (Table 1) were adjusted with phosphate buffer to pH 6, 7, and 8, dried, pulverized, and passed through a 40-mesh (~0.4 mm) sieve. Subsamples of each soil preparation were moistened to 0, 50, and 100% of field capacity, and treated with S-methyl [^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) at 200 μg/10 g (dry weight) of soil. The soil samples at 0% of field capacity were covered and maintained in a ventilated hood; the remaining soil samples (50 and 100% of field capacity) were incubated in glass tanks under saturated atmospheric conditions. All soil samples were maintained at 27 ± 2 C.

Soil samples were taken on days 0, 1, 3, 7, 14, 28, and 56 posttreatment. The soils were extracted once with acetone:methanol (1:1) and twice with chloroform:acetonitrile (1:1). The extracts were radioassayed by using LSC, followed by two-dimensional TLC separation using chloroform:ethyl acetate:ethanol:n-hexane (5:1:1:1) and ether:n-hexane:ethanol (4:1:1), and by subsequent radioassay by using LSC. The extracted soil samples were combusted, and the evolved $^{14}CO_2$ was trapped and quantified by using LSC.

Mobility - Leaching and Adsorption/Desorption

Experiment 1

Lufkin fine sandy loam, Michigan muck, coarse sand, and Houston clay (Table 1) were packed into polypropylene soil columns (63 x 128 mm), saturated with water, and drained for 24 hours. Thirty-four milligrams of [^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) impregnated [redacted] (10% w:w) was applied 38 mm below the soil surface of each column. One inch of water per week was added for 7 weeks and leacnate was collected and quantified by using LSC. Following the leaching period, the soil in the columns was removed in 25 mm segments and extracted twice with chloroform:methanol (1:1). The extracts were combined, and a portion was quantified by using LSC. The remaining extract was evaporated to a smaller volume and characterized by using TLC. The extracted soil samples were combusted, and the evolved $^{14}CO_2$ was trapped in 2-methoxyethanol:2-aminoethanol (2:1, v:v) and quantified by using LSC.

Experiment 2

Three polypropylene soil columns (152 x 200 mm) were packed with Houston clay, Lufkin fine sandy loam, and coarse sand (Table 1), and separated with wire screen into 55 mm layers. The columns were saturated with water, drained for 24 hours, and treated with 34 mg of [^{35}S]aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.) impregnated granules 44 mm below the soil surface. In a fine spray, 1 inch of water per week was added for 5 weeks. The columns were frozen, and separated into 50 mm segments, which were thawed, mixed, and divided into subsamples. Soil samples were extracted as described above in Experiment 1. The extracted soil samples were digested with nitric acid.

Experiment 3

Triplicate samples of Lufkin fine sandy loam, coarse sand, and Lakeland fine sand (Table 1) were packed into metal columns (150 x 760 mm), moistened to field capacity, and treated with 34 mg of [^{35}S]aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.) impregnated granules 55 mm below the soil surface. The columns were maintained in a greenhouse, and were covered to minimize evaporation. One inch of water was added per week for 9 weeks, and leachate was collected weekly for radioassayed by using LSC.

Experiment 4

Triplicate samples of Lufkin fine sandy loam soil (Table 1) moistened to 0, 25, 50, 75, and 100% of field capacity, were added to 250 ml beakers to a depth of 6 cm, and treated with 500 µg of [^{35}S]aldicarb (Temik, specific activity 46.3% mCi/mM, Union Carbide Corp.) 2 cm from the bottom. A layer of sand (0.5 cm) was placed on top of each soil sample. Soil samples were maintained under conditions of "a normal outdoor environment" for 24 hours. Samples were extracted once with acetone:methanol (1:1), then twice with chloroform:acetonitrile (1:1). The extracts were radioassayed by using LSC, followed by two-dimensional TLC separation using chloroform: ethyl acetate:ethanol:n-hexane (5:1:1:1) and ether:n-hexane:ethanol (4:1:1) and by subsequent radioassay by using LSC. The extracted soil samples were digested with nitric acid.

Mobility - Laboratory Volatility

Experiment 1

Lufkin fine sandy loam soil (Table 1) was packed into a polypropylene soil column (63 x 128 mm), and saturated with water. Thirty-four milligrams of

[^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) impregnated granules were applied 38 mm below the soil surface, and the column was placed inside a glass container (23 cm high, 11.5 cm inside diameter). One inch of water was added to the soil column each week for 7 weeks. Air was continuously drawn through the glass container at 15 liters/hour and passed through two gas-washing flasks containing methyl cellosolve:ethanolamine (2:1, v:v). Trapping solutions were changed daily, and aliquots were quantified by using LSC.

Experiment 2

A Lufkin fine sandy loam (Table 1) soil column (63 x 128 mm) was saturated, drained for 24 hours, and treated with 34 mg of [^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) impregnated granules at 38 mm below the soil surface. The soil column was placed inside a jar which had a 63-cm hole in its base to allow for drainage. One inch of water was added to the soil column weekly for 7 weeks, and the leachate was collected and quantified by using LSC. Air was drawn through the jar (15 liters/hour) and passed through two flasks containing 2-methoxyethanol:2-aminoethanol (2:1, v:v). The trapping solutions were changed twice daily and aliquots were quantified by using LSC.

Experiment 3

Thirty-four milligrams of [^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) impregnated granules were applied at 20, 75, or 115 mm below the surface of the soil in three 63 x 128 mm polypropylene columns of Lufkin fine sandy loam (Table 1), which were then placed under a jar as described in Experiment 2. An additional column of the same soil type, with 34 mg of [^{14}C]aldicarb applied at a 75 mm depth, was placed completely inside a glass container. All other experimental conditions and analyses of samples were identical to those described in Experiment 2.

Experiment 4

Three Lufkin fine sandy loam soil (Table 1) columns were prepared; one column was treated with 34 mg of [^{14}C]aldicarb (Temik, specific activity 4 mCi/mM, Union Carbide Corp.) impregnated granules 35 mm below the surface of the soil, and two columns were treated with 34 mg of [^{35}S]aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.) impregnated granules 35 or 115 mm below the soil surface. Each column was placed under a separate glass container. All other experimental conditions were as described in Experiment 2.

Experiment 5

Coarse sand (Table 1) was washed, dried, saturated with water, treated with 100 µg of [^{35}S]aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.), and added to 6-dram shell vials in a 1-cm layer. A separate portion of coarse sand was treated and maintained dry. A 5.5-cm layer of untreated sand was added on top of the treated layer, and the vials were maintained for 24 hours in an oil bath at 25, 50, and 75 C. Soil samples were extracted once with acetone:methanol (1:1), then twice with chloroform:acetonitrile (1:1). The extracts were radioassayed by using LSC, followed by two-dimensional TLC separation using chloroform:ethyl acetate:ethanol:n-hexane (5:1:1:1) and ether:n-hexane:ethanol (4:1:1) and by subsequent radioassay by using LSC. The extracted soil samples were digested with nitric acid.

Field Dissipation - Terrestrial

Experiment 1

Lufkin fine sandy loam soil (Table 1) columns (63 x 128 mm) were treated with 34 mg of [^{35}S]aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.) impregnated granules, 76 mm below the surface of the soil. The soil columns were open at the top and covered with plastic screen (52 x 52 mesh) layers at the bottom. The soil was thoroughly moistened, and the columns were buried in a field of the same soil type to a depth that placed the top of the columns 76 mm below the surface of the soil. Natural rainfall was the only source of moisture (Table 7). Triplicate samples were collected on 3, 7, 21, 35, and 49 days after treatment, and were extracted twice with chloroform:methanol (1:1). The extracts were combined, and a portion was quantified by using LSC. The remaining extract was evaporated to a smaller volume and characterized by using TLC. The extracted soil samples were digested with nitric acid.

Experiment 2

[^{35}S]Aldicarb (Temik, specific activity 46.3 mCi/mM, Union Carbide Corp.) impregnated granules were applied to samples of coarse sand, Lufkin fine sandy loam, and West Texas sandy loam soils (Table 1), at 450 µg/50 g of soil. Each soil sample was placed in a flat, rectangular packet (7 x 9 cm) of 200-mesh stainless steel, and was buried in a field of the same soil type at a depth of 13 cm. One portion of each soil type was maintained dry by covering the samples with plastic during inclement weather, and the remaining soil samples were maintained moist. Soil packets, and samples of the soil 5 cm above and below the packets, were collected on 0, 1, 3, 7, 14, 28, and 56 days after treatment. Soil samples were extracted once with acetone:methanol (1:1), then twice with chloroform:acetonitrile (1:1). The extracts were radioassayed by using LSC, followed by two-dimensional TLC separation using chloroform:ethyl acetate:ethanol:n-hexane (5:1:1:1) and ether:n-hexane:ethanol (4:1:1) and by subsequent radioassay by using LSC. The extracted soil samples were digested with nitric acid.

REPORTED RESULTS:

Metabolism - Aerobic Soil

[^{14}C]Aldicarb degradation at pH 7 is shown in Table 2; soil pH (6, 7, or 8) had no appreciable effect on the rate of degradation. Recovery of radioactivity by 56 days posttreatment ranged from 4% (sand, pH 8) to 85% (clay, pH 8). [^{14}C]Aldicarb was degraded slowly (half-lives >56 days) in all test soils at 0% of field capacity. The rate of degradation increased (half-lives <1-28 days) at 50 and 100% of field capacity in all soils with the exception of sand (50 and 100% of field capacity) and fine sandy loam (50% of field capacity). Aldicarb sulfoxide and aldicarb sulfone increased to maximum concentrations of 10, 46, 25, and 53% of the applied radioactivity in sand (pH 6), fine sandy loam (pH 6), clay (pH 7), and muck (pH 8) soils, respectively. Respective maximum concentrations of aldicarb sulfoxide oxime, aldicarb sulfone oxime, aldicarb sulfoxide nitrile, aldicarb sulfone nitrile, and four unidentified noncarbamate degradates in the four soils were 10 (pH 6 and 7), 21 (pH 8), 67 (pH 8), and 40% (pH 7) of the applied radioactivity.

Mobility - Leaching and Adsorption/Desorption

Experiment 1

[^{14}C]Aldicarb was mobile in fine sandy loam, muck, coarse sand, and clay soils; after leaching 128-mm soil columns with 7 inches of water, 4-84% of the applied radioactivity was found in the leachate (Table 3). Of the total recovered radioactivity (soil and water), aldicarb sulfoxide accounted for up to 3.2% of the radioactivity in the leachate (clay), while aldicarb sulfone and other unidentified degradates increased to maximum concentrations of <0.1% and 1.9%, respectively.

Experiment 2

After the addition of 1-inch of water to 200 mm soil columns, [^{35}S]aldicarb leached a distance of 150 mm in sand, and 50 mm in clay and fine sandy loam (Table 4). Aldicarb sulfoxide, aldicarb sulfone, and noncarbamate degradates reached maximum concentrations of 5, 1, and 42% of the applied radioactivity, respectively.

Experiment 3

No radioactivity was detected in water eluted from 760-mm fine sand or fine sandy loam soil columns (of metal) leached with 9 inches of water. Leachate from coarse sand columns contained 1.6% of the applied radioactivity following the leaching period.

Experiment 4

Soil moisture content affected the movement and recovery of [^{35}S]aldicarb in fine sandy loam; in dry soil (0% of field capacity), ~85% of the applied radioactivity remained in the treated layer (4-6 cm), while the majority of

111

the applied radioactivity (42-80%) in samples at 25, 50, 75, and 100% of field capacity moved up from the treated layer to the 2- to 4-cm, 0- to 4-cm, 0- to 2-cm, and 0- to 2-cm segments, respectively. Radioactivity recovered from the soil samples ranged from 53% (100% of field capacity) to 88% (0% of field capacity).

Mobility - Laboratory Volatility

Experiment 1

Approximately 5% of the applied radioactivity was accounted for in the soil after 7 weeks, and ~50% was found in the trapping solution. Results for the leachate were not reported.

Experiment 2

Approximately 56% of the applied radioactivity was recovered after 7 weeks of leaching; soil and leachate accounted for ~13% of the applied radioactivity, while ~43% was found in the trapping solution.

Experiment 3

A total of 95% of the applied radioactivity was recovered from the soil, leachate, and trapping solution of the soil column placed completely inside a glass container. Trapping solution from soil columns treated with [^{14}C]aldicarb at 20, 75, and 115 mm below the surface of the soil contained 83, 52, and 34% of the applied radioactivity 36 days after treatment (Table 5).

Experiment 4

Approximately 58% of the applied radioactivity was recovered from the trapping solution of the soil column treated with [^{14}C]aldicarb, while ~0.2% of the applied radioactivity was found in the trapping solution of soil columns treated with [^{35}S]aldicarb (Table 6).

Experiment 5

After 24 hours of incubation at 25, 50, and 75 C, 92, 44, and 11% of the applied radioactivity remained in wet sand, while 83, 65, and 52% remained in dry sand. Loss of radioactivity in wet sand was correlated with water evaporation.

Field Dissipation - Terrestrial

Experiment 1

Aldicarb dissipated with a half-life of ~7 days (Table 7). By day 49 posttreatment, only 0.9% of the applied radioactivity was present; the majority was associated with unidentified noncarbamate degradates.

Experiment 2

No radioactivity was detected in moist soil packets buried at a depth of 13 cm by the first sampling interval (1 day posttreatment), following a 4-inch rainfall 6 hours after treatment. In dry soil packets (13 cm deep) total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) dissipated with half-lives of <1, 4, and 7 days in coarse sand, sandy loam, and fine sandy loam, respectively. Concentrations of [^{35}S]-aldicarb in soil taken 5-cm above and below the treated soil packets were <0.55 ppm.

DISCUSSION:

Metabolism - Aerobic Soil

Degradation products were identified by TLC; however, data were not provided to yield quantitative estimates of the aldicarb degradates present.

Mobility - Leaching and Adsorption/Desorption

1. This portion of the study was considered to be scientifically invalid because water was added to the soil columns at a rate of 1-inch per week, thereby allowing aldicarb to degrade. In addition, clay soils were allowed to dry out between water application and pull away from the sides of the soil columns, precluding percolation of water through the soil and any accurate assessment of aldicarb mobility.

2. The soil columns used in this study were too short (only 5-8 inches) to accurately assess aldicarb mobility in soil.

Mobility - Laboratory Volatility

1. The test substance used was not a typical end-use product.

2. In the fifth experiment, excessive temperatures were used (50 and 75 C) that did not simulate actual use conditions.

3. Volatility was not expressed as $\mu g/cm^2/hour$.

Field Dissipation - Terrestrial

The test substance used was not a typical end-use product.

Table 1. Soil characteristics.

Soil	Sand (%)	Silt (%)	Clay (%)	Organic matter (%)	pH
Pure sand	100.0	0.0	0.0	0.0	7.0
Lufkin fine sandy loam	58.0	22.0	20.0	1.4	6.8
Houston clay	4.4	40.1	55.5	8.1	8.0
Michigan muck	--[a]	--	--	78.0	6.0
Coarse sand	97.0	2.0	1.0	0.1	7.2
West Texas sandy loam	61.0	26.0	13.0	1.0	6.9

[a] Values not reported.

Table 2. Distribution (% of applied) of recovered aldicarb residues in soils at varying moisture levels and at pH 7.[a]

Moisture content (%)	Component	Days posttreatment 0	7	14	56
	Pure sand				
0	Aldicarb	90.2	72.8	65.4	42.2
	Oxidation products[b]	4.9	4.7	7.4	5.9
	Noncarbamate degradates[c]	0.0	0.5	1.0	1.6
50	Aldicarb	96.9	87.4	86.4	69.0
	Oxidation products	2.5	4.6	5.5	5.0
	Noncarbamate degradates	0.0	1.1	1.3	1.7
100	Aldicarb	93.5	85.7	86.3	55.6
	Oxidation products	2.8	4.0	3.3	1.2
	Noncarbamate degradates	0.0	1.2	2.6	10.5
	Lufkin fine sandy loam				
0	Aldicarb	90.1	79.1	75.2	55.2
	Oxidation products	6.0	11.0	13.9	24.5
	Noncarbamate degradates	0.0	1.6	2.6	3.4
50	Aldicarb	88.0	72.1	61.2	15.1
	Oxidation products	4.7	14.0	19.7	40.5
	Noncarbamate degradates	0.0	3.0	3.2	14.7
100	Aldicarb	90.0	4.8	2.2	0.7
	Oxidation products	2.9	1.0	1.4	0.5
	Noncarbamate degradates	0.0	13.9	14.8	17.1
	Houston clay				
0	Aldicarb	93.0	82.0	81.0	63.7
	Oxidation products	3.4	6.8	7.3	10.4
	Noncarbamate degradates	0.0	1.4	1.2	1.8
50	Aldicarb	85.0	40.7	7.3	0.5
	Oxidation products	3.4	25.2	8.4	3.9
	Noncarbamate degradates	0.0	7.6	15.6	23.6
100	Aldicarb	83.2	5.2	2.3	0.8
	Oxidation products	2.6	2.9	2.6	1.2
	Noncarbamate degradates	0.0	42.1	40.5	26.3
	Michigan muck				
0	Aldicarb	72.5	68.8	69.4	62.5
	Oxidation products	14.3	15.4	16.6	12.3
	Noncarbamate degradates	0.0	2.4	1.4	2.3
50	Aldicarb	75.3	42.6	33.8	3.7
	Oxidation products	10.9	27.0	40.9	50.4
	Noncarbamate degradates	0.0	5.0	5.0	20.1
100	Aldicarb	32.9	1.3	1.4	0.7
	Oxidation products	4.7	0.8	1.3	0.6
	Noncarbamate degradates	0.0	21.6	39.8	26.5

---

[a] Degradation of [^{14}C]aldicarb was not appreciably different at pH 6 and 8.

[b] Aldicarb sulfoxide and aldicarb sulfone.

[c] Aldicarb sulfoxide oxime, aldicarb sulfone oxime, aldicarb sulfoxide nitrile, aldicarb sulfone nitrile, and four unidentified noncarbamate degradates.

Table 3. Distribution of [^{14}C]aldicarb in soil columns following leaching with 1 inch of water per week for 7 weeks.[a]

	Percentage of applied radioactivity in indicated layer (inches)					Percentage of total applied radioactivity				
Soil type	0-1	1-2	2-3	3-4	4-5	Extractable	Unextractable	In leachate	Recovered	Lost
Houston clay	0.44	0.09	0.06	0.04	0.02	0.65	2.47	12.50	15.62	84.38
Lufkin fine sandy loam	1.16	0.33	0.12	0.07	0.03	1.71	2.95	3.93	8.59	91.41
Coarse sand	0.01	T[b]	0.21	0.45	2.04	2.71	0.21	83.97	86.89	13.11
Michigan muck	8.75	5.34	8.47	5.59	4.81	32.96	7.13	3.6	43.55	56.45

[a] Results are the average of triplicate samples.

[b] T = trace amounts (<0.01%).

Table 4. Leaching of $[^{35}S]$aldicarb through 200-mm soil columns with the addition of 1 inch of water/week/column.[a]

Depth	Percent of applied radioactivity recovered from indicated soils and week(s) after treatment											
	Sand				Loam				Clay			
	1	2	3	5	1	2	3	5	1	2	3	5
0-50 mm	40.3	4.9	0.4	0	7.9	0	0	0	1.4	0	0	0
50-100 mm	5.3	0.8	0.7	0	0.2	0	0	0	0.1	0	0	0
100-150 mm	2.3	0.5	0.7	0	--[b]	0	0	--	--	0	0	--
150-200 mm	0.7	0.4	0.3	0	--	--	0	0	--	0	--	--
Leachate	0	0.1	2.3	2.1	0	0	0.3	0.2	0	0	T[c]	T
Unextractable (soil)	0.6	0.2	T	T	3.8	1.8	0.9	T	5.1	3.0	0.9	T
Total recovery	61.1	25.9	14.1	6.8	63.5	25.4	13.3	2.6	34.9	13.8	4.4	1.8

[a] All columns were treated with 34 mg of $[^{35}S]$aldicarb applied 40 mm from the soil surface. Results are expressed as the average of triplicate samples.

[b] Value not reported.

[c] T = trace amounts (<0.01%).

Table 5. Volatilization of [^{14}C]aldicarb equivalents from Lufkin fine silt loam soil columns.

Days after treatment	Cumulative percentage of applied radioactivity recovered in trapping solution at indicated depths (mm) 20	75	115
1-4	7.5	1.5	0.1
4-8	26.5	4.8	1.8
8-12	35.7	7.0	3.1
12-16	39.0	14.1	6.8
16-20	46.0	23.2	11.7
20-24	55.0	35.0	20.0
24-28	65.5	45.9	26.9
28-32	76.0	50.7	32.5
32-36	83.0	52.1	33.6
Recovered from soil[a]	8.4	16.1	6.8
Recovered from water[b]	2.5	3.3	7.9
Total recovery	93.9	71.5	48.3

[a] Total radioactivity found in soil after 38 days includes both extractable and unextractable residues.

[b] Total radioactivity detected in water leached through the columns during the experimental period.

Table 6. Volatilization of [^{14}C] or [^{35}S]aldicarb equivalents from Lufkin loam soil columns.

	Cumulative percentage of applied radioactivity recovered in trapping solution at indicated depths (mm)		
Days posttreatment	35[a]	35[b]	115[b]
1-4	1.6	0.1	T[c]
4-8	7.5	0.1	T
8-12	27.9	0.1	T
12-16	44.8	0.2	T
16-20	54.1	0.2	T
20-24	55.9	0.2	T
24-28	57.1	0.2	T
28-31	57.8	0.2	T
Recovered from soil[d]	4.9	15.0	11.0
Recovered from water[e]	2.6	29.2	48.9
Total recovery	65.3	44.4	59.9

[a] Treated with 34 mg [^{14}C]aldicarb.

[b] Treated with 34 mg [^{35}S]aldicarb.

[c] T = trace amounts (<0.01%).

[d] Total radioactivity found in soil after 38 days includes both extractable and unextractable residues.

[e] Total radioactivity detected in water leached through the columns during the experimental period.

Table 7. Recovery of [^{35}S]aldicarb and its degradates from Lufkin fine sandy loam under field conditions.[a]

Component	Percent of applied radioactivity recovered at indicated days after treatment[b]				
	3	7	21	35	49
Aldicarb	59.2	45.1	3.4	0	0
Aldicarb sulfoxide	4.0	3.1	3.2	1.1	T
Aldicarb sulfone	0	0	0	0	0
Others[c]	3.2	4.2	10.2	8.8	0.8
Total extracted	66.4	52.4	16.8	9.9	0.8
Unextractable residue	4.5	3.3	1.3	0.9	0.1
Total recovered	70.9	55.7	18.1	10.8	0.9

[a] Soil columns were buried in a field to a depth that placed the top of the columns 76 mm below the surface of the soil and were thoroughly wet at time of treatment. The columns received 2.3, 0.6, 0.1, and 1.75 inches of rainfall at 7, 16, 22, and 38 days following treatment, respectively.

[b] Results are the average of triplicate samples. T = trace amounts (<0.01%).

[c] Unidentified noncarbamate degradates.

120

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 5

CASE GS0140 ALDICARB STUDY 24 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00053381 CONTENT CAT 01
Richey, F.A., Jr., and H.H. Moorefield. 1972. Temik--aldicarb pesticide: upward movement of aldicarb through soil during water evaporation: Project No. 111A12. Unpublished study received Jan. 18, 1977 under 1016-EX-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-V.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 1/2 (MH) START-DATE END DATE

REVIEWED BY: K. Ellis and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: K. Elli T. Opeka DATE: Jan. 31, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

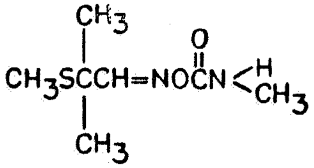
1. This study is scientifically valid.

2. Aldicarb is mobile in Blanton fine sand soil. After evaporation of water from a saturated soil column, the majority of the applied radioactivity (72.3%) moved 1-4 inches above the original application depth. Aldicarb sulfoxide represented the major portion of the extracted radioactivity (75.2%).

3. This study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because the procedure used is not an EPA acceptable method of analysis for soil mobility studies.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}}CH{=}NO\overset{\displaystyle O}{\overset{\|}{C}}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

A 10-inch soil column (2.75 inch inside diameter) was filled to a depth of 6 inches with Blanton fine sand soil (sieved to <2 mm, characteristics unspecified). The soil was saturated, and S-methyl [^{14}C]aldicarb (source and purity unspecified) in acetone, was applied to the top of the soil column at 4 lb ai/A. Four additional inches of untreated soil were added to the column and saturated. The column was held at room temperature for 16 hours, and was then heated to 38 C on its top surface for 7 days using an infrared heat lamp.

A slow stream of air was aimed at the surface to speed evaporation. The column was weighed every 20 hours to determine water loss. After the evaporation period, the column soil was removed in layers which were extracted three times with acetone. The extracts were quantified by using LSC.

The extracts from the 0.25- to 1.0-inch layer were combined and reduced in volume by removing the acetone under vacuum. The remaining concentrate was mixed in an equal volume of acetonitrile and then shaken and partitioned with an equal volume of methylene chloride. After separation, the aqueous layer was extracted twice with methylene chloride and the acetonitrile-methylene chloride extracts were combined, dried, and filtered. Aliquots of the aqueous and organic phases were radioassayed. The organic phase was concentrated by solvent removal under vacuum and/or in a dry nitrogen stream. An aliquot was mixed with known amounts of aldicarb standards and the mixture was characterized by using two-dimensional TLC. The two solvent systems used were ether:hexane:acetone (2:1:1, v:v) and methylene chloride: acetonitrile (3:2, v:v). Radioactive spots were located by autoradiography and quantified by using LSC. Nonradiolabeled standard spots were visualized under UV light and by differential adsorption of iodine from the vapor phase.

REPORTED RESULTS:

In a 10-inch fine sand soil column, aldicarb moved readily upward. Following the evaporation of 49% of the soil water, 47.6% of the applied radioactivity had moved ~3 inches upward in the soil column (Table 1). The distribution of extractable radioactivity is shown in Table 2.

DISCUSSION:

1. Characteristics of the test soil such as pH were not reported.
2. The procedure used is not one of the three recommended by EPA for assessing pesticide mobility in soil.

Table 1. Recovery of radioactivity (expressed as aldicarb equivalents) from soil column.

Soil layer (inches)	Percentage of radioactivity applied	Concentration (ppm)
0-0.25	5.5	2.97
0.25-1	42.1	7.62
1-2	14.5	1.97
2-3	10.2	1.39
3-4	7.6	1.02
4-5	6.9	0.93
5-7	2.6	0.17
7-10	2.7	0.12

Table 2. Distribution of extractable radioactivity from Blanton fine sand.

Component	Percent of extracted radioactivity
Aldicarb	0.9
Aldicarb sulfoxide	75.2
Aldicarb sulfone	8.5
Unidentified organoextractables	14.0
Water solubles	2.4
Total	101.0

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 25 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 052020

FORMULATION 90 - FORMULATION NOT IDENTIFIED

FICHE/MASTER ID 00026981 CONTENT CAT 11
Metcalf, R.L., and J.R. Sanborn. 1975. Illinois natural history survey bulletin: pesticides and environmental quality in Illinois: Volume 31, Article 9. Urbana, Ill.: State of Illinois, Dept. of Registration and Education, Natural History Survey Div. Also In unpublished submission received July 19, 1978 under 201-403; submitted by Shell Chemical Co., Washington, D.C.; CDL:234470-AB.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: EFF -10-1500000IL

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: DATE: Feb. 3, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

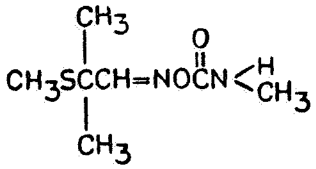
CONCLUSION:

Laboratory Accumulation - Fish

This study is scientifically invalid because the procedures and protocols used were not sufficient for assessment of the accumulation potential of aldicarb in fish; i.e., concentration in water was not compared with concentration in fish over time to generate accumulation data. This study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because fish were not exposed to aldicarb for 28 days and there was no depuration period. In addition, fish samples were not fractionated into edible and visceral tissues.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}CH{=}NO\overset{\overset{\displaystyle O}{\|}}{C}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

[^{14}C]Aldicarb (purity and source unspecified) was added to a model ecosystem consisting of a 20-gallon aquarium with terrestrial and aquatic portions, after the method of Metcalf, et al. (1971. Environ. Sci. Technol. 5:709). Daphnia, mosquito larvae, saltmarsh caterpillars, and sorghum plants were added to the aquarium, and [^{14}C]aldicarb, at 0.2-1.0 lb/A, was applied to the base of 7-day-old sorghum plants. The aquarium was maintained at 27 ± 1 C and illuminated on a 12-hour diurnal cycle with 2000 foot candles of fluorescent light. After 30 days, three mosquito fish (Gambusia affinis) were added to the system. After 3 days, the aquatic organisms were sampled and radioassayed.

Tests organisms were homogenized and extracted with acetonitrile. Extracts were centrifuged and supernatants concentrated and radioassayed. Insoluble residues were combined and solubilized. Water samples were extracted with diethyl ether. The resulting ether fractions were combined, dried, and concentrated, whereas the aqueous fractions were hydrolyzed with 1.0 N hydrochloric acid and reextracted with diethyl ether. Samples were quantified by using LSC. Extracts containing high concentrations of radioactivity were characterized by using TLC. The plates were developed in hexane:benzene:ethanol (2:2:1) and radioautographed. Spots were scraped from the plates and quantified by using LSC.

REPORTED RESULTS:

Aldicarb was found at 1.31 ppm in fish, and 0.031 ppm in water. Aldicarb degradates (aldicarb sulfone oxime, aldicarb sulfone, and aldicarb sulfoxide) were found at ≤0.056 ppm in water. Aldicarb sulfone oxime at 1.01 ppm was the only degradate found in fish samples.

DISCUSSION:

This study was considered scientifically invalid because the protocol used (Metcalf et al., 1971) allows exposure of fish to the test compound and any degradates for only 3 days. This exposure period is not long enough to allow for reliable estimation of accumulation potential based on equilibrium conditions. The protocol also does not include a depuration period.

(TDR03B)

DATA EVALUATION RECORD

CASE GS0140 ALDICARB STUDY 26 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00101939 CONTENT CAT 01

Clarkson, V., B. Rowe, R. Romine, and W.H. Hensley. 1968. Temik insecticide: field evaluation of the persistence and movement of Temik and its carbmate metabolites in soil: File No. 10485. Unpublished study received Apr. 18, 1969 under 9F0698; submitted by Union Carbide Corp., New York, NY; CDL:091372-O.

FICHE/MASTER ID 00101926 CONTENT CAT 01

Union Carbide Corp. 1968. Residue studies of Temik. Compilation; unpublished study received Jan. 24, 1969 under 9F0798; CDL:091371-A.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10142010

DIRECT RVW TIME = 19 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: H. Bartels DATE: Feb. 9, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

1. The runoff portion of this study is scientifically valid.

2. Carbamate residues do not move horizontally from the treated area when aldicarb (10% G) is applied at 10 lb ai/A to a bare, sloping field (1% slope) and irrigated to runoff.

3. Currently, there are no requirements for the submission of runoff data.

Field Dissipation - Terrestrial

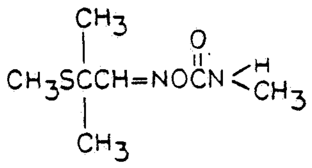
1. The portion of this study involving the in furrow application of aldicarb (10% G) to Norfolk sandy loam field plots is scientifically invalid because the amounts of aldicarb recovered were considerably greater than comparably treated fields, suggesting that inappropriate procedures and protocols were used. The portion of this study assessing dissipation of aldicarb residues in "medium clay" soils is also scientifically invalid because sampling intervals were insufficient to establish an aldicarb residue decline curve. Other portions of the field dissipation section are scientifically valid.

2. Total carbamate residues dissipate rapidly with a half-life of <7 days in mineral soils when aldicarb (10% G) is applied at 5 or 10 lb ai/A. Carbamate residues dissipate slowly with a half-life of 30-60 days in a high organic matter (85%) muck soil when aldicarb is applied at 3 and 6 lb ai/A.

3. This portion of the study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because a nonspecific colorimetric method was employed, soil characteristics and rainfall and irrigation data were incompletely provided, and soil samples were not taken in increments to a depth of >15 cm and/or to a depth sufficient to define the extent of leaching.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

The portion of this study dealing with aquatic field dissipation appears in 00101940 and has been reviewed as Study 37.

Mobility - Leaching and Adsorption/Desorption

Aldicarb (Temik, 10% G, Union Carbide Corp.) was broadcast at 10 lb ai/A to a 0.45 acre Norfolk sandy loam (pH 5.6, 1% organic matter) field plot, on June 21, 1968 and incorporated to a depth of 6 inches. The field plot sloped at 1 foot per 100 feet toward a 60- x 100-foot farm pond. No crop was planted in the field; however, weeds and grass developed during the 8-week study period. The treated field was sprinkler irrigated with 5 inches of water on June 28, 1968 and received an additional 5.7 inches of rainfall during the study period. Soil and runoff water samples were collected at 15-, 30-, and 45-foot intervals downhill from the treated area. In addition, water samples from the pond and soil samples from the treated area were collected.

Soil cores measuring 1-inch in diameter and ~6 inches in depth were collected from the runoff area on days 14, 21, and 28 posttreatment, composited, and frozen until analysis. The soil samples were extracted with 20% acetone in chloroform (v:v), oxidized to aldicarb sulfoxide and analyzed for total carbamate residues colorimetrically at 530 nm (UCC method: UC 21149-II-Soil). The method sensitivity was reported as 0.04 ppm and the average recovery rate for samples fortified with aldicarb, aldicarb sulfoxide, and aldicarb sulfone was 97, 92, and 95%, respectively.

Runoff water samples were collected in 1 gallon buckets placed flush with the soil surface on days 8, 14, 17, 21, 24, and 27 posttreatment and frozen until analysis. Water samples were extracted with chloroform, oxidized to aldicarb sulfoxide and analyzed for total carbamate residues colorimetrically at 530 nm (UCC method: UC 21149-II-Water). The reported minimum limit of detection was 0.02 ppm and the recovery rates for samples fortified with aldicarb, aldicarb sulfoxide, and aldicarb sulfone were 89, 69, and 99%, respectively.

Pond water samples were collected on days 7, 14, 21, 28, 35, 49, and 56 posttreatment, and frozen until analysis by using the procedure described above.

Field Dissipation - Terrestrial

Aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 5 or 10 lb ai/A to Norfolk sandy loam field plots during the 1965-1968 growing season. In 1965, aldicarb was broadcast at 5 and 10 lb ai/A and rototilled 6 inches deep. On days 0, 7, 14, 28, 56, and 94, forty, 6-inch soil cores were collected, mixed, and subsampled. Cumulative rainfall for the 94-day study period was 6.79 inches.

In 1966, Norfolk sandy loam field plots were similarly prepared and 20 8-inch soil cores were collected and composited for analysis on days 0, 2, 7, 14, and 28. Cumulative rainfall was 2.85 inches during the 28-day study period.

During the 1968 growing season, aldicarb was applied at 5 and 10 lb ai/A in furrow at the time of planting with potatoes. One-inch diameter soil samples were collected on days 1, 15, 30, 62, 76, and 91, posttreatment, divided into 3-inch segments, and composited. On days 124, 139, and 154, posttreatment, 6-inch unsegmented soil cores were collected and composited. In a second 1968 experiment, aldicarb was broadcast at 10 lb ai/A and rototilled to a depth of 6-8 inches. Random, 6-inch deep soil cores were collected, composited, and sampled on days 0, 3, 7, 8, 14, 21, 28, 35, 49, and 56 posttreatment.

In additional studies, aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 3 and 6 lb ai/A and 4 lb ai/A to muck (85% organic matter) and "medium clay loam" soils, respectively. In the muck soil, aldicarb was broadcast and raked into the top 3 inches of soil. Samples were collected to a 3-inch depth on days 0, 7, 14, 28-29, and 57-58. In the "medium clay loam" soil, aldicarb was applied as an 8-inch side-dress band. Random 6-inch deep soil cores were collected from the treated area on days 14, 30, 60, and 120, posttreatment.

In another series of experiments, aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 1-8 lb ai/A to sandy, sandy loam, and unspecified soils as a sidedress or as an in furrow application and in conjunction with other chemicals as provided in Table 3. Harvest interval (82-327 days) soil samples were collected from a depth of 3-9 inches, composited, and frozen until analysis.

In the runoff study described above, 25 random, 6-inch deep soil cores were collected from the treated area prior to treatment and a 3, 7, 8, 14, 21, 28 days and 5, 7, and 8 weeks posttreatment.

Total carbamate residues were determined by UCC method UC 21149-II-Soil. The soil samples were extracted three times with a 20% (v:v) acetone in chloroform solution, oxidized to aldicarb sulfoxide and determined colorimetrically. The reported minimum limit of detection was of 0.04 ppm. Average recoveries of samples fortified with aldicarb, aldicarb sulfoxide, and aldicarb sulfone were 94, 92, and 95%, respectively.

REPORTED RESULTS:

Mobility - Leaching and Adsorption/Desorption

Total carbamate residues in soil samples ranged from 0.05 to 0.08 ppm throughout the 28-day study period regardless of the distance from the treated area.

Runoff water samples contained total carbamate residues of 0.06-0.14 ppm at 8 days posttreatment (1 day after irrigation). Thereafter, the residue levels remained constant at 0.02-0.07 ppm at all sampling sites.

Field Dissipation - Terrestrial

Total carbamate residues (aldicarb, aldicarb sulfoxide, aldicarb sulfone) detected in a Norfolk sandy loam soil when aldicarb (10% G) was applied at 5 and 10 lb ai/A are provided in Table 1. When aldicarb was applied at 5 lb ai/A, the total carbamate residues decreased during the first week posttreatment from 2.8 and 3.0 to 0.82 and 0.45 ppm in the 1965 and 1966 growing seasons, respectively. When aldicarb was applied at 10 lb ai/A, carbamate residues decreased during the first week posttreatment from 10.9, 13.3, and 9.4 ppm to 3.2, 0.95, and 5.5 ppm during the 1965, 1966, and 1968 seasons, respectively.

The Norfolk sandy loam soil treated with aldicarb (10% G) at 5 lb ai/A by in furrow application during 1968 showed a decrease in carbamate residues from 47 and 29 ppm 1 day posttreatment to 22 and 19 ppm 30 days posttreatment in the 0- to 3- and 3- to 6-inch segments, respectively. In similarly treated plots with aldicarb applied at 10 lb ai/A, total carbamate residues declined from 76 and 65 ppm on day 1 to 56 and 52 ppm 30 days after application in the 0- to 3- and 3- to 6-inch segments, respectively.

In the 85% organic matter muck soil, total carbamate residues declined from 39.3 to 12.6 ppm during the first 2 months posttreatment when aldicarb (10% G) was applied at 3 lb ai/A (Table 2). During the same period, carbamate residues decreased from 57.2 to 29.4 ppm when aldicarb (10% G) was applied at 6 lb ai/A.

The "medium clay" soil treated with aldicarb (10% G) at 4 lb ai/A showed a decrease in total aldicarb residues from 4.9 to 0.6 ppm at 14 days and ~2 months posttreatment, respectively (Table 2).

In the harvest interval soil samples (82-327 days) total carbamate residues ranged from 0.10 to 0.39 ppm (Table 3).

In the sandy loam field plot treated with aldicarb (10% G) at 10 lb ai/A for the runoff studies described above, total carbamate residues declined from 9.4 ppm immediately after treatment to 0.13 ppm 8 weeks after treatment (Table 4).

DISCUSSION:

Mobility - Leaching and Adsorption/Desorption

1. The soil was not fully characterized.
2. No pretreatment or immediate posttreatment samples were collected for samples.
3. A nonspecific colorimetric method was employed.
4. A discrepancy exists between the location of the collection sites in relation to the treated field and the total aldicarb residues detected; the data sheets report aldicarb residues according to the distance from the pond and a summary table gives the detected aldicarb residues according to the distance from the treated field plot.

Field Dissipation - Terrestrial

1. A nonspecific colorimetric method was used; therefore, aldicarb residues were not identified or quantified.
2. Untreated control sites were not provided for all of the test sites.

3. Cumulative rainfall and/or irrigation data were reported only for the Norfolk sandy loam field sites during the 1965 and 1966 studies.

4. Test soils were not completely characterized.

Table 1. Total carbamate residues (ppm) detected in a Norfolk sandy loam soil when aldicarb (10% G) was applied at 5 or 10 lb ai/A over three growing seasons.[a]

Application rate (lb ai/A)	Sample depth (inches)	Days posttreatment						
		0-1	7	14-15	28-30	91-94	154	Control
				1965				
5	0-6	2.8	0.82	0.50	0.24	0.08	--	0.10
10	0-6	10.9	3.2	2.6	0.86	0.19	--	--
				1966				
5	0-8	3.0	0.45	1.5	0.58	--	--	0.07
10	0-8	13.3	0.95	0.44	1.5	--	--	--
				1968				
5[b]	0-3	47	--	42	22	0.5	--	--
	3-6	29	--	34	19	2.1	--	--
	0-6	--	--	--	--	--	0.32	--
10[b]	0-3	76	--	65	56	1.2	--	--
	3-6	65	--	38	52	2.3	--	--
	0-6	--	--	--	--	--	0.6	--
10[c]	0-6	9.4	5.5	0.66	0.19	--	--	0.06

[a] From 00101926.

[b] In furrow treatment.

[c] Broadcast treatment and rototilled to a depth of 6-8 inches.

Table 2. Total carbamate residues (ppm) detected in muck and medium clay soils.[a]

Soil type	Application rate (lb ai/A)	Days after application					
		0	7	14	28-30	57-60	Control
Muck[b]	3	39.3	33.8	20.7	20.0	12.6	0.09
Muck[b]	6	57.2	39.6	24.0	27.7	29.4	0.09
Medium clay	4	--	--	4.9	2.1	0.6	0.06

[a] From 00101926.

[b] Reported values are an average of samples from duplicate studies begun on August 26 and September 17, 1966 under similar conditions.

Table 3. Total carbamate residues (ppm) from harvest interval samples.[a]

Soil type	Application rate (lb ai/A)	Other chemicals applied	Days posttreatment	Aldicarb residues (ppm)
Sandy loam	6	Dylox, DDT, toxaphene Cygon, asodrin	121	0.11
Uncharacterized	1 + 5	Terrachlor Super X	143	0.39
Uncharacterized	4	None	98	0.24
Uncharacterized	4	Treflan	89	0.18
Uncharacterized	8	Treflan	82	0.18
Sandy	4	Treflan	89	0.17
Uncharacterized	4	None	97	0.13
Sandy loam	3	Lorox	326	0.10
Sandy loam	8	Lorox	327	0.10
Sandy loam	16	Lorox	327	0.11

[a] From 00101926.

Table 4. Total carbamate residues (ppm) detected in sandy loam soil treated with aldicarb (10% G) at 10 lb ai/A.[a]

Days posttreatment	
0 (pretreatment control)	0.06
0	9.4
3	7.2
7	5.5
	Irrigation with 5 inches of water
8	0.66
14	0.66
21	1.1
28	0.19
5 weeks	0.09
7 weeks	0.20
8 weeks	0.13

[a] From 00101939.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 27 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050525 GUIDELINE 40 CFR 163.62-9b/c/d

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102079 CONTENT CAT 01
Leistra, M., J. Smelt, and T. Lexmond. 1976. Conversion and leaching of aldicarb in soil columns. Pestic. Sci. 7:471-482. Also In unpublished submission received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-Y.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: L. Lewis T. Opeka DATE: May 5, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

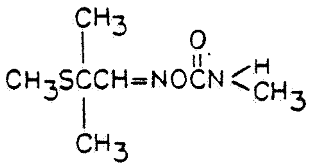
1. This study is scientifically valid.

2. Aldicarb and its oxidation products (aldicarb sulfoxide and aldicarb sulfone) are highly mobile in silt loam, humic sand, and loam soils. Total residues in the leachate of soil columns leached with ~11-26 inches of water were equivalent to 20-72% of the applied aldicarb. Aldicarb sulfoxide represented the major portion of residues in the leachate.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because the test substance was not characterized and a materials balance was not conducted.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\parallel}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Soil columns of Schokland silt loam (28 cm long), Wehl humic sand (25 cm long), Westmaas loam (50 cm long), and Nagele loam (50 cm long) were taken from fields in the Netherlands (Table 1). The silt loam and humic sand soil columns were treated with aldicarb (test substance uncharacterized, source unspecified) at 27.7 and 15.9 kg/ha, respectively. Water was intermittently applied to the treated columns with a rainfall simulator at 23 mm/day (silt loam) or 28 mm/day (humic sand) for 10-15 days. The top 20 cm of the two loam soil columns were removed, partially dried, sieved (4 mm), replaced in the columns, and covered with a 1-cm layer of glass beads. Water was applied to the columns at 12.2-13.0 mm/day, and after several days of percolation, aldicarb in water was dripped uniformly onto the soil columns at ~5 kg/ha. Leachate was collected from all columns three times a week for ~7 weeks, and stored in sealed glass bottles at 2 C until analysis. Leachate samples were extracted with chloroform, dried using anhydrous sodium sulfate, filtered, and concentrated. Concentrated extacts were either separated prior to injection into a GC by using column chromatography or injected directly into a GC. The limit of detection was 0.01 µg/ml of leachate.

REPORTED RESULTS:

For all soil columns, levels of aldicarb in the leachate were <0.1 nmol/ml, whereas aldicarb sulfoxide comprised the greatest proportion of residues. Levels of aldicarb sulfone were low (<0.7 nmol/ml) in the leachate from the silt loam and humic sand soil columns, but represented a substantial portion of the residues leached from the two loam soil columns (Table 2).

DISCUSSION:

1. The test substance was not characterized.

2. The amount of water applied to the two loam soil columns, following the application of aldicarb was not stated; however, it was assumed to be the same as the amount applied prior to the application of aldicarb (12.2-13 mm/day).

3. A materials balance was not conducted.

Table 1. Soil characteristics.

Soil type	Layer (cm)	Bulk density (g/ml)	Volume fraction of liquid	Organic matter (%)	Clay (%)	Silt (%)	pH-KCl
Schokland, silt loam	0-28	1.22	0.42	3.4	18.4	55.7	7.4
Wehl, humic sand	0-25	1.15	0.34	3.2	2.3	2.2	6.9
Nagele, loam	0-20	1.13	0.47	3.3	23.9	43.9	7.2
	20-34	1.18	0.45	2.5	13.6	63.4	7.4
	34-48	0.95	0.52	4.6	17.5	60.6	7.4
Westmaas, loam	0-16	1.07	0.50	4.7	25.9	44.3	7.4
	16-32	1.24	0.46	3.6	23.4	43.2	7.3
	32-48	1.39	0.41	1.1	15.0	41.4	7.6

Table 2. Distribution of aldicarb sulfoxide and aldicarb sulfone in the leachate of loam soil columns.

Soil column	Fraction (%) of applied aldicarb		
	Aldicarb sulfoxide	Aldicarb sulfone	Total
Nagele loam I	47	19	66
Nagele loam II	46	18	64
Westmaas loam I	41	9	50
Westmaas loam II	26	18	44

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 28 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 100520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00102078 CONTENT CAT 01
Kearby, W., C. Ercegovich, and M. Bliss. 1970. Residue studies on aldicarb in soil and scotch pine. J. Econ. Entomol. 63(4):1317-1318. Also In unpublished submission received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-X.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: EFB -20-259935113

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels T. Opeka DATE: Feb. 18, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Terrestrial

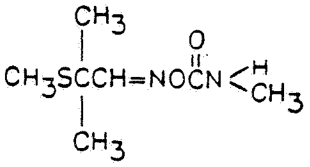
1. This study is scientifically valid.

2. Aldicarb (10% G) at 5-20 lb ai/A dissipates rapidly with a half-life of 15-36 days in a Gilpin fine loam soil planted with Scotch pine trees.

3. This study does not meet EPA Data Requirements for Registering Pesticides (1983) because rainfall data and soil characteristics were not reported, a nonspecific colorimetric method was used, and the patterns of formation and decline of degradates were not addressed.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$\mathrm{CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}}$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (10% G, Union Carbide Corp.) was broadcast onto a Gilpin fine loam soil (uncharacterized) on April 29, 1966 at 0.5, 1.0 and 2.0 lb/12 scotch pine trees in 3-foot bands on 2 sides of each 12-tree row. The trees were spaced at a 6 x 6 foot interval, yielding application rates of 5, 10, and 20 lb ai/A. One row of 12 trees was left untreated to serve as a control. Eight to ten soil cores were collected from depths of 0-6 and 6-12 inches at 1, 15, 26, and 63 days after application. The samples were stored at -40 C until analyzed. Soil samples were extracted with chloroform:acetone (4:1, v:v), followed by colorimetric quantification.

REPORTED RESULTS:

One day following treatment, aldicarb and its degradates were detected in the upper 6 inches of soil at 0.38-0.92 ppm, depending on the application rate (Table 1). No residues were detected at the 6- to 12-inch sampling depth 1 day following treatment. When applied at 5 and 10 lb ai/A, there was no apparent residue remaining in the 0- to 6-inch depth at 36 and 63 days after treatment, respectively. Aldicarb residues persisted in plots treated with aldicarb at 20 lb ai/A for 63 days.

DISCUSSION:

1. The colorimetric method employed does not differentiate between aldicarb and its degradation products. Detection and/or sensitivity limits were not provided.

2. No pretreatment or immediate posttreatment sampling times were reported.

3. Soil characteristics and rainfall data were not provided.

Table 1. Persistence of aldicarb residues (ppm) in a fine loam soil treated with aldicarb (10% G) at three different rates.

Treatment (lb ai/A)	Sampling depth (inches)	Days after application			
		1	15	36	63
5	0-6	0.38	0.18	0.00	0.00
	6-12	0.00	0.02	0.04	0.00
10	0-6	0.85	0.24	0.10	0.00
	6-12	0.00	0.04	0.02	0.00
20	0-6	0.92	0.61	0.29	0.07
	6-12	0.00	0.07	0.04	0.04

145

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 7

CASE GS0140 ALDICARB STUDY 29 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102064 CONTENT CAT 01

Andrawes, N., W. Bagley, and R. Herrett. 1971. Fate and carryover properties of Temik aldicarb pesticide 2-methyl-2-(methylthio)-propionaldehyde O-(methylcarbamoyl)oxime in soil. J. Agric. Food Chem. 19(4):727-730. Also In unpublished submission received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:09661-C.

FICHE/MASTER ID 00101935 CONTENT CAT 01

Andrawes, N., W. Bagley, and R. Herrett. 1968. Temik metabolism: Fate of C^{14}-Temik in cultivated soil: File No. 9218. Unpublished study received Apr. 18, 1969 under 9F0798; submitted by Union Carbide Corp., New York, NY; CDL:091372-K.

FICHE/MASTER ID 00101937 CONTENT CAT 01

Andrawes, N., W. Bagley, and R. Herrett. 1968. Temik metabolism: degradation and carry-over properties of...(Temik) in soil: File No. 10494. Unpublished study received Apr. 18, 1969 under 9F0798; submitted by Union Carbide Corp., New York, NY; CDL:091372-M.

SUBST. CLASS = S.

DIRECT RVW TIME = 9 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels T. Opeka DATE: Jan. 28, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Terrestrial

1. This portion of the study is scientifically valid.

1416

2. [^{14}C]Aldicarb dissipates rapidly with a half-life of <7 days in a cultivated sandy loam soil sampled to a depth of 20 cm. In an uncultivated sandy loam soil, [^{14}C]aldicarb dissipates more slowly with a half-life of 14-30 days. The parent compound degraded quickly, accounting for 82% of the recovered radioactivity when sampled immediately after treatment. In both the cultivated and uncultivated soils, the major degradate was aldicarb sulfoxide (~13% of the recovered radioactivity immediately following treatment in both soils). High dissipation rates corresponded to heavy rainfall periods. Discing the treated soil served to dilute the applied [^{14}C]aldicarb.

3. This study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because a typical end-use product was not used. In addition, soil characteristics and preapplication samples were not provided.

Confined Accumulation - Rotational Crops

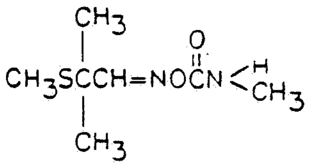
1. This portion of the study is scientifically valid.

2. Aldicarb residues are taken up by rotational crops. [^{14}C]Aldicarb residues (uncharacterized) ranged from <0.01 to 0.06 ppm in tomato plants rotated to a Norfolk sandy loam soil 90 days after treatment with [^{14}C]-aldicarb at 3 lb ai/A. The tomato plants were analyzed 7 days following planting into the treated soil.

3. This portion of the study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because tomatoes were not analyzed at the time of harvest, irrigation and rainfall data were not provided for the specified sampling interval, and aldicarb residues were not characterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Field Dissipation - Terrestrial

[^{14}C]Aldicarb (specific activity 80 µC/mM, 98.5% radiochemical purity, Union Carbide Corp.) was diluted with technical aldicarb (purity unspecified) and applied to a cultivated and an uncultivated Norfolk sandy loam soil (pH 6.0, additional characteristics unspecified) over two growing seasons.

During the 1967 growing season, [^{14}C]aldicarb (specific activity 29.3 µCi/mM) was applied in furrow at 3 lb ai/A to field plots (1.5 x 12.2 m) planted with potatoes. [^{14}C]Aldicarb (109 mg) in 10 ml of 80% acetone in water was applied to 30-cm sections in a 10-cm wide x 10-cm deep furrow. Seed pieces were planted 30 cm apart in the treated sections on April 25, 1967. The field plot was irrigated (amount applied unspecified) during June and July as needed by using an overhead sprinkler.

On April 29, 1978, [^{14}C]aldicarb (specific activity 80 µCi/mM) was applied in an acetone:water solution at 3.0 lb ai/A to an uncultivated Norfolk sandy loam soil (pH 6.0, additional characteristics unspecified) in a furrow measuring 60 cm long, 10 cm wide, and 1.5 cm deep. Following treatment, the furrow was filled with soil, watered, and neither fertilized nor irrigated during the 90-day study period.

In a separate experiment, [^{14}C]aldicarb (specific activity 101 µCi/mM) was applied in furrow at 1 lb ai/A. The treated soil (characteristics unspecified) was aged for 14 days followed by discing to a depth of 15-20 cm. Three soil samples were taken for analysis from the center of the treated band.

All soil samples were obtained by taking 2 x 20-cm cores from within the treated furrow at weekly to monthly intervals following treatment.

Three cores were taken at each sampling interval, and each was thoroughly mixed and subsampled for analysis. Total residual radioactivity was determined by extracting 1-g subsamples of soil with water:ethanol (1:1, v:v) and quantifying by using LSC. The ethanol:water extract of each soil sample was concentrated under vacuum to remove the ethanol and adjusted to 50 ml with water. Acetonitrile was added and the solution was partitioned four times with chloroform. The organic extract was dried, filtered, and concentrated under vacuum. Aliquots were removed for TLC determination of aldicarb and its degradates, followed by LSC. Recovery values were not reported.

Confined Accumulation - Rotational Crops

At the conclusion of the field dissipation study (potato field) in 1968 (90 days after application of [^{14}C]aldicarb at 3.0 lb ai/A), 3-week old greenhouse-grown tomato plants were transplanted into the fallow field plot. After 7 days, the plants were harvested, weighed, extracted with ethanol:water (1:1, v:v) and analyzed by using LSC.

REPORTED RESULTS:

Rainfall and temperature data for the 1967 and 1968 growing seasons are provided in Table 1.

Field Dissipation - Terrestrial

Levels of [^{14}C]aldicarb and its degradates detected in the cultivated and uncultivated soils are provided in Tables 2 and 3, respectively. The total recovered radioactivity decreased from 13.1 to 2.49 ppm in the cultivated soil and from 15.36 to 10.79 ppm in the uncultivated soil during the first 14 days posttreatment. Aldicarb sulfoxide and aldicarb sulfone accounted for up to ∼70 and ∼45% of the recovered radioactivity in both the cultivated and uncultivated soils, respectively.

[^{14}C]Aldicarb levels decreased from 0.59 ppm to 0.02 ppm after discing when applied at 1 lb ai/A.

Confined Accumulation - Rotational Crops

Tomato plants rotated into aldicarb-treated soil 90 days after application contained [^{14}C]aldicarb residues ranging from <0.01 to 0.06 ppm 7 days after planting.

DISCUSSION:

Field Dissipation - Terrestrial

1. Soil characteristics were not fully described.
2. Soil samples were not taken in increments or to depths sufficient to assess the extent of aldicarb leaching in soil.
3. The amount of irrigation water applied to the cultivated soil during June and July 1967 was not specified and the amount of water applied immediately following treatment in both field plots was not provided.
4. Only 82% of the recovered radioactivity on day 0 was parent compound.

Confined Accumulation - Rotational Crops

The tomato plants were sampled only 7 days following transplantation from the greenhouse and were not analyzed at the time of harvest.

Table 1. Summary of daily temperature and rainfall for the 1967 and 1968 growing seasons.

Period[a]	Temperature (C)		Rainfall (cm)[b]
	High	Low	
	1967 Growing Season		
April 25-May 1	19.7	6.0	5.95
May 2- May 8	22.2	8.5	2.78
May 9-May 24	22.2	10.1	6.10
May 25-June 23	27.8	15.1	12.57
June 24-July 23	29.2	18.8	7.49
	1968 Growing Season		
April 29-May 5	24.5	9.9	0.9
May 6-May 12	23.4	9.1	1.9
May 13-May 30	23.2	12.3	8.0
May 31-July 7	28.6	17.5	13.7
July 8-July 28	30.0	19.9	3.8

[a] These periods correspond to various sampling times.

[b] Plot was irrigated once in June, 1967 (amount not specified).

Table 2. Relative concentrations of [^{14}C]aldicarb and its degradates in cultivated soil treated with [^{14}C]aldicarb at 3 lb ai/A during the 1967 growing season.[a]

Component	Percentage of recovered radioactivity at indicated days after treatment					
	0	7	14	30	70	90
Aldicarb	82.6	34.7	6.5	1.6	ND[b]	ND
Aldicarb sulfoxide	12.7	48.6	66.9	54.6	31.1	13.1
Aldicarb sulfone	1.4	1.4	11.6	24.7	50.0	41.5
Aldicarb sulfoxide oxime	1.2	1.8	0.9	0.8	2.0	2.8
Aldicarb sulfoxide nitrile	ND	0.8	1.3	0.6	1.2	0.9
Aldicarb sulfone nitrile	ND	1.2	0.5	1.1	3.0	4.8
Unknowns	0.9	3.4	2.5	8.4	3.2	13.3
Water solubles	1.2	5.0	9.8	8.2	9.6	23.6
Total recovered radioactivity (ppm)	13.1	3.47	2.49	2.65	0.17	0.07

[a] Based on triplicate samples and duplicate analyses for each sample.

[b] ND - none detected (no detection limits given).

Table 3. Relative concentrations of [^{14}C]aldicarb and its degradates in an uncultivated soil treated with [^{14}C]aldicarb at 3 lb ai/A during the 1968 growing season.[a]

Component	Percentage of recovered radioactivity at indicated days after treatment					
	0	7	14	30	70	90
Aldicarb	81.5	42.1	3.25	ND[b]	ND	ND
Aldicarb sulfoxide	12.0	43.7	76.4	47.2	30.8	38.0
Aldicarb sulfone	1.4	2.0	7.4	33.4	10.9	7.3
Aldicarb sulfoxide oxime	1.2	ND	0.6	3.2	2.0	2.7
Aldicarb sulfoxide nitrile	ND	ND	ND	ND	ND	ND
Aldicarb sulfone nitrile	ND	ND	ND	6.5	4.2	4.8
Unknowns	1.1	ND	2.3	1.8	13.7	7.7
Water solubles	1.9	12.2	10.1	7.9	38.4	39.5
Total recovered radioactivity (ppm)	15.36	11.19	10.79	0.66	0.16	0.05

[a] Based on triplicate samples and duplicate analyses for each sample.

[b] ND - none detected (no detection limits given).

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 5

CASE GS0140 ALDICARB STUDY 30 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 100520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00080815 CONTENT CAT 02
Union Carbide Corporation. 1965. Residue data: UC 211491. Compilation; unpublished study received Jan. 25, 1966 under 6G0473; CDL:090525-0.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10141010
SEC: RCBR-25-10142010 RCBR-25-10366010 RCBR-25-10494010
RCBR-25-10325010 RCBR-25-10380010 RCBR-25-10080010
RCBR-25-10306010 RCBR-25-10042010 RCBR-25-10039010

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: Feb. 2, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

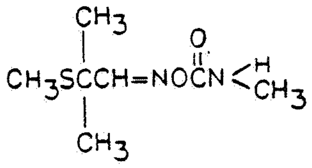
CONCLUSION:

Field Dissipation - Terrestrial

This study cannot be validated because the procedures and analytical methods employed were inadequately described. This study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because sampling intervals were inadequate to establish a residue decline curve, and field test data, including rainfall and irrigation data, soil textural characteristics were not provided, and soil samples were not taken in increments to a depth of >15 cm and/or to a depth sufficient to define the extent of leaching.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (UC 21149, 10% G, Union Carbide Corp.) was applied at 1, 2, 4, and 8 lb ai/A to a Norfolk sandy loam soil (pH 5.8, textural characteristics unspecified) on August 29, 1963. Random replicate 6-inch soil cores were collected at 5, 14, 32, 64, 162, and 228 days following treatment.

During the 1964 growing season, aldicarb (UC 21149, 10% G, Union Carbide Corp.) was applied at 0.5-32 lb ai/A to field plots prior to planting with cotton or potatoes. Applications were made by broadcast, in furrows, or as a side-dress at planting or at squaring. Treatment specifications are included in Table 2. Random replicate 1-inch diameter soil cores were taken to a 3- to 6-inch depth from the treated plots at harvest (97-154 days post-treatment).

The soil samples were frozen for subsequent analysis. Aldicarb residues were determined by using a colorimetric method (Union Carbide method 1875). Reported minimum limits of detection ranged from 0.03 to 0.17 ppm.

REPORTED RESULTS:

The amount of aldicarb residues present in a sandy loam soil following treatment with aldicarb at 1, 2, 4, and 8 lb ai/A decreased by 60-95% after 14 days (Table 1).

The results from the studies evaluating application-to-harvest interval soil samples are shown in Table 2.

DISCUSSION:

1. No preapplication or immediate postapplication sampling was done.
2. The colorimetric procedure employed is assumed to be nonspecific and that the concentrations of aldicarb reported include degradates as well as parent compound.

3. Soil characteristics were not reported for the field plots used in the 1964 experiments.

Table 1. Aldicarb residues recovered in a Norfolk sandy loam soil following treatment with the 10% G formulation.

Application rate (lb ai/A)	Aldicarb residues (ppm) at indicated days after application[a]					
	5	14	32[b]	64	162	228
1	0.54	0.22	0.20	0.15	0.25	0.08
2	1.01	0.38	0.19	0.33	0.21	0.15
4	0.81	0.20	0.12	0.07	0.22	0.08
8	3.94	0.56	0.12	0.26	0.21	0.07

[a] Average of two replicates.

[b] 0.17 ppm in untreated control.

Table 2. Aldicarb residues in harvest interval soil samples when applied as 10% G during the 1964 growing season.

Application rate (lb ai/A)	Time and method of application	Days application to harvest	Aldicarb residues at harvest (ppm)
32	Squaring: side-dress	97	0.22
10	Planting: broadcast	134	0.11
2	Planting: furrow	154	0.10
0.5	Planting: furrow	154	0.10
1	Planting; furrow	154	0.08
8	Planting: broadcast	157	0.08
3	Planting: furrow	109	0.06
1	Planting: broadcast	134	0.06
8	Squaring: side-dress	97	0.06
2	Squaring: side-dress	97	0.04

[a] Analysis of untreated samples plus reagents.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 31 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 150525 GUIDELINE 40 CFR 163.62-11b

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00102073 CONTENT CAT 01
Hirsh, D., K. Sheets, and G. Holsing. 1977. Aldicarb subsequent crop residues: File No. 23520. Unpublished study received Dec. 6, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096671-S.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: H. Bartels DATE: Apr. 29, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

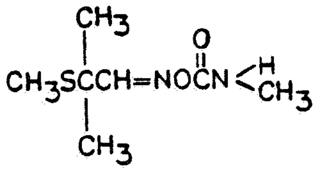
CONCLUSION:

Confined Accumulation - Rotational Crops

This study could not be evaluated because the document reviewed was incomplete (pages 4 and 5 were omitted from the document). The missing information included meteorological data and portions of the reported results. This study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because residues in crop and soil samples were not characterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}CH{=}NO\overset{\displaystyle O}{\overset{\|}{C}}N{<}\begin{matrix}H\\CH_3\end{matrix}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

Norfolk loamy sand soil (reported as a sandy loam; 82% sand, 8% silt, 10% clay, 1.1% organic matter, CEC 4.0 meq/100 g, pH 5.7) was treated with S-methyl [^{14}C]aldicarb (analytical grade, specific activity 6.06 mCi/mM, 99.8% purity, California Bionuclear Corp. and Union Carbide Corp.) at 5 lb ai/A, covered with 3 inches of untreated soil, and placed outdoors in containers designed to contain the radioactive soil and to collect leachate. Barley and turnip seeds were planted 119 days after the soil had been treated. Spinach seeds also planted at this time failed to germinate and were replaced with a planting of lettuce 150 days after soil treatment. Crops were harvested between 71 and 116 days after planting. Barley, turnip, and lettuce were replanted in the soil 1 year posttreatment. Soil samples were taken at the time of planting and harvesting each rotational crop. Total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) were determined in crop samples by using GC with a detection limit of 0.02 ppm. Crop and soil samples were combusted, and the evolved $^{14}CO_2$ trapped and quantified by using LSC. Leachate was assayed by direct LSC.

REPORTED RESULTS:

Small grain, root, and leafy vegetable crops planted 119 days after [^{14}C]-aldicarb was applied at 5 lb ai/A to Norfolk loamy sand soil, contained carbamate residues ranging from 0.02 to 0.72 ppm (Table 1). No carbamate residues were detected in crops planted 1 year posttreatment. At the time of the first planting, 22% of the applied radioactivity had been leached from the soil, and 63% had been lost as $^{14}CO_2$. Radioactive residues remaining in the soil at the time of harvest of the 119-day crops were ~9% of applied, and remained at this level during the balance of the study.

DISCUSSION:

1. Because pages 4 and 5 were missing from the document reviewed, a full evaluation of the study was not possible. The missing information included meteorological data and portions of the reported results.

2. Residues were not characterized.

3. Soil samples were not taken immediately posttreatment.

4. The soil used in this experiment was reported as a sandy loam. According to USDA's soil classification system, the soil is a loamy sand and has been reported as such in this review.

Table 1. Total ^{14}C and carbamate residues in crops planted 119 days and 1 year after applying [^{14}C]aldicarb to soil at 5 lb/A.

	Residues calculated as aldicarb (ppm)			
	119 days		1 year	
Crop	^{14}C	Carbamate	^{14}C	Carbamate
Lettuce	0.06	0.02	0.013	ND[a]
Turnip tops	0.25	0.04	0.045	ND
Peeled turnip	0.03	ND	--	--
Turnip peeling	0.04	0.14	0.007	--
Unpeeled turnip	--	--	--	ND
Barley heads	0.24	0.04	0.033	ND
Barley green plants	0.24	0.05	0.060	ND
Barley straw	1.35	0.72	--	--
Soil at planting	0.37	--	0.26	--
Soil at harvest	0.25	--	0.31	--

[a] Not detected (<0.02 ppm).

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 32 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00068252 CONTENT CAT 01

Romine, R.R., and R.L. Meeker. 1972. Temik aldicarb pesticide: leaching of aldicarb into sandy soil with irrigation of a Temik treated sugar beet field: UCC Project Report No. 17079. Unpublished study received Aug. 4, 1977 under 1016-79; submitted by Union Carbide Corp., Arlington, Va.; CDL:231503-U.

SUBST. CLASS = S.

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: May 2, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Terrestrial

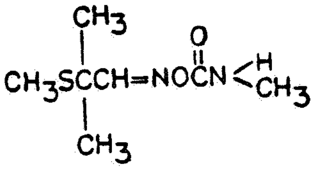
1. This study is scientifically valid.

2. Aldicarb residues dissipate rapidly in a sandy loam soil with a half-life of <4 days when aldicarb 10% G was applied at 5.4 lb ai/A. The pattern of irrigation (furrow or sprinkler) does not affect the dissipation rate of carbamate residues, including aldicarb, aldicarb sulfoxide, and aldicarb sulfone.

3. This study does not satisfy EPA Data Requirements for Registering Pesticides (1983) because a nonspecific method was used and aldicarb degradates were not differentiated or quantified.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

Aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 5.4 lb ai/A to a 2-acre sandy loam (pH 7.8, ~13% clay, 0.23% organic matter) sugarbeet plot on October 19, 1971. The pesticide was applied in 6-inch bands into the seed lines of sugarbeet beds at planting to a depth of 3 inches. The test plot was divided into two 1-acre plots and irrigated by either furrow or sprinkler methods. Cumulative inches of water applied are included in Table 1.

Twenty-five 8-foot deep soil cores were taken at 0, 4, 8, 16, 32, 64, and 132 days after application. The soil samples were divided into increments of 0-6, 6-12, 12-24, 24-48, and 48-96 inches, composited, and frozen for subsequent analysis.

Soil samples were extracted with acetone:distilled water (1:1), mixed on a concentric rotator for 2 hours, and filtered through glass wool. The soil extracts were oxidized to aldicarb sulfone by adding 40% peracetic acid while stirring continuously and transferred to a separatory funnel. The funnels were shaken for 30 seconds and the lower solvent layers were separated and filtered through anhydrous sodium sulfate. The filtrate was evaporated to dryness, redissolved in chloroform, cleaned up with a Florisil column clean up, and analyzed for total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) by using GLC equipped with a flame photometric detector. The lower limit of detection was 0.02 ppm. Fortified soil samples yielded an average recovery rate of 93.5% with a range of 90.0 to 97.5%.

REPORTED RESULTS:

The total (all depths combined) aldicarb residues found in the furrow and sprinkler irrigated soils decreased from 7.5 and 6.7 ppm to 0.06 and 1.1 ppm, respectively, in 4 days following application (Table 1). In the sprinkler irrigated plot, 85% of the detected aldicarb residues were concentrated in the 6- to 12-inch layer after 4 days, with the remainder in the upper 6 inches of soil. During the same time interval in the furrow irrigated plot, only 30% of the recovered aldicarb was found in the upper 6 inches of soil (remainder in the 48-96 inch increment).

DISCUSSION:

1. Contamination of core samples, especially in the 48- to 96-inch soil layer, is possible from the sampling tube that was driven through the treated layer.
2. Aldicarb degradates were not separated or quantified.

Table 1. Carbamate residues in an irrigated sandy loam sugarbeet field following an application of aldicarb 10% G at 5.9 lb ai/A.

Days after application	Cumulative inches of water	Carbamate residues (ppm) at indicated depths (inches)[a]				
		0-6	6-12	12-24	24-48	48-96
Furrow irrigation						
0	0	7.5	--	--	--	--
4	4.01	0.02	ND[b]	ND	ND	0.04
8	4.01	0.02	ND	0.20	0.20	0.02
16	4.01	0.18	0.08	0.02	0.06	0.02
32	8.01	0.35	0.10	0.23	0.05	ND
64	11.81	0.51	0.10	0.10	0.04	0.03
132	19.47	0.22	0.22	0.26	0.08	0.06
Sprinkler irrigation						
0	0	6.7	--	--	--	--
4	5.51	0.17	0.93	ND	ND	ND
8	9.01	0.08	0.13	0.05	ND	ND
16	9.01	0.14	0.72	0.10	ND	ND
32	16.51	ND	ND	0.37	0.06	ND
64	21.31	0.02	ND	0.03	0.11	0.10
132	29.97	ND	ND	0.10	0.06	0.02

[a] Nondetectable concentrations (<0.02 ppm) in controls.

[b] Nondetectable (<0.02 ppm).

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS0140 ALDICARB STUDY 33 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 100520

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00101923 CONTENT CAT 01
Union Carbide Corp. 1971. Magnitude of the residues: aldicarb. Compilation; unpublished study received May 3, 1972 under 2F1188; CDL:091000-I.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10468010 SEC: RCBR-25-10479010

DIRECT RVW TIME = 9 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: Feb. 4, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSION:

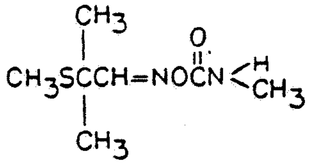
Field Dissipation - Terrestrial

This study is scientifically invalid because of inadequate sampling procedures and protocols. This study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because a nonspecific method was used, rainfall and irrigation data were not provided, and soil samples were not taken in increments to a depth of >15 cm and/or to a depth sufficient to define the extent of leaching.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\parallel}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, 10% G, Union Carbide Corp.) was broadcast at 10-20.5 lb ai/A and incorporated into the upper 3-7 inches of Marl limestone, loam, sandy loam, clay loam, silt loam and muck soils during 1968, 1969, and 1970 (Table 1).

In a second experiment (Table 3), Greenfield sandy loam (pH 7.3) field plots (30 x 100 feet) were treated with 1-3 applications of aldicarb [Temik, 10% GV[redacted] Union Carbide Corp.] at 5 and 10 lb ai/A. Aldicarb was broadcast on March, May, and August, 1970 and double-disced into the top 4-5 inches of the soil. Thirty 6-inch deep soil cores were collected, composited, and frozen until analysis.

The soil samples were extracted with acetone:water (1:1) followed by oxidation to aldicarb sulfone with peracetic acid. The resulting extract was cleaned up with liquid-liquid partitioning and liquid column chromatography. The total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide) in the form of aldicarb sulfone, were quantified by using GC with a flame photometric detector. Method sensitivity was reported as 0.01-0.02 ppm.

REPORTED RESULTS:

Carbamate residues detected in soils treated with a single application of aldicarb at 10-20.5 lb ai/A are provided in Table 2. Aldicarb residues dissipated rapidly in the Marl limestone and the Caribou loam soil with a half-life of <4 days. In the Caribou sandy loam soil, aldicarb residues fluctuated between 1.7 and 8.3 ppm over the first 32 days posttreatment followed by a decrease in aldicarb residues to 3.0 and 0.18 ppm at 64 and 128 days posttreatment, respectively. Aldicarb residues in the Mitchell silt loam soil declined from 3.2 to 0.87 ppm over a 64-day period; however, during the first 32 days posttreatment, the detected residues fluctuated between 2.5 and 5.5 ppm. In the Salinas clay loam soil, aldicarb residues declined from 6.0 ppm at 2 days posttreatment to 1.7 ppm at 128 days posttreatment. Aldicarb residues dissipated slowly in the Michigan muck soil with a half-life of ~64 days.

Recovered aldicarb residues in the Greenfield sandy loam after repeated applications of aldicarb were erratic with half-lives ranging from 14 days to between 62 and 126 days (Table 3). Generally, there was an increase in aldicarb residues 2 days after application, followed by a gradual but inconsistent decline thereafter.

DISCUSSION:

1. In several treatments, aldicarb residues fluctuated sporadically over the first 32-64 days posttreatment, indicating improper techniques and/or soil contamination.
2. Rainfall and/or irrigation accumulation data were not reported for any of the test sites.
3. No immediate posttreatment samples were taken.
4. The depth of the soil samples was insufficient to assess the downward mobility of aldicarb.
5. All soils were incompletely characterized.

Table 1. Summary of treatment and sampling conditions.

Soil type and location	Formulation	Application rate (lb ai/A)	Application date	Sampling method
Marl limestone Homestead, FL	10% G	20	6/8/70	Six-inch random cores composited and subsampled
Caribou loam Presque Isle, ME	10% G	20	5/30/70	Twenty-five 6-inch random cores composited and subsampled
Caribou sandy loam Presque Isle, ME	10% G	20.5	5/22/69	Twenty-five 6-inch random cores composited and subsampled
Mitchell silt loam Mitchell, NE	10% G	20	6/16/69	Twenty-five 6-inch random cores composited
Unspecified soil Davis, CA	10% G	20	6/3/70	Twenty-five 6-inch random cores composited and subsampled
Michigan muck Portage, MI	10% G	20	4/27/70	Twelve 6-inch cores from each of two 200 sq. ft. reps composited
Michigan muck Bath, MI	10% G	10	7/8/68	Ten 8-inch random cores
Salinas clay loam Salinas, CA	10% G	20	8/4/69	Twenty-five 6-inch deep cores composited

Table 2. Total carbamate residues (ppm) in 6-inch soil cores following a single broadcast application of aldicarb (10% G).[a]

Soil type and location	Days after treatment								Control
	1	2	4	8	16	32	64	128	
Marl limestone FL	19.5	10.4	2.9	2.1	1.1	0.3	0.08	0.04	<0.01
Caribou loam ME	16	17	6.8	5.9	8.4	2.9	2.0	0.35	<0.01
Caribou sandy loam ME	5.1	5.3	4.5	8.3	4.4	1.7	3.0	0.18	<0.02
Mitchell silt loam NE	3.2	2.7	5.5	3.0	3.5	2.5	0.87	0.36	<0.05
Unspecified soil CA	3.7	13.4	7.3	14.2	14.6	6.8	1.7	0.48	--
Michigan muck MI	21.6	19.5	18.4	19.3	15.4	17.9	7.7	2.9	0.31
Michigan muck MI	--	--	--	--	6.2	3.9	1.8	1.7	<0.02
Salinas clay loam CA	--	6.0	7.5	7.4	6.8	3.4	2.3	1.7	<0.02

[a] Total carbamate residues include aldicarb, aldicarb sulfone, and aldicarb sulfoxide.

Table 3. Total carbamate residues (ppm) in a Greenfield sandy loam soil after single and multiple applications of aldicarb [10% GV [redacted][a]

Application rate (lb ai/A)	Days after last application						
	0	1	6	14	30	62	126
5	2.5	4.8	2.4	2.0	2.8	1.7	0.6
5+5	5.4	4.3	2.7	2.1	0.24	0.12	0.05
5+5+5	0.10	0.88	0.12	0.05	0.04	0.04	--
10	3.8	5.7	6.3	5.6	5.2	4.4	0.73
10+10	1.6	2.1	2.0	1.4	0.38	0.23	0.05
10+10+10	5.1	6.8	4.6	1.1	0.51	0.22	--

[a] Total carbamate residues include aldicarb, aldicarb sulfone, and aldicarb sulfoxide.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

CASE GS0140 ALDICARB STUDY 34 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00101968 CONTENT CAT 02
Union Carbide Corp. 1969. Soil: decline of aldicarb. Unpublished study received Aug. 20, 1970 under 0F1008; CDL:091748-M.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS SEC: EFB -30-050525

DIRECT RVW TIME = 9 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: Feb. 7, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSION:

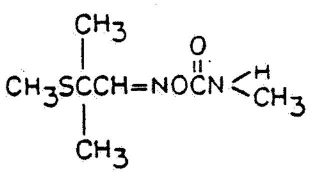
Field Dissipation - Terrestrial

This study is scientifically invalid because the inconsistent results suggest that improper methods of application and/or sampling were employed; therefore, representative decline curves for aldicarb residues cannot be generated. In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because a nonspecific method was employed, complete soil characteristics were not provided, and soil samples were not taken in increments to a depth of >15 cm and/or to a depth sufficient to define the extent of leaching.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N\mathord{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb [Temik, 10% G and 10% GV [redacted] Union Carbide Corp.] was applied at 20 lb ai/A to a 20- x 20-foot Norfolk sandy loam field plot (soil textural properties unspecified, pH 6) located in Clayton, North Carolina on April 28, 1969. One test plot was broadcast with aldicarb 10% GV and the granules were allowed to sit on the soil surface. In two similar field plots, aldicarb 10% G or 10% GV was broadcast and rototilled into the top 6 inches. Rainfall data are provided in Table 1.

Ten soil core samples, measuring 1-inch in diameter and 6 inches deep, were collected and composited. Fifty-gram subsamples were analyzed for total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide) by using Union Carbide's procedure referred to as UC 21149-III-Soil. The soils were extracted with acetone:water (1:1), followed by oxidation to aldicarb sulfone by using peracetic acid. Cleanup of the sample was done with a Florisil column and total aldicarb concentrations were determined by using a GC equipped with a flame-photometric detector. The limit of detection was reported as 0.1 ppm.

Greenhouse studies are included in 00101915 (reviewed as Study 40).

REPORTED RESULTS:

The results of the field studies are provided in Table 2. When applied by broadcast and left on the soil surface, total carbamate residues (10% GV) decreased from 20.0 ppm to 0.4 ppm after 64 days posttreatment. Detected carbamate residues fluctuated sporadically between 0.09 and 12.5 ppm when applied by broadcast and incorporated to a depth of 6 inches. The reported half-life of carbamate residues under field conditions was 16 days.

DISCUSSION:

1. Aldicarb and its degradates were not isolated, identified, or quantified.

2. The field data are inconsistent and fluctuate sporadically in all treatments over the study period making a half-life estimate unreliable.

3. The test soil was not completely characterized.

Table 1. Cumulative rainfall (inches) through test period.

Date	Cumulative rainfall
April 29	0.3
April 30	0.3
May 2	0.3
May 6	0.53
May 14	0.63
May 30	1.65
July 1	8.2
September 3	9.9

175

Table 2. Carbamate residues (ppm) in a Norfolk sandy loam soil treated with aldicarb on April 28, 1969 at 20 lb ai/A.[a]

Aldicarb treatment	Days after treatment[b]								
	0	1	2	4	8	16	32	64	128
Aldicarb 10% GV; broadcast, left on soil surface	20.0	24.5	9.7	16.0	5.7	1.9	2.6	0.4	0.05
Aldicarb 10% G; broadcast, incorporated into top 6 inches	6.6	7.8	7.9	12.5	5.9	5.8	5.0	2.0	0.09
Aldicarb 10% GV; broadcast, incorporated into top 6 inches	1.8	6.0	5.6	7.2	8.7	4.1	9.4	1.0	0.6

[a] Untreated controls showed <0.01 ppm.

[b] Average of two replicate samples.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS0140 ALDICARB STUDY 35 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00102061 CONTENT CAT 01
Woodham, D., R. Edwards, R. Reeves, and R.L. Schutzmann. 1973. Total toxic aldicarb residues in soil, cottonseed, and cotton lint following a soil treatment with the insecticide on the Texas high plains. J. Agric. Food Chem. 21(2):303-307. Also In unpublished submission received Dec. 9, 1977 under 1016-69; submitted by Union Carbide Corp., Arlington, VA; CDL:096670-V.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-20-150505

DIRECT RVW TIME = 7 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: Feb. 8, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

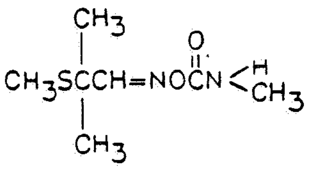
CONCLUSION:

Field Dissipation - Terrestrial

This study cannot be validated because of extreme variability in the data and because no immediate posttreatment sample was collected; therefore, a representative aldicarb residue decline curve cannot be drawn. In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because aldicarb was not applied at the highest recommended label rate, a nonspecific method was used, the soil was not completely characterized, irrigation and rainfall data were not provided, and soil samples were not taken in increments to a depth of >15 cm and/or to a depth sufficient to define the extent of leaching.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}CH{=}NO\overset{\overset{O}{\|}}{C}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 1.5 lb ai/A to an irrigated and a nonirrigated sandy loam soil. The insecticide was placed 5-6 inches deep in furrows around seedling cotton plants. Approximately 50 6-inch soil cores were collected from each of the treated fields both in and between cotton rows. Control samples were collected from untreated field plots and soil samples from a creek bottom adjacent to a treated field were also taken.

Soil samples were extracted with acetone:distilled water (1:1), mixed on a concentric rotator for 2 hours, and the extracts were filtered through glass wool into flasks. The soil extracts were oxidized to aldicarb sulfone by adding 40% peracetic acid while stirring continuously, transferred to a separatory funnel and the flasks were rinsed with chloroform, which was also transferred to the funnel. The funnels were shaken for 30 seconds and the chloroform solvent layer was separated and filtered through anhydrous sodium sulfate. The filtrate was evaporated to dryness, redissolved in chloroform, cleaned up with a Florisil column, and analyzed for total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) by using GLC equipped with a flame photometric detector. Fortified soil samples yielded an average recovery rate of 93.5% with a range of 90.0 to 97.5%.

Analyses of the soil samples was by the Brownsville, Gulfport, and Union Carbide Laboratories. The limit of detection was 0.01 ppm at the Brownsville and Gulfport laboratories and 0.02 ppm at the Union Carbide Laboratory.

REPORTED RESULTS:

Aldicarb residues were detected only in soil samples taken from the plant rows (Table 1); aldicarb residues were not detectable (<0.01-<0.02 ppm) in samples taken from between the rows.

In nonirrigated fields, aldicarb residues were present at 0.33 ppm 2 days after application and 1.65 ppm 3 days after application. In ~1 month, the average aldicarb residue dropped to 0.15 ppm and in 5 months no aldicarb residues were detected.

The irrigated fields showed aldicarb residues ranging from 0.10 to 0.70 ppm at 11-18 days following treatment. After 4 and 5 months following treatment, aldicarb residues were not detectable in the soil samples.

DISCUSSION:

1. Complete soil characteristics (pH, organic matter, and CEC) were not provided.
2. Several of the test plots were examined under irrigated conditions; however, information on the method, amounts and dates of irrigation were not reported.
3. No pretreatment or immediate posttreatment samples were collected for analysis. In addition, data presented were extremely variable.
4. Soil was only sampled to the depth of the application zone, no samples were taken at a greater depth to determine downward mobility.

Table 1. Total carbamate residues[a] in soil rows treated with aldicarb 10% G at 1.5 lb ai/A.

Field number	Approximate days or months after application	Aldicarb residues (ppm)
	Nonirrigated fields	
1	2 days	0.33
	1 mo.	0.05
	5 mos.	ND[b]
4	3 days	1.65
	1 mo.	0.25
	5 mos.	ND
	Irrigated field	
2	18 days	0.10
	4.5 mos.	ND
3	12 days	0.36
	41 days	0.03
	4 mos.	ND
5	13 days	0.70
	42 days	ND
	5 mos.	ND
6	11 days	0.41
	36 days	0.06
	42 days	ND

---

[a] Expressed as aldicarb sulfone.

[b] ND; nondetectable (<0.01-<0.02 ppm).

CASE GS0140 ALDICARB STUDY 36 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 101045

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00025511 CONTENT CAT 02
Back, P.C. 1979. Temik aldicarb pesticide: the Long Island water situation. Unpublished study received Jan. 30, 1980 under 1016-69; submitted by Union Carbide Corp., Arlington, Va.; CDL:241702-A.

FICHE/MASTER ID No MRID CONTENT CAT
Union Carbide Agricultural Products Company, Incorporated. 1981. Monitoring aldicarb residues in soil and water, 1980. Compilation, unpublished study received Jan. 19, 1981.

FICHE/MASTER ID 00096543 CONTENT CAT 01
Union Carbide Agricultural Products Company, Incorporated. 1982. Monitoring aldicarb residues in soil and water, 1981. Compilation; unpublished study received Mar. 9, 1982 under 264-330; CDL:246960-A.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: EFF -10-0514013 SEC: EFB -30-100520

DIRECT RVW TIME = 38 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: DATE: Feb. 8, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

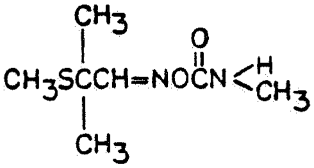
Exposure

1. This monitoring study is scientifically valid.

2. The possibility of aldicarb residues in well water exists in wells near aldicarb-treated fields. Aldicarb residues ≤50 ppb were found in well water samples from New York (Long Island), Wisconsin, Florida, Maine, Virginia, and North Carolina; aldicarb residues >200 ppb were found in 2-8% of the private wells sampled in Suffolk County, Long Island, New York between November 1979 and May 1981.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

Long Island well water monitoring, 1979-1981--During 1979, a total of 149 wells (79 municipal water wells, and 70 private wells) were sampled in Suffolk County, New York, for aldicarb residue determination (Table 1). From April to June, 1980 (Phase I), 7819 private wells in the county were sampled, and from August to November, 1980 (Phase II), 551 private wells were sampled, 85 of which were resamplings of Phase I wells. Phase III samples were taken between May and July, 1981, and were comprised of 552 private wells, 441 of which were resamplings of Phase II weeks.

Special interest areas, 1980-1981--Three to five aldicarb-treated fields in each special interest area (Table 1) were selected for soil and water testing. Selection criteria for these areas included a minimum field size of 5 acres, sandy soil, high water table, aldicarb treatment in at least two previous crop years, and nearby surface or well water supply. Triplicate soil samples were taken from each site using a 3.25-inch diameter bucket soil auger, at depths of 0-1, 1-2, 2-4, 4-6, and 6-8 feet. Water samples were taken from surface water supplies, irrigation wells, and house wells in or adjacent to aldicarb-treated fields.

High-use areas, 1980-1981--Well water sampling was conducted during 1980 and 1981 in counties identified as high aldicarb use areas [10-1345 million pounds of aldicarb (Temik) 10% G per county]. In each county (Table 1) a minimum of four water samples were taken from wells on farms with recorded aldicarb use. Approximately 100 samples were obtained in 1980, and 146 in 1981.

Soil and water samples were usually frozen within 6 hours after sampling. Storage stability studies demonstrated that no significant change in aldicarb residue content resulted from storing water samples in plastic bottles at room temperature (21-24 C) for ≤3 weeks. Samples were quantified for total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone). Residue characterization was performed for 41 water samples.

Water samples were oxidized with peracetic acid, and extracted with methylene chloride. Extracts were evaporated to dryness, diluted in acetone, and quantified by using GC. Average recovery values for aldicarb sulfone and aldicarb sulfoxide were 111% and 105%, respectively. The limit of detection for aldicarb in water using this method was 1 ppb.

Air-dried soil samples were extracted with acetone:water (1:1), oxidized with peracetic acid, cleaned up by using liquid-liquid partitioning, and quantified by using GC. The limit of detection for aldicarb residues in soil using this method was 5 ppb.

REPORTED RESULTS:

Long Island well water monitoring, 1979-1981--Aldicarb residues >200 ppb were found in water samples taken from private wells in Suffolk County (Table 2). Public water supplies were sampled at 79 sites in 1979, 15 of which had aldicarb residues in the range of 1 to 26 ppb. Of 70 private wells sampled in 1979, 52% had no detectable residues (<1 ppb) and the remaining water samples had aldicarb residues ranging from 1 to >200 ppb. Of 7819 wells sampled in 1980, 67% had no detectable aldicarb residues, 18% showed aldicarb residues at 1-7 ppb, and 15% showed 8-200 ppb. A second series of 551 samples (including 85 resampled wells) were taken 6 months later, of which 49% contained nondetectable residues of aldicarb, 27% contained 1-7 ppb, and 24% contained 8->200 ppb. Resampling of 441 of these wells after 6 months showed that aldicarb residues had increased in 46% of the samples, declined in 19%, and remained even in 35%.

Residues characterized were predominantly aldicarb sulfoxide and aldicarb sulfone, at a ratio of ~50:50 (Table 3). Maximum levels of parent aldicarb occurred as ~10% of the total residue at two sites.

Special interest areas, 1980-1981--Aldicarb residues were degraded rapidly in the surface soils of potato fields in Wisconsin; ~5 months after treatment, 15% of the applied aldicarb remained in the 0- to 1-foot soil strata (Table 4). Aldicarb residues ≤80 ppb were detected in the 4- to 6-foot depth. Of the wells adjacent to treated fields, 38% of the house wells had aldicarb residues <3 ppb, and 47% of all sampled wells had residues ≤6 ppb.

Eight months after aldicarb application to citrus groves in Florida, at 65-67 lb ai/A, no aldicarb residues were detected in soil at 0-4 feet, and residues ≤115 ppb were found at the 5- to 8-foot level. Aldicarb residues <8 ppb were found in water samples taken from wells in or adjacent to the treated citrus groves.

Factors promoting the transport of aldicarb residues to subsoils in Wisconsin and Florida included the permeability and acidity of the sandy soils, and the high water table (normally 10-20 feet below the surface).

No significant transport of aldicarb residues to subsoils was found in field monitoring of aldicarb treated soil in Virginia, Washington-Oregon, California, and Texas (in Virginia, this was attributed to dry weather conditions during the study); residues <11 ppb were found in soil beyond the root zone. Aldicarb residues were not detected (<1 ppb) in water samples from these areas.

High-use areas, 1980-1981--Aldicarb residues <38 ppb were found in well water samples from Aroostook County, Maine, 10 ppb from Accomack County, Virginia, and 2 ppb from the Virginia-North Carolina line.

DISCUSSION:

This was a comprehensive monitoring study, with a well designed protocol and acceptable analytical methodology.

Table 1. Sampling protocol for 1979-1981 soil and water monitoring.

Year	Location	Sample obtained
1979	Long Island	79 municipal water wells 70 private wells
1980	Long Island	7819 private wells 551 private wells
	Special Interest Areas:	Soil and water samples from aldicarb-treated fields:
	Wisconsin	127 soil; 31 water
	Florida	141 soil; 33 water
	Virginia	39 soil; 3 water
	Washington-Oregon	39 soil; 6 water
	California	28 soil; 4 water
	Texas	41 soil; 27 water
	High-use Areas:	Approximately 100 well water samples obtained from counties with a history of significant aldicarb use.
	New York Maine New Jersey Virginia North Carolina South Carolina Alabama Michigan Idaho Arizona Colorado Missouri Texas	
1981	Long Island	552 private wells
	Special Interest Areas:	
	Wisconsin	505 soil; 65 water
	Florida	445 soil; 88 water
	Virginia	30 soil; 27 water
	High-use Areas:	
	Georgia North Carolina Virginia Maine	146 wells sampled

Table 2. Percent of private wells by aldicarb concentration (Suffolk County, New York).

Aldicarb residues[a] (ppb)	Nov. 1979[b]	Phase I May 1980	Phase II Nov. 1980	Phase III May 1981
0	52	67	49	27
1-7	17	18	27	42
8-15	13	6	11	15
16-30	9	3	4	10
31-50	1	2	3	4
51-100	6	3	3	2
101-200	1	1	2	0
>200	1	(0.2)	1	0
Total no. of samples	70	7819	551	552

[a] Total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide); limit of detection = 1 ppb.

[b] Column developed by reviewer.

Table 3. Characterization of aldicarb residues in well water on Eastern Long Island, 1980.[a]

Sample location	Aldicarb residues (ppb)	Total percent of residues present as		
		Parent aldicarb	Aldicarb sulfoxide	Aldicarb sulfone
Remsenberg	69	0	49	51
Calverton	115	0	53	47
Aqueboque	109	0	73	27
Jamesport	188	0	68	32
Laurel	225	0	54	46
Jamesport	148	0	54	46
Jamesport	176	0	54	46
Laurel	138	0	55	45
Mattituck	260	0	59	41
Cuthogue	108	0	53	47
Cutchogue	149	0	66	34
Scuthhold	123	0	67	33
Greenport	181	0	49	51
Orient	333	0	72	28
Southhampton	79	0	39	61
Watermill	104	0	50	50
Watermill	119	0	49	51
Watermill	95	0	58	42
Bridgehampton	80	0	55	45
Wainscott	131	0	45	55

[a] Total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide).

Table 4. Average aldicarb residues (ppb) in Wisconsin soils, 1980.[a]

	Soil depth in feet from surface and sampling time							
	Surface-1 foot		1-2 foot		2-4 foot		4-6 foot	
Field	July	Sept	July	Sept	July	Sept	July	Sept
I	234	93	45	77	4	17	0	18
II	789	52	159	63	97	64	35	30
III	566	112	215	52	18	33	27	33
IV	369	72	50	27	154	41	24	21
V	488	20	58	27	10	57	--	13
5 farm average:	489	70	105	49	57	42	17	23
% loss:	85		53		26		Gain	

---

[a] Total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide); limit of detection = 5 ppb. Nondetectable concentrations were converted to 0 to facilitate averaging.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 37 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 100520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00101910 CONTENT CAT 01
Union Carbide Corp. 1973. Residues: Temik 10 G and Temik 15 G. Unpublished study received June 21, 1974 under 1016-78; CDL:026641-A.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10505510 SEC: RCBR-25-10142010

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: A. Bartels DATE: Apr. 25, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

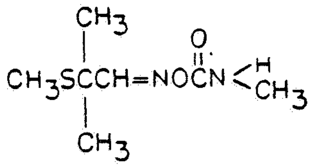
CONCLUSION:

Field Dissipation - Terrestrial

This study is scientifically invalid because sampling intervals were insufficient to establish an aldicarb residue decline curve. In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because a nonspecific analytical method was used, the test substance was not applied at the highest registered label rate, and the soils were incompletely described.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, 10% G and 15% G, Union Carbide Corp.) was applied at 1, 2, and 4 lb ai/A to a sandy loam soil (pH 7.3, other characteristics unspecified) planted with sugarbeets on January 12, 1972. The application method varied according to the treatment rate as follows: 1 lb ai/A, applied into planter shoe at planting; 2 lb ai/A, drilled 2 inches below seed row; and 5 lb ai/A, incorporated in band 4-6 inches wide, 1-3 inches deep at seed line. Other chemicals applied included Betanal, Pyramin, and NPO. Rainfall and irrigation data during the study period were 1.8 and 46 inches, respectively. Twelve-inch deep soil cores were collected at 282 days following treatment and frozen until analysis. Aldicarb residues (unspecified) were determined by using UCC method "Aldicarb-FPD-Soil (short)" (assumed to be a nonspecific GC method).

In a second study, aldicarb (Temik, 10% G, Union Carbide Corp.) was applied at 1.1 or 5.1 lb ai/A to a Greenfield sandy loam soil (pH 7.3, other characteristics unspecified) planted with sugarbeets. When applied at 1.1 lb ai/A, aldicarb was incorporated to 0.75 inches deep with seed and at 5.1 lb ai/A, aldicarb was applied in a 5-inch band to 2-3 inches deep. There was no rainfall during the study period; however, there were two furrow irrigations of 6 inches each. Twenty-five, 1-inch diameter soil cores were collected to a 12-inch depth from the sugarbeet seed line at 60 days posttreatment. The soil cores were divided into two 6-inch segments, composited, and frozen until analysis. Soil samples were extracted with acetone:distilled water (1:1), mixed on a concentric rotator for 2 hours, and the extracts were filtered through glass wool into flasks. The soil extracts were oxidized to aldicarb sulfone by adding 40% peracetic acid while stirring continuously, transferred to a separatory funnel, and the flasks were rinsed with chloroform, which was also transferred to the funnel. The funnels were shaken for 30 seconds and the chloroform solvent layer was separated and filtered through anhydrous sodium sulfate. The filtrate was evaporated to dryness, redissolved in chloroform, cleaned up with a Florisil column clean up, and analyzed for total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone) by using GLC equipped with a flame photometric detector. The limit of detection was 0.02 ppm. Fortified soil samples yielded an average recovery rate of 93.5% with a range of 90.0 to 97.5%.

In a third study, aldicarb (Temik, 15% G, Union Carbide Corp.) was applied at 1.3 or 5.6 lb ai/A to a Greenfield sand loam soil (pH 7.3, other characteristics unspecified). Endrin was also applied in the second and third studies. When applied at 1.3 lb ai/A, aldicarb was incorporated to 0.75 inches deep with seed and at 5.6 lb ai/A, aldicarb was applied in a 5-inch band 2-3 inches deep. There was no rainfall during the study period; however, the field site was furrow irrigated twice with 6 inches water each. Soil cores were collected and analyzed as described in the second study.

REPORTED RESULTS:

In the first study, aldicarb residues in sandy loam soils treated with aldicarb 10% G or 15% G at 1, 2, and 4 lb ai/A indicated <0.3 ppm in 12-inch soil cores at 282 days posttreatment.

In the second study, when aldicarb was applied at 1.1 lb ai/A, the 0- to 6- and 6- to 12-inch soil segments indicated carbamate residues of 2.6 and 0.54 ppm, respectively at 60 days posttreatment. Plots treated with aldicarb 10% G at 5.6 lb ai/A had carbamate residues of 4.4 and 0.51 ppm in the 0- to 6- and 6- to 12-inch segments, respectively, 60 days following treatment.

When aldicarb 15% G was applied at 1.3 lb ai/A in the third study, the 0- to 6- and 6- to 12inch segments contained carbamate residues of 0.61 and 0.18 ppm, respectively; at 5.6 lb ai/A, carbamate residues were 1.21 and 0.27 ppm in the 0- to 6- and 6- to 12-inch segments, respectively, 60 days posttreatment.

DISCUSSION:

1. A nonspecific GC method was employed to determine aldicarb residues.
2. Only a harvest interval sample was collected for analysis.
3. Test soils were incompletely described.

CASE GS0140 ALDICARB STUDY 38 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00036313 CONTENT CAT 01
Gunther, F.A., G.E. Carman, R.C. Baines, and W.E. Westlake. 1975. Aldicarb (Temik) residues in oranges, orange leaves, and soil after soil application in an orange grove. Unpublished study received Oct. 10, 1975 under 6G1689; prepared in cooperation with Univ. of California--Riverside, Citrus Research Center and Agricultural Experiment Station, Dept. of Entomology and others, submitted by Union Carbide Corp., Washington, D.C.; CDL:096440-H.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10310010 EFB -20-259902010
SEC: RCBR-25-10109010 RCBR-25-10110010

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: H. Bartels DATE: Feb. 10, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

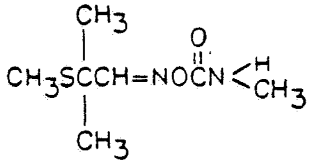
CONCLUSION:

Field Dissipation - Terrestrial

This study is scientifically invalid because sampling intervals were insufficient to establish a residue decline curve. This study would not satisfy EPA Data Requirements for Registering Pesticides (1983) because a nonspecific GC method was employed, soil characteristics and rainfall and irrigation data were not reported, and the test substance was not completely characterized.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}\begin{matrix}H\\CH_3\end{matrix}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Aldicarb (Temik, G, purity unspecified, Union Carbide Corp.) was applied at 2.5-20 lb ai/A to four 'Valencia' orange groves (soil uncharacterized) on April 8, 1974. The treatments were as follows: Plot I, 2.5 lb ai/A; Plot II, 5.0 lb ai/A with a second application at the same rate 36 days later; Plot III, 10 lb ai/A; Plot IV, 20 lb ai/A; and Plot V, untreated control. Applications were made in a 4-foot band around each of the nine trees comprising each plot (four replicate plots for each treatment) and the area was rototilled to a depth of 2-3 inches. The grove was sprinkler irrigated 2 days after treatment with an unspecified amount of water.

Eight 12-inch deep soil cores were collected and composited from each plot. Soil samples were air dried, mixed thoroughly, and frozen until analysis.

Samples were analyzed for total carbamate residues by using a Union Carbide GC method entitled "A Method for the Determination of Total Toxic Aldicarb Residues in Citrus Fruits and Foliage."

REPORTED RESULTS:

Total carbamate residues in soil when aldicarb was applied at 2.5-20 lb ai/A are provided in Table 1. When aldicarb was applied at 2.5 lb ai/A, aldicarb residues declined from 0.31 ppm 7 days after application to 0.08 ppm 52 days following application. Treatments made at 10 and 20 lb ai/A showed inconsistent aldicarb residue recoveries throughout the study period. Two applications of aldicarb at 5 lb ai/A showed a decrease in aldicarb residues from 0.61 to 0.34 between 7 and 35 days following the first application. After the second application (day 36), aldicarb residues dropped from 0.95 ppm 16 days after the second application to 0.48 ppm 19 days later.

DISCUSSION:

1. Soil characteristics were not provided.

2. Rainfall and irrigation data were not reported.
3. Aldicarb residue levels in the untreated control plot were not reported.
4. No pretreatment or immediate posttreatment samples were collected for analysis.
5. It was stated that inconsistent aldicarb recovery rates in Plot IV were possibly the result of contaminated irrigation water pooling at the sample site.

Table 1. Carbamate residues (ppm) in 12-inch soil cores after treatment.[a]

Application rate (lb ai/A)[b]	Days after application								
	7	14	21	28	35	52	71	113	154
2.5	0.31	0.34	0.38	0.22	0.22	0.08	0.06	0.03	0.01
10.0 (two 5.0, 36 days apart)	0.61	0.73	0.55	0.45	0.34	0.95[c]	0.48	0.23	0.19
10.0	0.94	0.58	0.90	0.57	1.02	0.31	0.17	0.14	0.16
20.0	2.46	2.91	2.19	1.82	2.45	1.30	1.77	2.27	0.09

[a] A nonspecific method was used, that determined total carbamate residues (aldicarb, aldicarb sulfone, and aldicarb sulfoxide); values are the average of three replicate samples.

[b] Data for the untreated control plot were not reported.

[c] Second treatment made before this sampling.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 39 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 050530 GUIDELINE 40 CFR 163.62-10b

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00053364 CONTENT CAT 01

Bull, D.L. 1968. Metabolism of UC-21149 (2-methyl-2-(methythio)-propionaldehyde o-(methylcarbamoyl)oxime) in cotton plants and soil in the field. J. Econ. Entomol. 61(6):1598-1602. Also <u>In</u> unpublished submission received Jan. 18, 1977 under 1016-Ex-37; submitted by Union Carbide Corp., Arlington, Va.; CDL:228979-D.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-20-1510
SEC: EFB -30-050520 RCBR-20-1515

DIRECT RVW TIME = 3 1/2 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels DATE: Feb. 14, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

<u>CONCLUSIONS</u>:

<u>Field Dissipation - Terrestrial</u>

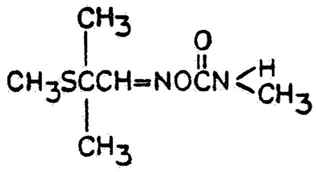
1. This study is scientifically valid.

2. [^{35}S]Aldicarb is degraded rapidly with a half-life of <1 week when applied at 2 mg/100 g (20 ppm) of fine sandy loam soil. Degradates found include aldicarb sulfoxide, aldicarb sulfone, aldicarb sulfoxide oxime, aldicarb nitrile sulfoxide and six unidentified compounds.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because a formulated end-use product was not used, soil samples were not taken in increments, soil characteristics were incompletely described, and rainfall and irrigation data were not reported.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

[^{35}S]Aldicarb (UC-21149, specific activity 5.05 µCi/mM, purity >99%, Union Carbide Corp.) was applied at 2 mg/100 g of sieved (50-mesh screen) Lufkin fine sandy loam soil and thoroughly mixed. The treated 100-g aliquots of soil were placed into fine mesh screen containers and buried to a depth of 4-6 inches in a cotton field. Duplicate packets of the treated soil were recovered at 0, 1, 2, 4, and 8 weeks after treatment.

The soil samples were extracted three times with acetone:ethanol (1:1), evaporated under vacuum, radioassayed, and degradates identified by using two dimensional TLC (5:1:1:1; chloroform:hexane:ethyl acetate:dioxane and chloroform:hexane:ethyl acetate:ethanol).

REPORTED RESULTS:

The recovery rates of [^{35}S]aldicarb and its degradates from a fine sandy loam soil are provided in Table 1. Within 30 minutes after treatment (week 0), 76.6% of the initial dose was recovered as the parent compound, 8.0% was present as aldicarb sulfoxide, and 14.4% was unextractable. Aldicarb sulfoxide was the dominant aldicarb degradate, accounting for as much as 36.8% of the initial dose during the 8-week study period. Within 1-week posttreatment, the amount of recovered parent compound declined to 1.6% of the applied dose. The amount of radioactivity lost during the study period increased from 38.5% to 86.3% of the applied dose after 1 and 8 weeks posttreatment, respectively.

DISCUSSION:

1. The loss of total applied radioactivity was attributed to volatilization or to leaching of the chemical from rainfall and irrigation.
2. Rainfall and irrigation data were not provided.
3. The soil used was not completely described.

Table 1. Recovery of $[^{35}S]$aldicarb and its degradates from a fine sandy loam soil.

Compound	Percentage of applied radioactivity at indicated weeks after treatment				
	0	1	2	4	8
Aldicarb	76.6	1.6	0.2	0.2	0.1
Aldicarb sulfoxide	8.0	36.8	14.4	2.2	0.8
Aldicarb sulfoxide oxime	0.7	0.7	1.2	0.5	0.1
Aldicarb sulfone	0.0	4.6	3.8	1.8	1.0
Aldicarb sulfoxide nitrile	0.0	1.5	0.7	0.1	0.1
Unknowns[a]	0.3	2.5	--[b]	0.9	0.5
Unextracted	14.4	13.8	15.9	12.9	11.1
Lost	0.0	38.5	60.4	81.4	86.3

[a] Six unknowns were separated.

[b] Value not legible.

CASE GS0140 ALDICARB STUDY 40 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 259931003

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00101915 CONTENT CAT 01
Union Carbide Corp. 1970. Temik 10 G aldicarb pesticide: nature and magnitude of residues in certain ornamental plants, greenhouse soils and water. Unpublished study received Apr. 12, 1971 under 1016-69; CDL:050847-E.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: EFB -30-100520

DIRECT RVW TIME = 15 (MH) START-DATE END DATE

REVIEWED BY: G. Bartels and T. Opeka
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: G. Bartels T. Opeka DATE: Mar. 1, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This portion of the study is scientifically valid.

2. Aldicarb residues (carbamate) are degraded rapidly with a half-life of ~1-3 weeks when aldicarb (10% G and 10% GV) is applied at 4-20 lb ai/A to greenhouse soils composed of sandy loam, peat, and/or perlite (incubation conditions unspecified).

3. This study does not fulfill EPA Data Requirements for Registering Pesticides (1983) because two nonspecific methods (colorimetric and GC) were used, the test substance was not a technical or purer grade product, complete soil descriptions were not provided, and incubation conditions were not reported.

Mobility - Leaching and Adsorption/Desorption

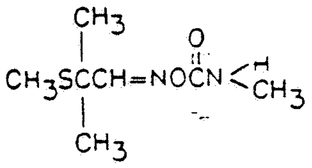
This portion of the study cannot be evaluated because procedures and protocols were incompletely described. In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because the method used was not one of the three recommended by EPA for use in assessing pesticide mobility in soil, soil samples were not collected for analysis and the test substance was not a technical or purer grade product.

Field Dissipation - Terrestrial

This portion of the study is scientifically invalid because the treated soils were not sampled on the date of application or immediately post-application to verify application rates and the sampling intervals were inadequate to provide data for estimating half-lives. This portion of the study would not fulfill EPA Data Requirements for Registering Pesticides (1983) because a nonspecific GC method was used, complete soil descriptions and irrigation and rainfall data were not provided, and the soil sampling depth was not reported.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Metabolism - Aerobic Soil

Aldicarb [Temik, 10% GV, [redacted] source of all chemicals used was Union Carbide Corp.] was broadcast at 4 lb ai/A to steam-sterilized, greenhouse beds (10 inches deep x 42 inches wide; soil uncharacterized) containing either poinsettia or carnations. Random 8-inch soil cores were taken on days 14, 28, 56, 98, and 140 posttreatment and stored frozen until analysis.

Two nonspecific analytical methods (UC 21149-II-Soil and UC 21149-III-Soil) were employed for determination of total carbamate residues (aldicarb, aldicarb sulfoxide, and aldicarb sulfone). Samples collected on days 14, 28, and 56 posttreatment were analyzed by using colorimetry and samples taken on days 98 and 140 posttreatment were quantified by using GC. In the colorimetric procedure (UC 21149-II-Soil), the soil samples were extracted with 20% acetone in chloroform, oxidized to aldicarb sulfoxide, and the absorbance measured at 530 nm. In the GC method (UC 21149-III-Soil), the soil samples

INERT INGREDIENT INFORMATION IS NOT INCLUDED

INERT INGREDIENT INFORMATION IS NOT INCLUDED

were extracted with acetone:water (1:1), separated by liquid column chromatography, oxidized to aldicarb sulfone with peracetic acid and quantified by using GC. The limit of detection for both methods was 0.01 ppm.

In a second experiment, aldicarb [Temik, 10% GV [redacted]], was broadcast at 20 lb ai/A to a greenhouse soil mixture (pH ~6) composed of Norfolk sandy loam:peat moss (2:1) and a Norfolk sandy loam soil. In a similar experiment, aldicarb [Temik, 10% G [redacted] was broadcast at 20 lb ai/A onto a Norfolk sandy loam (pH ~6) soil and maintained in the greenhouse. Ten 6inch deep soil cores were collected on days 0, 1, 2, 4, 8, 16, 33, 64, and 128 posttreatment, composited and stored frozen until analysis. The samples were analyzed by using the GC procedure described above. In 1968, aldicarb (Temik, 10% G) was broadcast at 5 and 10 lb ai/A and incorporated into the top 2-3 inches of a greenhouse soil mixture containing sand, loam, and perlite. Twenty-five, 1-inch diameter soil cores were collected from the top 3-6 inches of soil on days 1, 16, 31, 61, 91, 121, and 136 posttreatment and stored frozen until analysis. The samples were analyzed by using the colorimetric procedure described above.

In another experiment, aldicarb (Temik, 10% G) was broadcast at 10 and 20 lb ai/A onto a greenhouse mixture of loam:peat:perlite (2:1:1). Twenty-five, 1-inch diameter soil cores from the upper 3 inches of the bed were collected on days 1, 2, 4, 8, 16, 64, and 128, posttreatment. The soil samples were composited, and stored frozen until analysis by the GC method described previously.

In a 1969 experiment, aldicarb (Temik, 10% G) was applied at 11.4 lb ai/A to 5-inch pots containing chrysanthemums (soil uncharacterized). Soil samples were collected from the upper 0.5-inch of soil on days 1, 3, 7, and 14 following treatment and analyzed colorimetrically.

Aldicarb (Temik, 10% G and 10% GV) was broadcast at 5 and 10 lb ai/A to duplicate sandy loam greenhouse beds containing chrysanthemums in January, 1969. Twenty-five random soil cores, measuring 1-inch in diameter and 3 inches deep were collected and stored frozen until analysis. The samples were quantified by using the GC procedure described above.

In a final experiment, aldicarb (Ambush, 2% G) was applied at 1, 2, and 4 lb ai/A to an unspecified greenhouse soil on May 31, 1967. Six soil cores were taken from a 6-inch depth on day 113 following treatment and analyzed 33 following the second application. The samples were quantified by using fone) by a colorimetric method for ornamental plants (UC 21149-II-Orna). The soil samples were extracted with chloroform:acetonitrile (4:1), oxidized to aldicarb sulfoxide and determined colorimetrically at 540 nm.

Mobility - Leaching and Adsorption/Desorption

Aldicarb (Temik, 10% G, Union Carbide Corp.) was broadcast at ~10 lb ai/A to carnation beds (soil characteristics and depth unspecified) in November 1969. The beds were watered at 2 inches/week and 500-ml leachate samples were collected from duplicate beds on days 0, 3, 7, 14, and 21, posttreatment. The method of aldicarb residue determination was not provided.

Field Dissipation - Terrestrial

Sandy loam outdoor beds containing chrysanthemums were treated with two applications of aldicarb (Temik, 10% G and 10% GV) at 5 or 10 lb ai/A on January 28, 1969 and March 12, 1969. Other chemicals applied included Captan, Zineb, Kelthane and DDT. The beds were sprinkler irrigated daily and random samples were collected on days 5, 10, 21, and 33 following the second application. The samples were quantified by using the GC procedure described previously.

REPORTED RESULTS:

Metabolism - Aerobic Soil

Aldicarb residues detected in greenhouse soils treated with a single application of aldicarb (Temik, 10% G and 10% GV) are presented in Table 1. When aldicarb (Ambush 2% G) was applied at 1, 2, and 4 lb ai/A, aldicarb residues were detected at 0.71, 0.28, and 0.57 ppm at 113 days posttreatment.

Mobility - Leaching and Adsorption/Desorption

The results of leachate analyses for aldicarb residues are provided in Table 2.

Field Dissipation - Terrestrial

Aldicarb residues detected in soils treated twice with aldicarb (Temik, 10% G and 10% GV) are given in Table 3.

DISCUSSION:

Metabolism - Aerobic Soil

1. Nonspecific colorimetric and GC methods were used for aldicarb residue determinations.

2. Complete soil characteristics were not reported.

3. Incubation conditions such as temperature and moisture were not specified.

Mobility - Leaching and Adsorption/Desorption

1. Procedures and analytical methods were incompletely described; therefore, this portion of the study cannot be evaluated.

2. The depth of the soil bed and the soil characteristics were not specified.

3. Soil samples were not collected for analysis.

Field Dissipation - Terrestrial

1. A nonspecific GC method was used for aldicarb residue determination.
2. Soil sampling intervals were inadequate to provide data for accurately assessing aldicarb dissipation in soil.
3. Sampling depths, complete soil characteristics, and irrigation and rainfall data were not reported.

Table 1. Aldicarb residues (ppm) in soils maintained under greenhouse conditions.

Soil	Treatment	Days posttreatment						
		1	3-4	7-10	14-17	28-33	56-64	128-136
Unspecified steam-sterilized soil containing poinsettia	10% GV at 4 lb ai/A	--[a]	--	--	17	3.4	0.27	--
Unspecified steam-sterilized soil containing carnations	10% GV at 4 lb ai/A	--	--	--	2.4	1.9	0.65	--
Greenhouse mix	10% GV at 20 lb ai/A	14.7	14.1	7.4	6.2	2.8	2.1	0.7
Sandy loam	10% G at 20 lb ai/A	7.7	11.0	5.8	4.7	5.0	1.4	0.4
Sandy loam	10% GV at 20 lb ai/A	10.4	6.9	6.7	6.2	6.2	4.8	0.7
Greenhouse mix	10% G at 5 lb ai/A	28	--	--	11	10	1.7	1.2
Greenhouse mix	10% G at 10 lb ai/A	82	--	--	18	18	7.2	5.8
Greenhouse mix	10% G at 10 lb ai/A	80	22	21	17	10	3.1	0.33
Greenhouse mix	10% G at 20 lb ai/A	80	32	34	19	19	6.8	2.4
Unspecified soil containing chrysanthemums	10% G at 11.4 lb ai/A	9.9	10.2	3.1	1.4	--	--	--
Sandy loam[b]	10% G at 5 lb ai/A	--	--	2.8	1.3	0.04	0.18	--
Sandy loam[b]	10% GV at 5 lb ai/A	--	--	3.2	3.0	0.26	0.18	--
Sandy loam[b]	10% GV at 10 lb ai/A	--	--	8.6	5.8	2.7	0.18	--

[a] --; value not reported.

[b] Greenhouse beds containing chrysanthemums.

Table 2. Total aldicarb residues (carbamate) detected in carnation bed leachate (ppm).[a,b]

Analytical laboratory	Days posttreatment				
	0	3	7	14	21
University of California	0.69	0.73	0.96	0.69	0.56
Union Carbide Corp.	0.62	1.13	1.45	1.40	1.39

[a] Average of two duplicate samples.

[b] Control sample contained <0.01 ppm aldicarb residues throughout the study period.

Table 3. Aldicarb residues (ppm) in sandy loam greenhouse soils treated twice with aldicarb (Temik, 10% G or 10% GV) on January 28, 1969 and March 12, 1969.[a]

Treatment	Days after second application			
	5	10	21	33
10% G at 5 + 5 lb ai/A	1.2	5.5	0.60	0.71
10% GV at 5 + 5 lb ai/A	1.1	4.1	0.65	0.34
10% GV at 10 + 10 lb ai/A	3.3	8.0	3.0	1.4

[a] Soils were sampled only at 5, 10, 21, and 33 days after the second application.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 2

CASE GS0140 ALDICARB STUDY 41 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 1010

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 00094799 CONTENT CAT 02

Ivie, D.A. 1981. Letter sent to Donald Stubbs dated Oct. 28, 1981 concerning the use of aldicarb to control citrus nematodes in grapefruit orchards. Texas, Dept. of Agriculture, Agricultural & Environmental Sciences Div., unpublished study, including undated letter from E.L. Johnson to David A. Ivie; CDL:246256-A.

SUBST. CLASS = S. OTHER SUBJECT DESCRIPTORS PRIM: RCBR-25-10429010
SEC: EFB -30-101015 EFB -30-101045

DIRECT RVW TIME = 3 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: L Lewis R Schaefer DATE: May 2, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

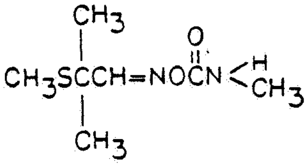
CONCLUSION:

Field Dissipation - Aquatic and Aquatic Impact

This monitoring study could not be validated because the analytical methodology was not reported. Currently, the submission of monitoring data is not required to fulfill EPA Data Requirements for Registering Pesticides (1983).

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{CH_3}{\underset{CH_3}{C}}CH{=}NO\overset{O}{\overset{\|}{C}}N{<}^{H}_{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde
O-(methylcarbamoyl)oxime

Bimonthly ground and surface water samples were taken from four sites in or near citrus orchards (aldicarb 15% G was applied at 5-5.4 lb ai/A) in Cameron County, Texas from April, 1981 to September, 1981. Groundwater samples were obtained from a centrally located well in aldicarb-treated citrus orchards. Surface water was also sampled from the Laguna Atascosa, the major drainage way into the Laguna Atascosa, and the Arroyo Colorado. A total of 12 groundwater and 36 surface water samples were obtained. Three brown shrimp samples from the Laguna Madre or the Arroyo Colorado were obtained commercially in April, June, and September of 1981 for aldicarb residue determination. Recovery values for water samples spiked with aldicarb at 1-30 ppb ranged from 85 to 100%. Recovery values for shrimp were not reported.

REPORTED RESULTS:

Aldicarb residues were not found (<0.01 ppm) in any of 48 groundwater and surface water samples from four sites in Cameron County, Texas in 1981. No aldicarb was detected in brown shrimp samples from the Laguna Madre or the Arroyo Colorado obtained during the same 6-month period.

DISCUSSION:

The validity of this study could not be determined because the analytical methodology used was not presented.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 2

CASE GS0140 ALDICARB STUDY 42 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC GUIDELINE 40 CFR 163.62-00520

FORMULATION 04 - GRANULAR

FICHE/MASTER ID 000101936 CONTENT CAT 01
Clarkson, V., and M. Meigen. 1968. Temik insecticide: the persistence of Temik in an agricultural soil as indicated by field and laboratory bioassay: File No. 10490. Unpublished study received Apr. 18, 1969 under 9F0798; submitted by Union Carbide Corp., New York, NY; CDL:091372-L.

SUBST. CLASS = S.

DIRECT RVW TIME = 3 1/2 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: L. Lewis DATE: Apr. 20, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Terrestrial

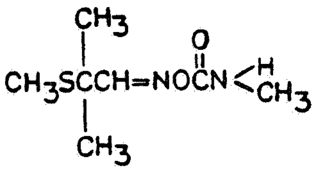
1. This monitoring study is scientifically valid.

2. Insecticidal aldicarb residues dissipated within 1 year in an unspecified field soil treated with aldicarb (10% G) at <6 lb ai/A, as determined by a Colorado potato beetle bioassay.

3. The submission of monitoring data is currently not required.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$\mathrm{CH_3S\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}CH{=}NO\overset{\overset{O}{\|}}{C}N{<}^{H}_{CH_3}}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

Aldicarb (Temik, 10% G, Union Carbide Corp.) was applied in furrow, at 2, 4, or 6 lb ai/A, to single adjacent 130-foot rows of potatoes planted in a nematode-infested field (soil unspecified) in March, 1967. The potatoes were grown to maturity, examined for nematode injury, and disced into the ground. The following spring, volunteer potato plants emerged in the treated field, and were allowed to grow. Colorado potato beetle adults and larvae in the treated field were observed to determine insecticidal aldicarb residues.

REPORTED RESULTS:

Between May 5 and 12, 1968, large numbers of the Colorado potato beetle began to feed and lay eggs on the potato plants. By May 24, 1968 all potato plants were completely destroyed.

DISCUSSION:

1. No toxic symptoms were noted in Colorado potato beetle larvae fed randomly sampled volunteer potato leaflets in the laboratory.

2. Control of Colorado potato beetle adults and larvae at the end of the 1967 growing season was described as excellent at all treatment rates.

(TDR03B) DATA EVALUATION RECORD PAGE 1 OF 3

CASE GS0140 ALDICARB STUDY 43 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC 30 TOPIC 052020

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID 00101940 CONTENT CAT 01

Clarkson, V., B. Rowe, and R. Romine. 1968. Temik insecticide: field evaluation of the persistence of Temik and its carbamate metabolites in pond water and their effect on pond fauna: File No. 10491. Unpublished study received Apr. 18, 1969 under 9F0698; submitted by Union Carbide Corp., New York, NY; CDL:091372-Q.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: L. Lewis and R. Schaefer
TITLE: Staff Scientists
ORG: Dynamac Corp., Enviro Control Division, Rockville, MD
TEL: 468-2500

SIGNATURE: DATE: Apr. 29, 1983

APPROVED BY:
TITLE:
ORG:
TEL:

SIGNATURE: DATE:

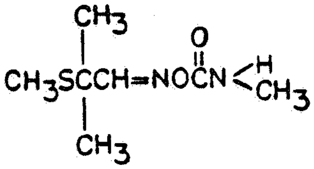
CONCLUSION:

Field Dissipation - Aquatic and Aquatic Impact

This study is scientifically invalid because carbamate residues were not quantified in fish that died during the test period and were removed from the aldicarb treated pond, experimental methods were only briefly and inadequately described, and water and bottom mud samples were not taken from random locations throughout the pond. This study would not satisfy EPA Data Requirements for Registering Pesticides (1983) because a nonspecific colorimetric method was used, and the test substance was not a typical end-use product.

MATERIALS AND METHODS:

ALDICARB, TEMIK, UC-21149



$$CH_3S\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{C}}CH{=}NO\overset{\displaystyle O}{\overset{\|}{C}}N{<}\genfrac{}{}{0pt}{}{H}{CH_3}$$

2-Methyl-2-(methylthio)propionaldehyde O-(methylcarbamoyl)oxime

A small farm pond, stocked with 75 bluegill and 6 large-mouth bass, was treated with aldicarb (Temik, 98.6% technical, Union Carbide Corp.) at 3 ppm. To achieve a uniform concentration of aldicarb throughout the pond, the pond water was treated by circulating it through a steel drum containing a gauze bag filled with aldicarb for 4.5 hours. Mud and water samples were taken from midpond at day 0, 1, 2, 3, 4, 5, 6, 7, 10, 14, 21, 28, 35, and 42 for aldicarb residue determination (both pretreatment and posttreatment samples were taken on day 0). The total carbamate content (aldicarb, aldicarb sulfone, and aldicarb sulfoxide) of samples at each interval was quantified by using a colorimetric method (UC 21149-II-Soil; UC 21149-II-Water). The detection limit for carbamate residues in both sediment and water was 0.06 ppm.

REPORTED RESULTS:

Carbamate residues in pond water dissipated with a half-life of ~10-14 days (Table 1). Six weeks after treatment, the carbamate content of the pond water had declined to 0.06 ppm. Bottom mud samples contained carbamate levels up to 0.09 ppm.

DISCUSSION:

1. Heavy rain (4.5 inches) that occurred during the last 3 days of the test period was stated to have doubled the volume of water in the pond, but the impact of this on carbamate residues was not addressed.

2. Aldicarb residues were not characterized.

3. Fish that died during the test period were removed from the pond, but were not analyzed for carbamate residues.

4. Water and bottom mud samples were taken only from midpond; therefore, the residue data presented are not representative of carbamate levels throughout the pond.

Table 1. Total carbamate residues in the water and sediment of a small farm pond treated with aldicarb.

Sampling interval (days)	Water (ppm)	Sediment (ppm)
0 (pretreatment)	0.03	0.06
0 (posttreatment)	2.8	0.06
1	2.7	<0.06
2	3.0	0.06
3	3.0	<0.06
4	2.7	<0.06
5	2.5	<0.06
6	2.3	<0.06
7	2.1	<0.06
10	1.6	<0.06
14	1.1	<0.06
21	0.42	<0.06
28	0.26	0.09
35	0.15	0.08
42	0.06	0.08

DATA EVALUATION RECORD

CASE GS 0140 ALDICARB STUDY 44 PM 300 09/29/82

CHEM 098301 Aldicarb

BRANCH EFB DISC --

FORMULATION 90 - FORMULATION NOT IDENTIFIED

FICHE/MASTER ID No MRID CONTENT CAT --

Union Carbide Corp. 1983. Temik aldicarb pesticide residues in Florida. Unpublished study received May 16, 1983; compilation of all Union Carbide Florida groundwater data; submitted by Union Carbide Corp.

SUBST. CLASS =

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

REVIEWED BY: Samuel M. Creeger
TITLE:
ORG: U.S. Environmental Protection Agency
LOC/TEL:

SIGNATURE: DATE: Aug. 30, 1983

APPROVED BY:
TITLE:
ORG:
LOC/TEL:

SIGNATURE: DATE: